PROCEEDINGS

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OF

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Volume 73

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A REDESCRIPTION OF AEDES (STEGOMYIA) SCUTELLARIS MALAYENSIS COLLESS AND THE DIFFERENTIATION OF THE LARVA FROM THAT OF AEDES (S.) ALBOPICTUS (SKUSE)

(DIPTERA: CULICIDAE)[1]

YIAU-MIN HUANG, *Southeast Asia Mosquito Project, Department of Entomology, Smithsonian Institution, Washington, D.C. 20560*

ABSTRACT—Both sexes of *Aedes* (*Stegomyia*) *scutellaris malayensis* Colless 1962 are redescribed and the larva and pupa described for the first time. Characters for separating the larva of this species from that of *A.* (*S.*) *albopictus* (Skuse) 1894–5 are given.

Aedes scutellaris malayensis is a Southeast Asia taxon, widely distributed throughout the area. The adults, except for the claspette of the male terminalia, have not been described in any detail, and the immature stages not at all. In the field, *s. malayensis* is often found with *albopictus* in the same breeding habitats such as tree holes, and unfortunately the immature stages are extremely similar and very difficult to separate. In view of this and present day interest in *Stegomyia*, it has been considered desirable to give a detailed description of all stages of *s. malayensis* at the earliest opportunity.

The following description is based primarily on specimens collected from Pulau Hantu, Singapore, the type locality of *s. malayensis*, by Mr. W. T. Chellappah during March, April, May, December, 1969 and January, 1970. Material Examined: 8 paratypes (4 males, 4 females) in USNM, 4 paratypes (2 males, 2 females) in BM, all bearing same data as holotype male and allotype female (*A. s. malayensis*, EX. Lab. Colony from Singapore, 1962). 343 adults (164 males, 179 females), 263 larvae, 253 pupae, 235 adults from individual rearings, 56 male terminalia slides, 17 female terminalia slides (Pulau Hantu, Singapore, March, April, May, December, 1969 and January, 1970, W. T. Chellappah).

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[1] This work was supported by Research Contract No. DA-49-193-MD-2672 from the U.S. Army Medical Research and Development Command, Office of the Surgeon General, Washington, D.C.

Aedes (Stegomyia) scutellaris malayensis Colless
(Figs. 1, 2, 3)

Aedes (*Stegomyia*) *scutellaris malayensis* Colless, 1962, Proc. Linn. Soc. N.S.W. 87: 314 (♂, ♀). Type locality: Pulau Hantu, Keppel Harbour, Singapore.

MALE. *Head.* Proboscis dark scaled (or sometimes with a few pale scales on the ventral side, or with a white stripe on the ventral side), slightly longer than fore femur; palpus dark, as long as proboscis, with a white basal band on each of segments 2–5; those on segments 4,5 incomplete dorsally; segments 4,5 subequal, slender, upturned, and with only a few short hairs; antenna plumose, shorter than proboscis; clypeus bare; pedicel covered with white scales except on dorsal side; decumbent scales of vertex all broad and flat; erect forked scales dark, not numerous, restricted to occiput; vertex with a median stripe of broad white scales, with broad dark ones on each side interrupted by a lateral stripe of broad white scales followed by a patch of white broad ones ventrally. *Thorax.* Scutum with narrow dark scales and a prominent median longitudinal stripe of similar white ones, the median stripe narrows slightly posteriorly and forks at beginning of the prescutellar space, there is on each side a posterior dorsocentral white line which does not reach to the middle of the scutum; a supraalar line of broad white scales present; acrostichal bristles absent; dorsocentral bristles present; scutellum with broad white scales on all lobes and with a few broad dark ones at the apex of mid lobe; anterior pronotum with broad white scales; posterior pronotum with narrow dark scales on the upper portion and with broad white scales on the lower portion forming a white stripe instead of a white patch; paratergite with broad white scales; postspiracular area without scales; subspiracular area without scales; patches of broad white scales on propleuron, on the upper and lower portions of sternopleuron and on the upper and lower portions of mesepimeron; mesepimeron scale patches well separated, sometimes narrowly connected; lower mesepimeron without bristles; metameron bare. *Wing.* With dark scales on all veins except for a minute basal spot of white scales on the costa; first forked cell 1.5 times as long as its stem. *Halter.* With dark scales. *Legs.* Coxae with patches of white scales; knee-spots present on all femora; fore and mid femora dark anteriorly, paler posteriorly; hind femur anteriorly with a broad white longitudinal stripe which widens at base and is narrowly separated from the apical white scale patch; fore and mid tibiae dark anteriorly, paler posteriorly; hind tibia dark; fore and mid tarsi with basal white bands on tarsomere 1,2; hind tarsus with basal white bands on tarsomeres 1–4, the ratio of the length of the white band to the total length of the tarsomere is as 1:4, 1:3, 2:5 and 2:3, tarsomere 5 all white or sometimes with a few dark scales on the apical ventral side; fore and mid legs with tarsal claws unequal, the larger one toothed, the smaller one simple; hind leg with tarsal claws equal, simple. *Abdomen.* Abdominal segment I with white scales on laterotergite; tergum II dark dorsally, with lateral pale spots only or sometimes with a median spot as well; terga III–VI each with a sub-basal transverse white band which is connected to the lateral spots, sometimes tergum III with a sub-basal median spot and with lateral spots which are turned dorsomesally; tergum VII with lateral white spots only; sternum VIII largely covered with white scales. *Terminalia.* Basimere 3.5 times as long as wide; its scales restricted to dorsolateral, lateral and ventral areas; with a patch of hairs on the basomesal area of the dorsal surface; mesal surface membranous; claspette with the distal expanded part subtriangular in shape, the sternal and tergal sides

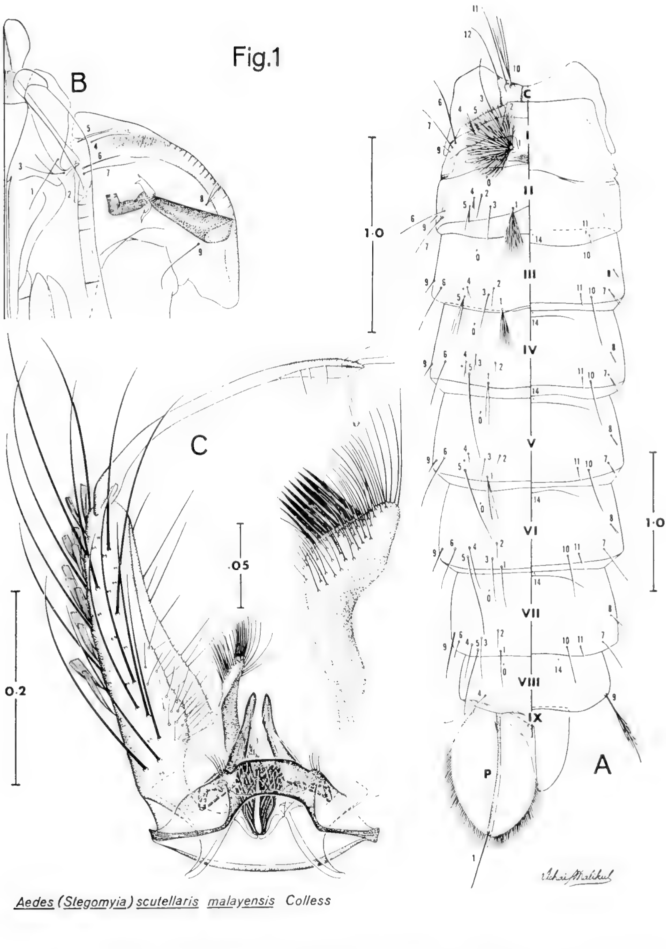


Fig. 1. *Aedes* (*Stegomyia*) *scutellaris malayensis* Colless. A, B, dorsoventral aspect of the male pupa; C, tergal aspect of the male terminalia with claspette enlarged (lateral aspect).

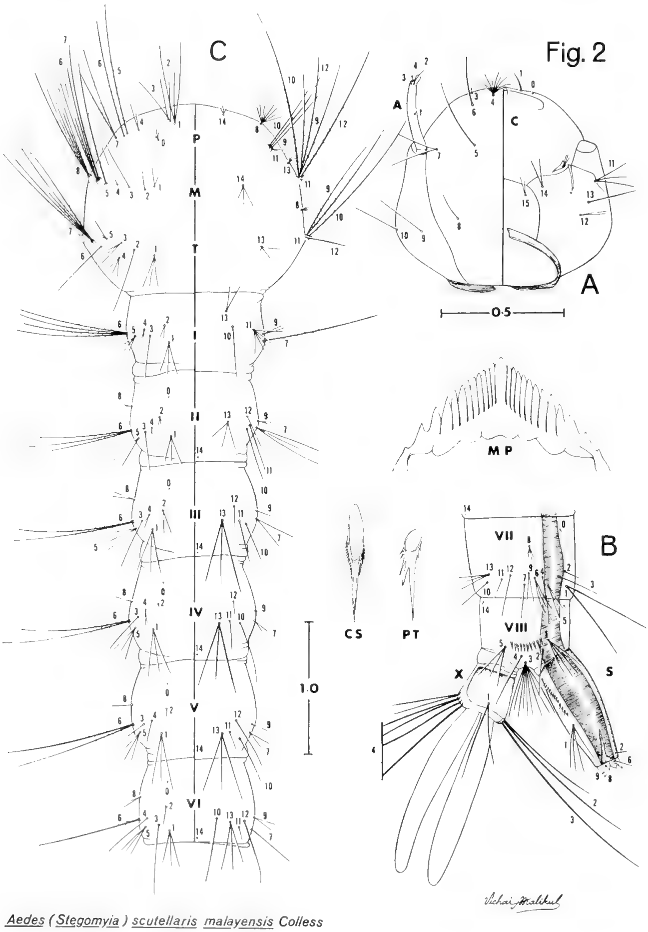
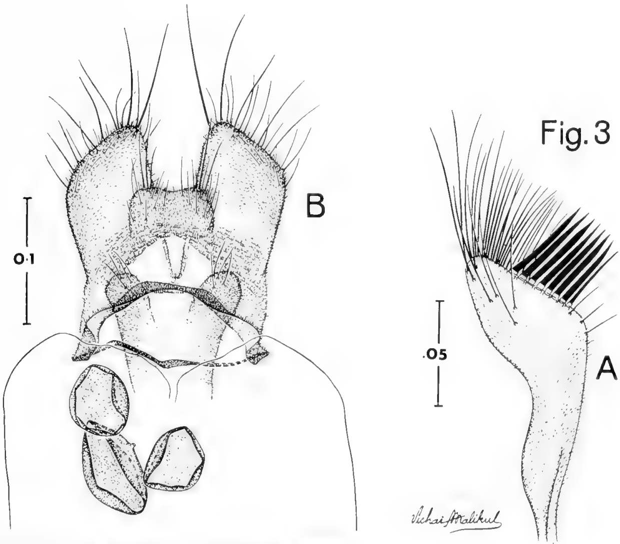


Fig. 2. *Aedes* (*Stegomyia*) *scutellaris malayensis* Colless. A, dorsoventral aspect of the head of the fourth instar larva; B, lateral aspect of the terminal abdominal segments of the fourth instar larva; C, dorsoventral aspect of the thorax and abdomen of the fourth instar larva.

Fig. 3



Aedes (Stegomyia) scutellaris malayensis Colless

Fig. 3. *Aedes* (*Stegomyia*) *scutellaris malayensis* Colless. A, mesal aspect of the claspette of the male terminalia; B, sternal aspect of the female terminalia.

not parallel but tapering, with 7–10 modified setae forming a prominent row on the middle area of the sternal side and occupying about ½ of it; distimere simple, elongate, as long as basimere, with a spiniform process and a few hairs at apex; aedeagus with a distinct sclerotized lateral toothed plate on each side; paraprocts without teeth; cercal setae absent; ninth tergum with 2 hairy lateral lobes.

FEMALE. Essentially as in the male, differing in the following respects: palpus ⅕ of proboscis, with white scales on apical half. Wing with first forked cell about 2 times as long as its stem. Fore and mid legs with tarsal claws equal, simple. Abdominal tergum I sometimes with a median spot; tergum II always dark dorsally, with lateral spots which are turned dorsomesally; tergum III often dark dorsally, with lateral spots only (or sometimes as in the male); terga IV–VII often with complete sub-basal transverse white bands or sometimes with an incomplete sub-basal transverse band on tergum IV; segment VIII largely retracted; sternum VIII with conspicuous rounded lateral lobe; post-genital plate with shallow notch; cerci short and broad; 3 spermathecae, 1 larger than the other 2.

PUPA. *Cephalothorax.* Trumpet short, three times as long as wide at the middle; both hair 1-C and 3-C single, longer than 2-C; 2-C usually single (1–2);

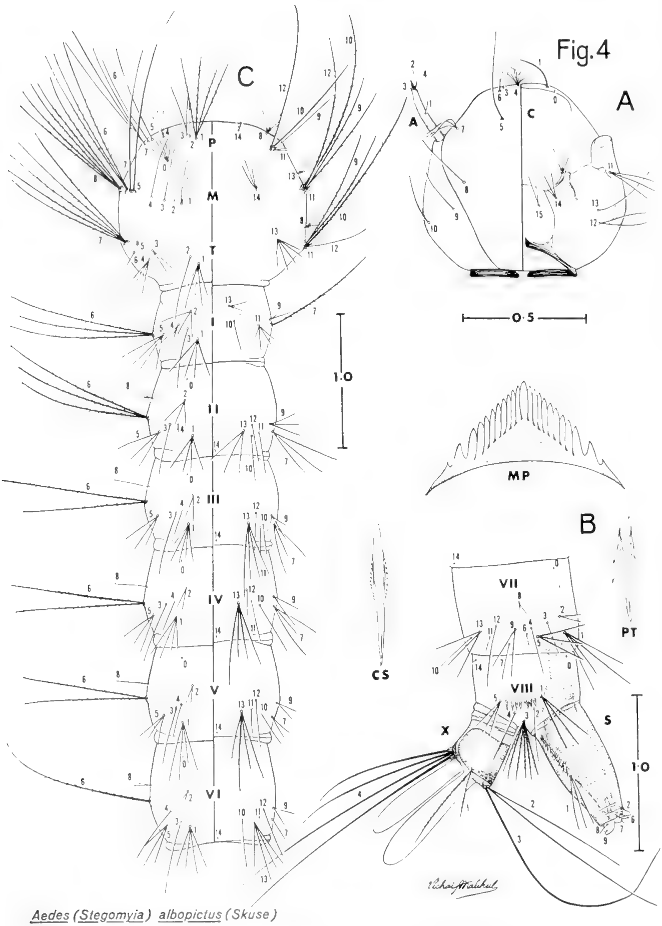


Fig. 4. *Aedes* (*Stegomyia*) *albopictus* (Skuse). A, dorsoventral aspect of the head of the fourth instar larva; B, lateral aspect of the terminal abdominal segments of the fourth instar larva; C, dorsoventral aspect of the thorax and abdomen of the fourth instar larva.

4-C usually single (1–2); 5-C usually with 2 branches (2–3); hair 6-C single, much stouter than 7-C; hair 10-C branched, mesad and caudad of 11-C; 11-C single. *Abdomen.* Hair 1-I well developed, with more than 10 branches, dendritic; hair 2-I single; hair 3-I single, long; hair 2-I and 3-I not widely separated, the distance between them as the distance between 4-I and 5-I; hair 1-II branched, dendritic; hair 2-II laterad of hair 3-II; hair 2-IV, V mesad of hair 1; hair 3-II and 3-III single, shorter than segment III; hair 5-IV, 5-V and 5-VI single, not reaching beyond the posterior margin of the following segment; hair 9-VIII usually with a strong main stem (1 or 2) and lateral branches of varying length. *Paddle.* Margins with fringe; hair 1-P single; hair 2-P sometimes present.

LARVA. *Head.* Antenna 0.5 length of head, without spicules; 1-A inserted near middle of shaft, single; inner mouth brushes pectinate at tip; head hair 4-C well developed, branched, closer to 6-C than 5-C, cephalad and mesad of 6-C; hairs 5, 6, 8, 9 and 13 single; 7 and 12 double; 10 usually single (1–2); 11 usually with 3 branches (3–4); 14 and 15 usually double (2–3); mentum with 11–12 teeth on each side. *Thorax.* Hair 1-P usually with 3 branches (2–3); 2-P single; 3-P double; 5-P and 6-P single; 7-P double; 11-P usually double (1–2); 5-M and 7-M single; 6-M with 3 branches; 8-M with 4–5 branches; 9-M usually with 3 branches (2–3); 10 and 12 single, long, stout; 11 single, small; 7-T usually with 5 branches (5–7); 9-T usually double (2–3); 10 and 11 similar to those on mesothorax; 12 more reduced. *Abdomen.* Hair 6-I usually with 4 branches (3–4); 7-I single; 6-II usually with 3 branches (2–3); 7-II usually with 3 branches (2–3); 6-III-V double; 6-VI single; 1-VII usually with 2 branches (2–3), long; comb of 8–12 scales in a single row, each scale with fine denticles or fringes at the base of the apical spine; pentad hair 2-VIII distant from 1-VIII; 1-VIII and 5-VIII with 3–4 branches; 3-VIII with 5–9 branches; 2-VIII and 4-VIII single; siphon short, about 2.5 times as long as wide, acus absent; pecten teeth 10–14 in number, evenly spaced, each tooth with 2–4 basal denticles; 1-S with 4–5 branches, inserted beyond last tooth and in line with the teeth; saddle incomplete; marginal spicules very small and inconspicuous; 1-X with 2 branches; 2-X with 2 branches; 3-X single; ventral brush with 4 pairs of hairs on grid, each hair single except 2 of the proximal ones usually double (1–2), sometimes 4 of the proximal ones double; without precratal tufts; gills long and about 4 times as long as saddle, sausage-like.

TYPE DATA. *Aedes* (*Stegomyia*) *scutellaris malayensis* Colless, holotype male, allotype female in the Australian National Insect Collection, Canberra; type locality: Palau Hantu, Keppel Harbour, Singapore (Colless 1962).

DISTRIBUTION. This species is widely distributed throughout Southeast Asia, being known from Singapore, Malaya, Thailand, Cambodia, Viet Nam, Taiwan and Hainan.

TAXONOMIC DISCUSSION. *Aedes s. malayensis*, a member of the *scutellaris* subgroup, is highly variable in both adult ornamentation and in the immature stages. However, certain characters of the male terminalia, such as the shape of the claspette and the degree of development of modified setae on it, are constant and unique. It is very similar to *s. scutellaris* from Aroe Island and New Guinea (Huang 1969), to *s. hensilli* from Ulithi Island, W. Carolinas and "*scutellaris*" from the Philippines. A full account of these and related forms will be given in the future.

BIOLOGY. Larvae were taken in tree-holes on Pulau Hantu and in fallen palm-fronds (Colless, 1957).

The topotypic material (Pulau Hantu, Singapore, W. T. Chellappah) newly reported here was reared from larvae or pupae which were collected from tree-holes and spathes holding water and reared from eggs which were obtained from wild caught adults.

The adults of *s. malayensis* are easily differentiated from *albopictus* by the characteristic abdominal ornamentation, while the larvae are extremely similar. In nature, the larvae of *s. malayensis* are often collected from the same breeding sites as *albopictus*, therefore, great care must be taken in identifying them. The following will suffice in about 80–90% of cases. In *s. malayensis* abdominal hair 1-VII usually with 2 long branches, when 3-branched then one much smaller than the other two; mesothoracic hair 9-M usually 3, rarely 2-branched; ventral brush hairs 4a-x usually double, occasionally single. In *albopictus* hair 1-VII usually 4, sometimes 3-branched, but always shorter and stronger; mesothoracic hair 9-M usually with 2 branches, rarely 3-branched; 4a-x always single.

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I am much indebted to Mr. W. T. Chellappah, Department of Parasitology, Faculty of Medicine, University of Singapore, Singapore, for his invaluable help in sending the Singapore material to SEAMP.

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HOST PLANTS OF APHIS GOSSYPII AT THE LOS ANGELES STATE AND COUNTY ARBORETUM, ARCADIA, CALIFORNIA[1]

(Homoptera: Aphididae)

Mortimer D. Leonard, *Collaborator, Entomology Research Division, Agricultural Research Service, U.S. Department of Agriculture*[2]

and

Harry G. Walker, *Entomologist* and Leonid Enari, *Plant Taxonomist, Los Angeles State and County Arboretum, 301 North Baldwin Ave., Arcadia, California 91006*

ABSTRACT—During 1966 and 1967 aphids were collected from 1332 different kinds of plants at the Los Angeles State and County Arboretum, Arcadia, California. *Aphis gossypii* Glover was found on 204 of these, which were distributed in 84 genera and 35 different plant families. The genera are listed in alphabetical order and with each species the date or dates of collection are given and the relative abundance of *A. gossypii* is usually indicated.

During 1966 and 1967 aphids were collected from 1332 different kinds of plants at the Los Angeles State and County Arboretum at Arcadia, California. *Aphis gossypii* Glover was found on 204 of these plants which are distributed in 84 genera and 35 plant families. The genera of the host plants are listed in alphabetical order including the family name, an alphabetical listing of the host species in each genus, the dates of collection and, where available, an indication of the abundance of the aphids.

In addition, there is an alphabetical listing of the family names of the host plants, plus the number of genera, the number of hosts and the number of collections in which *A. gossypii* were found.

Host Plants of ***Aphis gossypii*** Glover Arranged Alphabetically According to Genera and Giving the Date Aphids Were Collected and Indication of Abundance

Leguminosae

Acacia gillii Maiden & Blakely
2/XI/67 moderate

A. pennata Willd.
25/VII/67 scarce

Araliaceae

Acanthopanax trifoliatus Merrill
11/I/67 moderate

Malvaceae

Alyogyne hakeifolia (Giard.) Alef.
27/II/67 moderate

[1] This is the second in a series of papers on the host plants of aphids at the Los Angeles State and County Arboretum at Arcadia, California in which Dr. Leonard was responsible for the identification of the aphids, Dr. Walker for their collection and Dr. Enari for the identification of the host plants.

[2] Mail address: 2400 16th Street, N.W., Washington, D.C. 20009.

Compositae
Angianthus tomentosus Wendl.
20/I/67 abundant

Liliaceae
Asparagus sprengeri Regel.
27/X/67 scarce

Myrtaceae
Baeckea virgata Andr.
11/IV/67 scarce

Leguminosae
Bauhinia variegata Linn.
7/III/67 abundant

Begoniaceae
Begonia Hybrids Hort.
27/X/67 scarce

B. semperflorens Hook
27/X/67 moderate

Rutaceae
Boronia megastigma Nees
31/X/67 scarce

Pittosporaceae
Bursaria spinosa incana Lindl.
20/I/67 abundant
19/VII/67 abundant

B. s. inermis Blanco
20/I/67 abundant

Leguminosae
Caesalpinia crista Linn.
13/IV/67 scarce

Compositae
Calendula officinalis 'Pacific Beauty'
29/XII scarce

Myrtaceae
Callistemon pachyphyllus Cheel
14/IV/67 scarce

Cupressaceae
Callitris rhomboidea R. Br.
2/IV/67 scarce

C. robusta R. Br.
6/III/67 moderate

C. verrucosa R. Br.
21/VII/67 moderate

Apocynaceae
Carissa macrocarpa A.DC.
28/VI/67 scarce

Leguminosae
Cassia australis Reinw.
12/VI/66

C. tomentosa Ehrenb. & Hempr.
3/VI/67 scarce

Casuarinaceae
Casuarina equisetifolia Linn.
7/III/67 scarce

C. huegeliana Miq.
10/VII/67 scarce

Bignoniaceae
Catalpa speciosa Warder
5/V/67 scarce

Solanaceae
Cestrum nocturnum Linn.
7/IX/66 abundant

Myrtaceae
Chamaelaucium uncinatum Schauer
26/I/67 abundant

C. u. 'Rubrum'
26/I/67 abundant

Malvaceae
Chorisia speciosa St. Hil.
16/II/67 scarce

Compositae
Chrysanthemum maximum 'Temptation'
31/X/67 moderate

C. 'Rambler'
15/V/67 moderate

Rutaceae
Citrus sp.
16/III/67 abundant

C. limonia Risso
19/X/67 abundant

C. paradisi MacFad.
29/III/66 scarce

Ternstroemiaceae
Cleyera japonica Thunb.
10/VIII/67 moderate

Leguminosae
Clianthus formosus Ford & Vickery
27/XII/67 abundant

Combretaceae
Combretum glomeruliflorum Sond
17/IV/67 moderate
C. kraussii Hochst.
6/IV/67 moderate

Boraginaceae
Cordia myxa Linn.
24/III/67 abundant
19/VII/67 abundant

Rosaceae
Cotoneaster conspicua Marquand
18/X/66 abundant
2/V/67 moderate
28/XII/67 moderate
C. denticulata H. B. & K.
23/XI/66 abundant
C. harroviana Wils.
21/VI/67 abundant
C. microphylla thymifolia Koehne
12/X/67 scarce

Crassulaceae
Crassula falcata Wendl.
16/VIII/66 abundant
26/IX/67 abundant
11/X/67 abundant
C. portulacea Lam.
10/I/67 abundant
7/III/67 abundant

Solanaceae
Cyphomandra betacea Sendt.
14/IX/66 scarce
1/XI/66 abundant

Leguminosae
Cytisus canariensis Steud.
5/IV/67 scarce

Compositae
Diplopappus filifolius (Vent.) DC.
5/IV/67 moderate

Myoporaceae
Eremophila bignoniflora F. Muell.
24/X/67 scarce

Ericaceae
Erica australis Linn.
18/III/67 scarce
E. bauera Andr.
30/VI/66
E. glandulosa Andr.
22/IV/67 scarce

Rosaceae
Eriobotrya deflexa koshunenis K. & S.
18/X/67 scarce
28/XII/67 abundant
E. japonica Lindl.
11/X/67 abundant

Myrtaceae
Eucalyptus sp.
12/IV/67 scarce
E. aggregata Deane & Maiden
30/III/67 scarce
E. amygdalina Labill.
26/I/67 scarce
14/IV/67 moderate
E. angulosa Schau.
26/III/67 scarce
14/IV/67 scarce
E. behriana F. Muell.
18/IV/66 scarce
E. botryoides Sm.
23/X/67 moderate
E. brachycalyx Blakely
2/XI/67 abundant
E. b. chindoo Blakely
13/IV/67 moderate
E. brevifolia F. Muell.
2/XI/67 moderate
E. burracoppinensis Maiden
30/III/67 scarce
E. caesia Benth.
24/X/67 scarce

E. coccifera Hook	
4/II/67	moderate
E. coccifera 'Multifruited'	
11/VII/67	moderate
E. cosmophylla F. Muell.	
23/X/67	scarce
E. diversifolia Bonpl.	
30/III/67	scarce
E. ebbanoensis Maiden	
14/IV/67	moderate
E. erythronema Turcz.	
28/I/67	abundant
24/X/67	scarce
E. eudesmoides F. Muell.	
30/III/67	scarce
E. gigantea Dehnh.	
23/X/67	abundant
E. huberiana Naud.	
23/X/67	moderate
E. hybrid	
31/III/67	moderate
E. incrassata Labill.	
31/III/67	scarce
E. intertexta R. T. Baker	
12/IV/67	scarce
E. lansdowneana leucantha Blakely	
25/I/67	scarce
11/VII/67	scarce
E. leucophylla Domin.	
19/I/67	abundant
7/III/67	scarce
10/VII/67	scarce
E. leucoxylon pauperata J. E. Br.	
24/X/67	scarce
E. macrandra F. Muell.	
30/I/67	scarce
2/XI/67	scarce
E. marginata Sm.	
24/X/67	scarce
E. megacornuta C. A. Gardner	
24/III/67	scarce
E. melanophloia F. Muell.	
20/VII/67	scarce
E. melliodora A. Cunn.	
23/X/67	abundant
E. odontocarpa F. Muell.	
14/IV/67	scarce
E. oleosa F. Muell.	
2/XI/67	abundant
E. orbifolia F. Muell.	
2/XI/67	moderate
E. orgadophilia M. & B.	
23/X/67	moderate
E. ovata Labill.	
25/I/67	moderate
E. oxymitra Blakely	
31/III/67	scarce
2/XI/67	moderate
E. pachyloma Benth.	
2/XI/67	scarce
E. pachyphylla A. Cunn.	
31/III/67	moderate
2/XI/67	scarce
E. paniculata Sm.	
30/I/67	abundant
E. pauciflora Sieber	
12/VII/67	moderate
E. pileata Blakely	
31/III/67	scarce
E. platypus heterophylla Blakely	
2/XI/67	scarce
E. pyriformis Turcz.	
23/I/67	scarce
31/III/67	scarce
E. rhodantha B. & S.	
9/X/67	abundant
E. salmonophloia F. Muell.	
25/III/67	scarce
E. sideroxylon A. Cunn.	
24/X/67	scarce
E. stellulata Sieber	
24/X/67	scarce
E. stuartiana F. Muell.	
14/IV/67	moderate
E. tereticornis Sm.	
25/I/67	abundant
E. torquata Luehm.	
2/XI/67	scarce
E. umbellata Dum-Cours.	
2/XI/67	moderate

E. urnigera Hook
13/VII/67 abundant

E. xanthonema Turcz.
30/III/67 scarce

Celastraceae

Euonymus japonicus Linn.
19/VI/67 scarce

Moraceae

Ficus sp.
17/X/67 scarce

F. henneana Miq.
2/II/67 abundant

F. iteophylla Miq.
3/VI/67 scarce

F. natalensis Hochst.
30/XII/66 abundant

F. retusa Linn.
7/III/67 scarce

Onagraceae

Fuchsia hybrids
10/X/67 moderate

F. 'Ventura'
7/IX/67 moderate

Rubiaceae

Gardenia globosa Hochst.
10/XI/66 scarce

G. thunbergia Linn.
11/IV/66
25/X/67 scarce

Leguminosae

Genista cinerea DC.
23/V/67 abundant

Compositae

Gerbera jamesonii Bolus
30/VI/66

Malvaceae

Gossypium sp.
9/IX/66 abundant
15/XI/66 scarce

G. sturtianum J. H. Willis
17/I/67 abundant

Proteaceae

Grevillea thelemanniana Hueg.
29/VI/67 scarce

Rosaceae

Heteromeles arbutifolia Lindl.
25/IV/67 scarce

H. a. macrocarpa Munz.
20/IV/67 moderate

Malvaceae

Hibiscus G-65-9
29/X/66 abundant

H. 'Andersonii'
29/X/66 scarce

H. arnottianus A. Gray
29/X/66 moderate

H. a. kauaiensis
29/X/66 abundant

H. 'Blue Hawaiian'
26/IX/67 abundant

H. 'Cooperi'
29/X/66 moderate

H. 'D. H. Denisonii × *H.* Rosa F_1' Hort.
4/X/66 abundant

H. 'Deodar Double'
26/IX/67 abundant

H. 'Higbee Red'
29/X/66 abundant

H. 'Hybrid'
26/IX/67 abundant

H. ludwigii Eckl. & Zeyh.
18/I/67 moderate
17/X/67 scarce

H. manihot Linn.
30/X/67 scarce

H. mutabilis
1/V/67 scarce

H. pedunculatus Linn.
5/IV/67 scarce

H. rosa-sinensis Linn.
17/I/67 abundant

H. rosa-sinensis 'Sandra'
4/XI/67 abundant

H. 'Ross Estey'
4/X/66 abundant

H. surattensis Linn.
30/X/67 moderate

H. syriacus Linn.
11/X/67 abundant

Pittosporaceae

Hymenosporum flavum F. Muell.
9/XI/66 abundant
12/IV/67 moderate
30/VI/67 abundant
11/X/67 moderate

Hypericaceae

Hypericum balearicum Linn.
18/III/67 abundant

H. calycinum Linn.
27/X/67 moderate

H. canadense Linn.
10/IV/66

H. canariensis Linn.
11/X/67 abundant

H. elatum Ait.
4/XI/66 scarce
18/III/67 abundant

H. patulum Thunb.
19/VI/67 abundant
31/X/67 abundant

Saxifrageae

Itea yunnanensis Franch.
13/VI/67 scarce
4/X/67 moderate

Bignoniaceae

Jacaranda acutifolia Humb. & Bonpl.
11/VII/66 scarce
5/VI/67 scarce

Crassulaceae

Kalanchoe blossfeldiana V. Poelln.
20/X/66 abundant
25/IV/67 scarce

Myrtaceae

Kunzea ericifolia Reichb.
29/VI/67 scarce

K. recurva Schau.
29/VI/67 scarce

Verbenaceae

Lantana macrophylla Schau.
13/IV/66

Myrtaceae

Leptospermum 'Pom Pom'
14/IV/67 scarce
6/VII/67 moderate

L. 'Red Damask'
12/IV/67 scarce
30/VI/67 scarce

L. scoparium 'Ruby Glow'
30/VI/67 scarce

L. scoparium 'Snow White'
6/VII/67 scarce

L. scoparium 'Walker'
23/I/67 scarce

Lhotskya ericoides Schau.
12/IV/67 scarce

Hamamelidaceae

Liquidamber formosana Hance
16/III/67 moderate
6/V/67 scarce
15/VI/67 scarce

L. orientalis Mill.
18/III/67 scarce

L. styraciflua Linn.
5/IV/67 scarce

Myrtaceae

Melaleuca longicoma Benth.
2/XI/67 moderate

M. radula Lindl.
15/IV/67 scarce

M. squarrosa Donn
13/VII/67 scarce

M. uncinata R. Br.
14/IV/67 scarce

Metrosideros excelsa Soland.
26/III/67 scarce

Rutaceae

Microcitrus australis Swingle
27/X/67 scarce

Leguminosae
Mundulea sericea A. Cheval
8/V/67 scarce

Myoporaceae
Myoporum acuminatum R. Br.
27/XII/66 scarce
28/I/67 scarce

Myrtaceae
Myrtus communis Linn.
4/X/67 scarce
3/XI/67 scarce

Compositae
Olearia gunniana Hook
25/I/67 moderate

Rosaceae
Osteomeles subrotunda Lindl.
28/XII/67 moderate

Leguminosae
Oxylobium callistachys Benth.
23/X/67 scarce

Araliaceae
Paratropia stelzneriana
8/VIII/66 abundant

Hamamelidaceae
Parrotia persica CA. Mey.
5/IV/67 moderate

Rosaceae
Photinia beauverdiana Schneider
16/V/67 moderate
16/VIII/67 moderate

P. fraseri Dress
1/II/67 moderate
5/V/67 moderate
21/VII/67 abundant
27/XII/67 scarce

P. glabra Decne.
7/VII/66 abundant
16/VIII/67 abundant

P. serrulata Lindl.
5/VII/67 abundant

Pittosporaceae
Pittosporum tobira 'Varigatum'
14/III/67 moderate

Plumbaginaceae
Plumbago capensis Thunb.
15/VI/67 scarce

Portulacaceae
Portulaca olearacea Linn.
3/XI/67 moderate

Araliaceae
Pseudopanax lessonii C. Koch
1/VIII/66 scarce

Rosaceae
Pyracantha koidzumii Rehder.
16/III/67 moderate

Anacardiaceae
Rhus sp.
5/IV/67 scarce

R. viminalis Ait.
13/II/67 abundant

Labiatae
Salvia rutilans Carr.
14/IV/66 scarce

Araliaceae
Schefflera venulosa Harms.
25/III/66 abundant
6/X/66 abundant

Compositae
Senecio lineatus DC.
5/IV/67 scarce

S. petasitis DC.
7/IV/67 scarce

Rutaceae
Severinia buxifolia Tenore
1/VI/67 moderate

Leguminosae
Sophora secundiflora Lag.
15/V/67 moderate

Apocynaceae
Trachelospermum asiaticum Nakai
27/X/67 scarce
T. jasminoides Lem
13/VIII/66 scarce
4/X/66 moderate
5/X/67 scarce
17/X/67 abundant

Caprifoliaceae
Viburnum atrocyaneum C. B. Clarke
20/X/66 abundant
V. suspensum Lindl.
4/X/67 abundant
V. tinus Linn.
1/VIII/66 scarce

Apocynaceae
Vinca major Linn.
6/XI/67 abundant

Cupressaceae
Widdringtonia dracomontana Stapf.
5/IV/67 abundant

An Alphabetical List of the Families of the Host Plants of **Aphis gossypii** Glover Indicating the Numbers of Genera, Species or Other Identifications and the Number of Collections Made During 1966 and 1967

Families	Genera	Hosts	Samples Taken
Anacardiaceae	1	2	2
Apocynaceae	3	4	7
Araliaceae	4	4	5
Begoniaceae	1	2	2
Bignoniaceae	2	2	3
Boraginaceae	1	1	2
Caprifoliaceae	1	3	3
Casuarinaceae	1	2	2
Celastraceae	1	1	1
Combretaceae	1	2	2
Compositae	7	9	9
Crassulaceae	2	3	7
Cupressaceae	2	4	4
Ericaceae	1	3	3
Hamamelidaceae	2	4	6
Hypericaceae	1	6	8
Labiatae	1	1	1
Leguminosae	11	12	10
Liliaceae	1	1	1
Malvaceae	4	23	25
Moraceae	1	5	5
Myoporaceae	2	2	3
Myrtaceae	10	72	85
Onagraceae	1	2	2
Pittosporaceae	3	4	8
Plumbaginaceae	1	1	1
Portulacaceae	1	1	1
Proteaceae	1	1	1
Rosaceae	5	12	22
Rubiaceae	1	2	3
Rutaceae	5	8	8
Saxifragaceae	1	1	2
Solanaceae	2	2	3
Ternstroemiaceae	1	1	1
Verbenaceae	1	1	1
Total	84	204	249

THE SPECIES RELATED TO MINETTIA OBSCURA (LOEW), WITH ONE NEW SPECIES AND ONE NEW SYNONYM

(DIPTERA: LAUXANIIDAE)

GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—Examination of the type specimens of *Minettia obscura* (Loew) and *M. americana* Malloch shows that the latter is a synonym of the former and that the species Malloch considered to be *M. obscura* is until now unnamed. *Minettia obscura* of authors, not Loew, is described as *M.* **shewelli**, n. sp., and a revised key to the species of the group to which it belongs is given.

Since Malloch (1923:53), in describing *Minettia americana*, and since Malloch and McAtee (1924:14), in their key to *Minettia*, identified *M. obscura* (Loew) as a species with 3 dorsocentral bristles, that species has been misidentified. Examination of the type of *M. obscura* shows that *M. americana* is a synonym of *M. obscura* and that the species that Malloch considered to be *M. obscura* is until now unnamed. I am here describing *M. obscura* of authors, not Loew, as *M. shewelli*, new species, and presenting a revised key to the species of this group.

The genus *Minettia* Robineau-Desvoidy in North America, as treated by Shewell (1938:105; 1965:701), includes 5 very similar species that may be called the *obscura* group after the first-named species. These species may be recognized easily by black thorax, abdomen, and halteres. The only characters of use in distinguishing the species of this group that I can discern are cited in the key below. The term pseudaedeagus, used here, refers to the structure developed as a forked process from the end of the juncture of the aedeagal apodeme and the median anterior part of the hypandrium; it is what Shewell (1938) designated as "forked process of the genital sternite." A similar, even more aedeagus-like development occurs also in the Celyphidae. The male gonopore is just behind the base of the pseudaedeagus, and a true aedeagus is either lacking or present as a short, apparently inflatable sac-like structure.

KEY TO SPECIES RELATED TO **Minettia obscura** (LOEW)

1(10) Males.

2(7) Tip of pseudaedeagal process in profile abruptly turned forward at or a little apicad of middle; *dc* normally 4, with well developed antesutural *dc*.

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[1] Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

3(4) Pseudaedeagal processes in anterior view apically convergent, acute, length less than that of hypandrium at base of connecting strip .... **M. lobata** Shewell

4(3) Pseudaedeagal processes more or less divergent, length greater than that of hypandrium at base of connecting strip.

5(6) Surstylus with posterior edge not reflexed inwardly or only slightly so along entire length; hypandrium in profile steeply arcuately declivitous anteriorly; aedeagal apodeme in anterior view with free end only slightly expanded .... **M. obscura** (Loew)

6(5) Surstylus with posterior edge strongly reflexed inwardly in basal half; hypandrium in profile gently declivitous anteriorly; aedeagal apodeme in anterior view with free end strongly expanded .... **M. americanella** Shewell

7(2) Tip of pseudaedeagal process in profile not abruptly turned forward, either turned backward or only gently forward; *dc* normally 3.

8(9) Tip of pseudaedeagal process in anterior view strongly deflected laterad, medial sinus moderately broad .... **M. lyraformis** Shewell

9(8) Pseudaedeagal process cuneiform, the 2 processes separated by narrow sinus, with acute tips closely adjacent to each other (fig. A) .... **M. shewelli**, n. sp.

10(1) Females.

11(14) 8th sternum without depressions, or if with shallow basal depressions, the sternum much broader than long, mostly strongly convex and setose, and hind margin emarginate; *dc* normally 3.

12(13) 8th sternum nearly hemispherical .... **M. lyraformis** Shewell

13(12) 8th sternum much broader than long, with pair of shallow, shining depressions in basal corners, otherwise strongly convex and setose, posterior margin emarginate (fig. B) .... **M. shewelli**, n. sp.

14(11) 8th sternum with pair of well developed depressions; *dc* normally 4.

15(16) 8th sternum with pale yellowish lateral vesicles, tumid in life .... **M. lobata** Shewell

16(15) 8th sternum without lateral vesicles.

17(18) 8th sternum subtriangular, decidedly broadest near apex .... **M. obscura** (Loew)

18(17) 8th sternum subquadrate, broader than long, or subtrapezoidal .... **M. americanella** Shewell

The number of rows of acrostichal hairs, development of longitudinal grayish stripes on the mesoscutum, and small differences in length of aristal hairs have not been found usable in distinguishing the species. The number of dorsocentral bristles, like chaetotactic characters in most groups of Diptera, is subject to some variation. In 140 specimens of *M. lyraformis* collected in one locality in Maryland, only 10 had a 4th, antesutural dorsocentral, and in most cases this occurred only on one side or the extra bristle was but little greater in length or thickness than the surrounding hairs. In other species, even less abnormality in bristling was seen.

Minettia americanella Shewell

Minettia americanella Shewell, 1938:108, pl. 9, fig. 4–6; 1965:701.

The holotype is from Quebec. Other specimens were originally cited from several localities in Quebec, Ontario, and British Columbia. In 1965, Shewell cited New York, Pennsylvania, and North Carolina. I have strong doubts that this species is more than a variation of *M. obscura*, but have identified material that fits fairly well with Shewell's description and figures from New York, Pennsylvania, Michigan, Illinois, and Virginia.

Minettia lobata Shewell

Minettia lobata Shewell, 1938:108, pl. 9, fig. 7–9; 1965:701.

The type series is from several localities in Quebec. Shewell (1965) also cited Illinois, Massachusetts, and Georgia. I have seen it from Missouri, Iowa, Michigan, Pennsylvania, New York, Massachusetts, Connecticut, Maryland, and Virginia. The species is easily distinguished from its relatives.

Minettia lyraformis Shewell

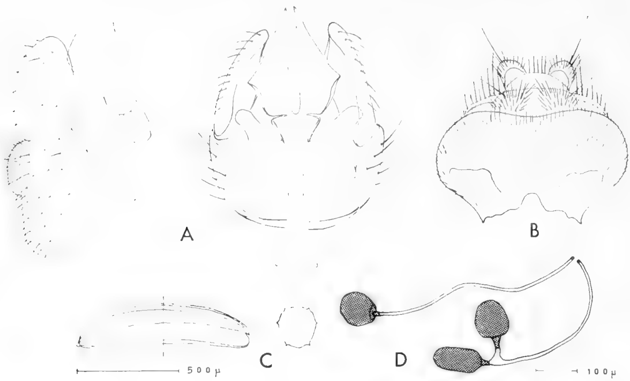
Minettia lyraformis Shewell, 1938:109, pl. 9, fig. 10–12; 1965:701.

The holotype is from Quebec, and other material was originally cited from several localities in Quebec and Ontario. Shewell (1965) cited also Southern Manitoba, New York, Tennessee, North Carolina, and Georgia. This species is also easily recognized. I have seen it from Alaska (Palmer), Missouri, Indiana, Michigan, New York, Rhode Island, Massachusetts, New Jersey, and Maryland.

Minettia obscura (Loew)

Lauxania obscura Loew, 1861:351 (Centuria I, no. 86).
Minettia obscura (Loew): Melander, 1913:65.
M. americana Malloch, 1923:25; Malloch and McAtee, 1924:14, 16, pl. 1, fig. 5–7; Shewell, 1938:137, pl. 9, fig. 1–3. **New synonym.**

The description of *Lauxania obscura* cites "English River; Kennicot—Pennsylvania; Osten-Sacken." A pair, both labeled "Type," from English River (tributary of Winnipeg River, SW Ontario, Kenora District), has been examined through the kindness of Howard E. Evans, of the Museum of Comparative Zoology at Harvard University, Cambridge, Massachusetts. Both specimens are in good condition, with 4 dorsocentral bristles and the postabdomen easily discernible. The male has been selected as lectotype and so labeled. Both sexes are of the



Figs. A–D, *Minettia shewelli* Steyskal, n. sp.: A, male postabdomen, profile and ventral views; B, female postabdomen, ventral view; C, egg, lateral view and section taken at broken line; D, spermathecae.

same species, one that Malloch, as indicated above, described as *M. americana.* I have seen no original material from Pennsylvania.

The male holotype of *M. americana* and the allotype, which is actually also a male, are from Plummers Island, Maryland. Conspecific paratypes in the U.S. National Museum are from Plummers Island and Cabin John Bridge, Maryland, and Great Falls, Virginia. Other paratypes in the U.S. National Museum have proven to be *M. americanella*, *M. lobata*, and *M. lyraformis.*

Shewell cited Quebec and Ontario localities (1965) and the States of Kansas and Virginia (1965). I have seen *M. obscura* also from Ontario, Quebec, Michigan, Illinois, New Mexico (Pecos), and Maryland.

Minettia shewelli, n. sp.
(Fig. A–D)

Minettia obscura (Loew), of Malloch and McAtee, 1924:14, 16, pl. 1, fig. 8; Steyskal, 1968:360. *Misidentification.*

Male. Apparently differing from *M. lyraformis* Shewell only in characters cited in preceding key. Dorsocentral bristles 3, all postsutural. Postabdomen as in fig. A; pseudaedeagal processes narrowly separated, tips extending closely adjacent to each other, in anterior view each process acutely cuneiform, in profile broad and gently sinuate, a little forwardly curved to sometimes mucronate tip; surstylus with mesal margin a little lobate or angulate in middle.

Female. Similar to male, except postabdomen (fig. B). Sternum 8 about 1.75 times as broad as long, lateral margins semicircular, anterior (basal) margin erosely emarginate, posterior margin gently concave; surface dull, strongly convex, covered with rather dense fine hairs except on pair of shallowly concave shining areas in basal corners. Sternum 9 with rather long hairs, except in mesal fifth, which is bare and margined by inclinate hairs. Spermathecae 2 + 1, as in fig. D.

Egg (fig. C, dissected from female). Colorless, slightly curved, smooth, with 2 strong carinae on concave side and 2 pairs of somewhat finer carinae on convex side, 200 μ in diameter by 850 μ long.

Holotype (male), allotype, and 4♂ paratypes, Bethesda, Montgomery County, Maryland, 17 May 1968 (G. Steyskal, no. 70721 in USNM[2]; additional paratypes—1♂, ibid., 5 May 1968 (G. Steyskal); 2♂ (one with abnormal antenna), ibid., 26 May 1968 (G. Steyskal); 7♂, ibid., 2 June 1968 (G. Steyskal and C. W. Sabrosky); 1♂, 2♀, ibid., 17 May 1969 (G. Steyskal); 14♂, ibid., 30 May 1969 (G. Steyskal); Missouri: 9♂, Columbia, 26 May–8 June 1906 (C. R. Crosby), in CU and CNC; Illinois: 1♀, Chicago, 6 June 1903 (A. L. Melander); Wisconsin: 1♂, Polk County, July (Baker); Michigan: 1♂, Lake County, 7 July 1957 (R. and K. Dreisbach), in CNC; 1♂, Midland County, 4 June 1937 (R. R. Dreisbach), in CNC; 1♂, ibid., 20 June 1954 (R. R. Dreisbach), in CNC; Indiana: 1 pair, Chesterton, 2 June 1916 (J. M. Aldrich); 2♂, Lafayette, "V-28" (J. M. Aldrich); 1♂, ibid., "12 July" (J. M. Aldrich); 1♂, ibid., 13 July 1915 (J. M. Aldrich); 4♂, ibid., 16 May 1916 (J. M. Aldrich); Ohio: 1♂, 4 mi E Kent, 16 July 1964 (W. B. Stoltzfus), in KSU; Tennessee: 2♂, 1♀, East Ridge, 9 May 1952 (O. Peck), in CNC; 7♂, Rutledge, July 1954 (M. R. Wheeler), in UT; Georgia: 2♂, 1♀, Chickamauga Natl. Military Park, 7 May 1952 (G. S. Walley), in CNC; 2♂, Clayton, 18–26 May 1911 (J. C. Bradley), in CNC; Cloudland Canyon State Park, 8 May 1952 (G. S. Walley), in CNC; 2♂, Pine Mountain, Rabun County, 14 May 1957, 1400 ft. (J. R. Vockeroth), in CNC; Connecticut: 1♂, Redding, 31 May 1930 (A. L. Melander); 1♂, ibid., 3 June 1934 (A. L. Melander); New York: 1♂, 1♀, "Dix. Hills," Long Island, 15 June 1935 (Blanton and Borders), in CNC; 1♂, Halfway Hollow Hills, Long Island, 18 May 1935 (Blanton and Borders), in CNC; 1♂, Ithaca, 10 June 1900, in CNC; Riverhead, Long Island, 27 May 1924 (Blanton and Borders), in CNC; Pennsylvania: 1♂, Germantown, 4 June 1905 (Harbeck); Maryland: 1♂, Plummers Island, 14 June 1917, in CNC; Virginia: 1♂, Falls Church, 13 July 1934, in CNC; 3♂, Great Falls, 9 July 1926 (A. L. Melander); 1♂, ibid., same date (J. M. Aldrich), in CNC; 3♂, ibid., 12 June 1949 (C. W. Sabrosky), in CWS; 1♂, ibid., 13 May 1951 (C. W. Sabrosky), in CWS; 1♀, ibid., 3 June 1951 (C. W. Sabrosky), in CWS; North Carolina: 1♀,

[2] Abbreviations of depositories: U. S. National Museum, Washington, D. C.; CNC, Canadian National Collection, Ottawa; CU, Cornell University, Ithaca, New York; CWS, collection of Curtis W. Sabrosky; KSU, Kent State University, Kent, Ohio; UT, University of Texas, Austin.

Clingmans Dome, Great Smoky Mountains National Park, 6300+ ft., 28 May 1957 (J. R. Vockeroth), in CNC; 1♀, Franklin, 17 June 1957 (J. R. Vockeroth), in CNC; 1 pair, Lake Junaluska, 27 May 1954 (H. V. Weems, Jr); 1♂, Willard, 10 May 1936 (F. S. Blanton), in CU. Specimens are in USNM, except as otherwise designated and 7 topotypical paratypes in CNC (1♂, 2♀, 17 May 1969; 4♂, 30 May 1969).

The type locality is in moist woods along Cabin John Creek at Bradley Boulevard, about 5 mi. W of the District of Columbia. The specimens were swept from low vegetation such as *Impatiens* sp., *Podophyllum peltatum, Rhus toxicodendron, Laportea canadensis, Galium* sp., *Eupatorium purpureum, Apios tuberosa,* and *Benzoin aestivale.* Also taken in this locality during 1968 and 1969 were 140 *M. lyraformis,* 39 *M. lobata,* and 12 *M. obscura.*

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MUSEUM NEWS

The U. S. National Museum has recently been divided into two separate museums, the National Museum of Natural History and the National Museum of History and Technology. Both are bureaus of the Smithsonian Institution. The U. S. National Museum now consists only of Offices of the Registrar, Administration and Exhibits. However, because all national biological and paleontological specimens have been and still are accessioned through the Office of the Registrar, it is appropriate to continue the designation USNM for specimens in all Smithsonian Museums.

A NEW SPECIES OF THE GENUS CUMMINGSIA FERRIS FROM THE REPUBLIC OF COLOMBIA[1]

(MALLOPHAGA: TRIMENOPONIDAE)

EUSTORGIO MÉNDEZ, *Gorgas Memorial Laboratory, Panama, R. P.*

ABSTRACT—*Cummingsia* **inopinata** Méndez, n. sp. from *Thomasomys cinereiventer* J. A. Allen, is described and illustrated. A member of the order Rodentia is added as a new host of the genus *Cummingsia*, which had been formerly recorded exclusively from South American marsupials. This finding seems to represent a case of secondary infestation by a species of *Cummingsia* on a rodent.

Judging from previous information on the genus *Cummingsia*, it had been considered that all its species were associated with South American marsupials. These obviously represent patterns of primary infestation on these mammals. Recently, however, a collection of biting and sucking lice from Colombia, submitted to me for identification by Dr. H. Trapido, has revealed an interesting new species of *Cummingsia* as a genuine parasite of *Thomasomys cinereiventer*, a member of the rodent family Cricetidae. This discovery modifies our knowledge of *Cummingsia* by adding a host belonging to a different mammalian order. The presence of this louse on a rodent seems to indicate an interesting case of secondary infestation of probable recent origin.

I am indebted to Dr. K. C. Emerson for the loan of a male and a female specimen of *Cummingsia peramydis* Ferris for comparative studies. My thanks are also expressed to Dr. Harold Trapido of the Rockefeller Foundation Unit at the Universidad del Valle, Colombia, for the opportunity of describing the following new species.

Cummingsia inopinata, n. sp.
(Figs. 1–5)

Diagnosis.—Morphological features of the head places this new species near *C. intermedia* Werneck; however, it is fundamentally different from the latter species in having a single row of setae on each abdominal sternite, except the first one, instead of two rows. Additional significant differences are present in the male and female genitalia which are here illustrated.

MALE (figs. 1–4). Head (fig. 2) conspicuous, wider than long, with temples slightly produced and bearing two long widely spaced setae in addition to several short setae. Rest of chaetotaxy moderately developed. Anterior margin of head convex, interrupted by small notch on each side, thus defining a clypeal region.

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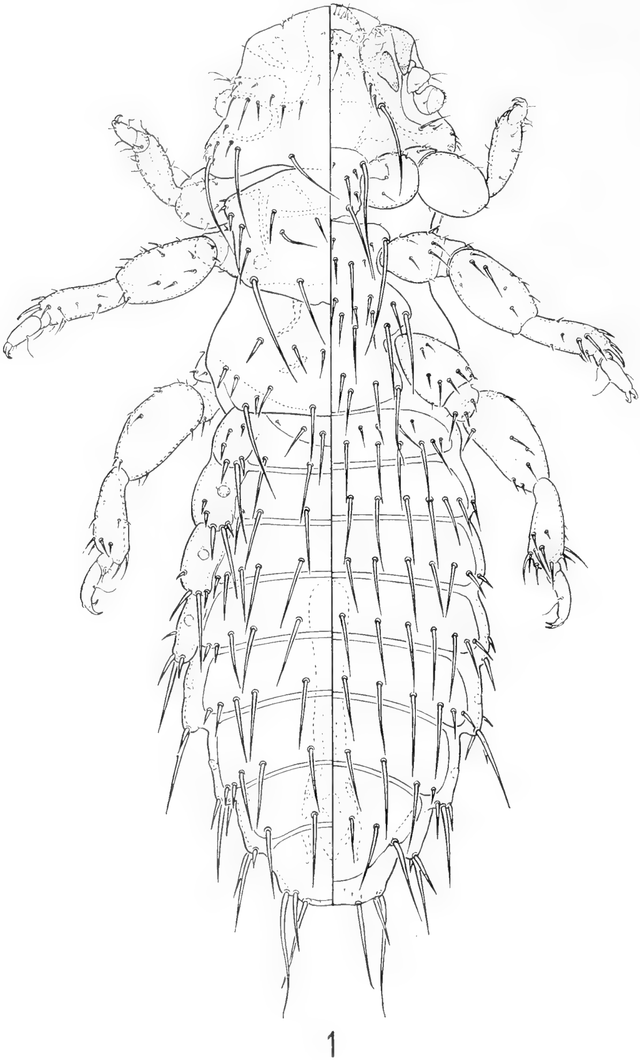
[1] This paper was submitted under the sponsorship of G. B. Fairchild.



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Lateral margins devoid of a notch, with most anterior area subangular. Labial palpus short, provided with several minute setae. Maxillary palpus about twice the length of labial palpus, also bearing a few minute setae. Preantennal ventral processes blunt, heavily sclerotized. Each antenna short, concealed in large, deep ventral fossa. Basal antennal segment very small, apparently without setae; second segment semitriangular, with two short setae on outer margin, besides one inner seta; third segment globular, with few minute setae. Prothorax smaller than pterothorax, suggesting an hexagonal shield having several setae of variable length. Pterothorax notably wide, showing subangular lateral margins, provided with various setae. Thoracic spiracles conspicuous. Thoracic sternal plates (fig. 3) distinct, the last three united, armed with well distributed setae. All legs stout, typical of genus, moderately clothed with setae. Abdomen ovate, slightly elongate, showing indented lateral margins. Tergal and sternal abdominal plates prominent, those of first segment with two rows of setae, remaining plates with one row. Pleural plates particularly well defined on segments 2–4, containing several strong setae. Genitalia (fig. 4) simple, characterized by broad basal plate having anterior portion considerably expanded into a blade of sinuate margins, expanded at its rounded apex. Each paramere short, ending in slender tip turned upward, bearing short subapical seta. Pseudopenis well developed, Y-shaped, with basal arm very short, open at tip. Ejaculatory sac delicate, membranous, covered with fine microspicules.

FEMALE.—In general morphology and chaetotaxy similar to the male, from which it differs in its sexual characters and larger size. Female genital region (fig. 5) apparently limited to last two abdominal segments. Caudal segment provided with two long caudo-marginal setae on each side, the outermost the longest. Genitalia fundamentally contained in this segment, characterized by broad genital armature with convex anterior margin and sclerotized lateral margins. Basally this structure bears two gonopods which are near each other and possesses a group of gonopodal setae preceded by ventral setae of armature.

Types.—Holotype male (No. HTC-2425) from Laguna de la Cocha, Depto. de Nariño, Colombia, elevation 2700 m, 18 May, 1968; allotype female (HTC-2399), same data as holotype; 4 male and 18 female paratypes, same data as holotype; 1 female paratype from Comis, 38 km between Pasto and Sibundoy, Depto. de Putumayo, Colombia, elevation 3100 m, 25 May, 1968. All specimens examined collected by Dr. H. Trapido.

Lengths.—Male holotype, 1.27 mm; female allotype, 1.44 mm.

Type host.—*Thomasomys cinereiventer* J. A. Allen, 1912.

Holotype and allotype will be deposited in the collection of the U.S. National Museum. Paratype specimens will be deposited in the British Museum (Natural History), Universidad del Valle, Cali, Colombia, Bernice P. Bishop Museum, Honolulu, Hawaii, and in the collections of Drs. Phyllis T. Johnson and K. C. Emerson. The rest of the paratypes

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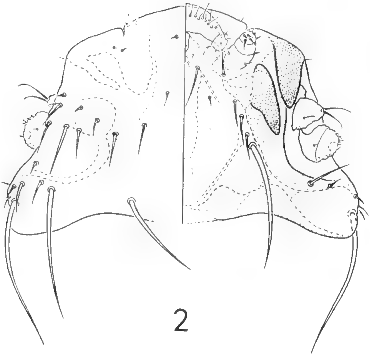
Fig. 1, *Cummingsia inopinata*, n. sp., dorsal-ventral view, ♂ holotype.



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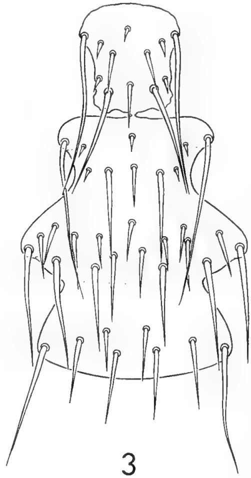

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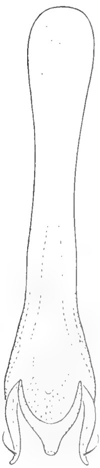

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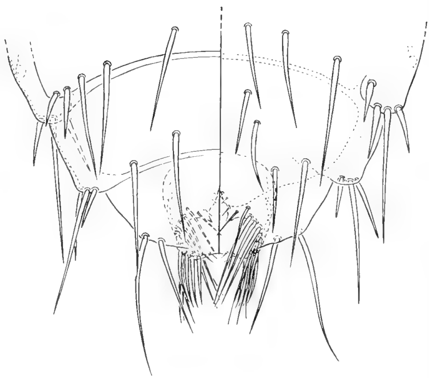

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Figs. 2–5, *Cummingsia inopinata*, n. sp.: 2, head, ♂ holotype; 3, thoracic sternal plates, ♂ holotype; 4, genitalia, ♂ holotype; 5, terminal abdominal segments, ♀ allotype.

will be maintained in the collection of the Gorgas Memorial Laboratory.

Remarks.—An attempt to explain how *Thomasomys cinereiventer*, a rodent of the family Cricetidae, acquired the ectoparasite described in this paper, can be made with some reservations. At present very little is known about the habits of this mammal, which seems to have been usually trapped on the ground. Nevertheless, the finding by Dr. H. Trapido of three specimens of a true bird flea, *Dasypsyllus gallinulae*, on three different individuals of *T. cinereiventer* at Cerro Munchique, Departamento del Cauca, Colombia, suggest the possibility that this rodent is at least partially arboreal. It might temporarily occupy tree holes or other sites containing bird nests, a source from which the mentioned fleas were probably obtained. Since most American marsupials are arboreal or semi-arboreal, I am inclined to think that, in a similar manner, *T. cinereiventer* may have acquired the original stock from which the new species of *Cummingsia* under discussion was derived, many years ago from opossum nests.

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A NEW BALLOPHILUS FROM THE PHILIPPINES

(Chilopoda : Geophilomorpha : Ballophilidae)

R. E. Crabill, Jr., *Department of Entomology, Smithsonian Institution Washington, D.C. 20560*

ABSTRACT—*Ballophilus* **comastes**, n. sp., is described from Luzon, Philippines.

Ballophilus, as restricted by Attems in 1929[1], is currently known geographically only sporadically. It has been recorded from sub-Saharan Africa, Madagascar, Mauritius, Southeast Asia, the Australian Region

[1] Das Tierreich, Lief. 52, pp. 100–101, 1929.

including some adjacent islands and New Zealand, and in the Americas only from Peru. The present new species extends the generic range (predictably I think) to include the Philippines. I suspect the genus probably occurs widely throughout the Old World Tropics, where its members have escaped capture commonly because of their diminutive size, furtive habits, and covert habitats. No doubt many unrecorded species await discovery.

The new species seems most to resemble Ribaut's *neocaledonicus*[2], from which it differs conspicuously as follows. In *neocaledonicus*: (1) pedal segments 61–79; (2) body suffused with green and purple. In *comastes*, new species: (1) pedal segments only 49; (2) body uniformly yellowish, not suffused with green or purple.

Ballophilus comastes, n. sp.

Holotype: male. Philippines: Luzon, Mt. Makiling, Lagunas, 150 m. below summit. February 1968. Roger Morse, leg. Deposited in the U.S. National Museum.

GENERAL. Pedal segments 49. Length 15 mm. Anteriorly strongly attenuate. Color yellowish. Vestiture: moderately clothed with stiff robust setae.

ANTENNAE. Ultimate 6 articles strongly capitate and more densely shortly setose than those preceding. Special setae: on article 14 ectally and mesally a patch of hyaline clavate setae; dorsally on 13 with two robust setae; dorsally on 9 with three robust setae. CEPHALIC PLATE. Dorsally domed; no discernible frontal suture. CLYPEUS. Paraclypeal sutures complete, very wide and vague. On anterior quarter with a row of four setae, with two anteroclypeals. LABRUM. Greatly reduced, substantially atrophied. FIRST MAXILLAE. Medial lobes small, telopodites far exceeding them. All lappets absent. SECOND MAXILLAE. Isthmus anteromedially forming a strongly re-entrant angle. Telopodite robust; each article wider than long; dorsal and ventral condyles present; claw broad, delicately bipectinate. PREHENSOR. Flexed, not exceeding anterior head margin. Denticles absent. Poison calyx small, cordiform, in tibiid. Poison gland extending posteriorly beyond prefemur. Pleurograms absent. TERGITES. Not granulate. STERNITES. All much longer than wide. Most posterocentrally with a small elliptically transverse raised porefield, this absent on 1st and penult, hence porefields on 2 through 47; those of anterior body third subcircular, less elliptical than those preceding. LEGS. Anterior and posterior parungues equal, short, ¼ as long as claw. ULTIMATE PEDAL SEGMENT. Pretergite bilaterally fissate. Tergite greatest width exceeds length. Presternite medially divided. Sternite greatest width exceeds length; sides and rear straight. Each coxopleuron with two homogeneous crypts. Legs greatly inflated. Tarsus double. Pretarsus setiform, long. With large setigerous alveoli as follows: one on coxopleuron, one on trochanter, one on prefemur, two on femur, two on tibia, one on first tarsus, two on second tarsus. POSTPEDAL SEGMENTS. Male gonopods each unisegmental. Without discernible anal pores.

[2] Forschung in N. Caledonien u. Loyalty Inseln, 3(I), p. 77, 1923.

A REPORT ON THE TETRANYCHIDAE OF PARAGUAY

(ACARINA)

BRAULIO RAMON ARANDA C., *Ministerio de Agricultura y Ganaderia, Asuncion, Paraguay*

and

CARLOS H. W. FLECHTMANN, *Escola Superior de Agricultura "Luiz de Queiroz", University of São Paulo, Piracicaba, São Paulo, Brasil*

ABSTRACT—An annotated list of tetranychid mites collected in Paraguay is presented.

Very little is known about the plant feeding mites in Paraguay. There are three references, Alvarez, et al. (1955), Nickel (1958) and Knorr, et al. (1968), and one general paper by Aranda (1969), which was presented as a thesis to the Escola Superior de Agricultura "Luiz de Queiroz", of the Universidade de São Paulo, in Piracicaba. Since this paper is not widely distributed, it has been thought best to bring the literature up to date, even though much work is yet to be done on Paraguayan plant mites. The classification presented by Tuttle and Baker (1968) is used.

Bryobia praetiosa Koch

Bryobia praetiosa Koch, 1836:8; Pritchard and Baker, 1955:26; Tuttle and Baker, 1968:60.

This species was recorded by Alvarez, et al. (1955) from orchards.

Monoceronychus linki Pritchard and Baker

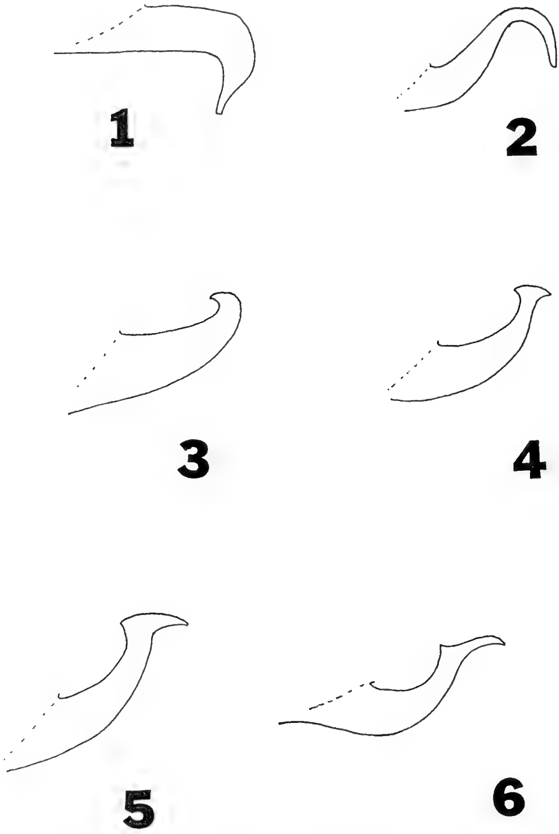
Monoceronychus linki Pritchard and Baker, 1955:92.

This species is only known to occur in Florida on grasses. One single tritonymph was found on sugar cane.

Eutetranychus banksi (McGregor)

Tetranychus banksi McGregor, 1914:358.
Eutetranychus banksi: Pritchard and Baker, 1955:115.

This species is known from Texas and Florida, and southward through Central and South America. In Paraguay it has been collected on citrus where it is apparently not yet a pest. It has also been collected from *Ilex paraguariensis* St. Hil., papaya (*Carica papaya* L.) and *Melia azedarach* Blanco.



Figs. 1–6, aedaeagi of Tetranychidae: 1, *Oligonychus* (*Oligonychus*) *coffeae* (Niet.); 2, *O.* (*Pritchardinychus*) *psidii* Flecht.; 3, *Tetranychus* (*Tetranychus*) *ludeni* Zach.; 4, *T.* (*T.*) *andrei* B. & P.; 5, *T.* (*T.*) *mexicanus* (McG.); 6, *T.* (*T.*) *paraguayensis* Aranda.

Aponychus spinosus (Banks)

Tetranychopsis spinosa Banks, 1909:134.

Eutetranychus spinosus: McGregor, 1950:197.

Aponychus spinosus: Tuttle and Baker, 1968:82.

Previously known from Canada and the U.S., this species has been collected from citrus in Paraguay. It was also collected from the same host in São Paulo, Brasil.

Aponychus schultzi (Blanchard)

Anychus schultzi Blanchard, 1940:24.
Eutetranychus schultzi: Pritchard and Baker, 1955:115.
Aponychus schultzi: Tuttle and Baker, 1968:82.

This species, previously recorded from Argentina and Brasil, has been collected from rice (*Oryza sativa* L.) and *Cycas revoluta* Bedd.

Mononychus tanajoa (Bondar)

Tetranychus tanajoa Bondar, 1938:443.
Mononychus tanajoa: Flechtmann and Baker, 1970:160.

This species is distinctive in having short dorsal setae and no reticulate pattern on the dorsum of the propodosoma, and was previously known from Brasil. It has been collected from *Manihot utilissima* Pohl. in Paraguay.

Mononychus planki (McGregor)

Tetranychus planki McGregor, 1950:300.
Eotetranychus planki: Pritchard and Baker, 1955:148.
Mononychus planki: Tuttle and Baker, 1968:105.

The distinctive character for this species is the reticulate pattern on the mediodorsal portion of the propodosoma as well as broad areas around the dorsal hysterosomal setae with the integument irregularly dotted. The dorsal hysterosomal setae are as long as the intervals between their bases.

M. planki has been collected from cotton (*Gossypium barbadense*).

Eotetranychus uncatus Garman

Eotetranychus uncatus Garman, 1952, in Pritchard and Baker, 1955:183.

This species, known from the U.S. and Mexico, has been collected from peach, causing considerable leaf damage.

Oligonychus (Oligonychus) coffeae (Nietner)

Acarus coffeae Nietner, 1861, in Nietner and Green, 1880:19.
Oligonychus coffeae: Pritchard and Baker, 1955:315.

This species was described from Ceylon, and has been recorded from several hosts from Florida, South Africa and Australia.

Females of *O. coffeae* were collected from coffee (*Coffea arabica* L.) and yerba mate (*Ilex paraguariensis* St. Hil.).

Oligonychus (Oligonychus) ilicis (McGregor)

Tetranychus ilicis McGregor, 1917:586.
Oligonychus ilicis: Pritchard and Baker, 1955:305.

This species, known as a pest of several ornamentals in the U.S. and Japan, and of coffee in Brasil, has been collected from *Psidium guajava* Raddi.

Oligonychus (Pritchardinychus) psidii Flechtmann

Oligonychus psidii Flechtmann 1967:40.
Oligonychus (Pritchardinychus) psidii: Flechtmann and Baker, 1970:157.

O. psidii is only known from its type locality, in Piracicaba, São Paulo, Brasil. It has been collected from *Psidium guajava* Raddi and *Pointiana regia* Boj. in Paraguay.

Tetranychus (Tetranychus) desertorum Banks

Tetranychus desertorum Banks, 1900:76; Pritchard and Baker, 1955:403; Tuttle and Baker, 1968:126.

This is a widespread species in North and South America, and was first collected in Paraguay by Nickel (1958). It has been collected from cotton, yerba mate, *Melia azedarach* Blanco, castor bean (*Ricinus communis* L.), *Manihot* sp., *Vicia fava* L., *Hordeum vulgare* L., *Campomanesia rhombea* Berg., *Citrullus vulgaris* Schrad, and *Eucaliptus* spp.

Flechtmann and Baker (1970) stated that the head of the aedaeagus of *T. desertorum* from Brasil is much smaller than that of those from Texas. In the paraguayan specimens we found both types, with "normal" and small aedaeagus, occurring on different hosts and different localities.

Tetranychus (Tetranychus) ludeni Zacher

Tetranychus ludeni Zacher, 1913:40; Pritchard and Baker, 1955:405.

This species, which in Brasil occurs mainly on beans and cotton, was collected from papaya, peaches, grapes and *Manihot* sp.

Tetranychus (Tetranychus) andrei Baker and Pritchard

Tetranychus andrei Baker and Pritchard, 1960:534.

This species, originally described from a legume from Africa, was collected on banana leaves (*Musa cavendishi* Lambert).

Tetranychus (Tetranychus) mexicanus (McGregor)

Septanychus mexicanus McGregor, 1950:33.
Tetranychus mexicanus: Pritchard and Baker, 1955:411.

From South America this species was previously known from Argentina and Brasil. The more important hosts in Paraguay are cotton, citrus, peaches, papaya, avocado (*Persea americana* Mill.) and yerba mate.

Tetranychus (Tetranychus) paraguayensis Aranda

Tetranychus paraguayensis Aranda, 1969:28.

This species belongs to *Tetranychus* (*Tet.*) s. str. in that the striae form a diamond shaped pattern between the third and fourth pairs of dorsocentral setae.

The proximal duplex setae on tarsus I is distal to the four proximal tactile setae. The terminal sensillum of the palpus of the female is strong and about 1.5 times as long as broad. Peritreme strongly recurved distally.

In the male the terminal sensillum of the palpus is slender and long, about 2.5 times as long as broad. The aedaeagus is unique, as shown in the drawing.

This species has been collected from citrus and papaya.

Tetranychus (Tetranychus) urticae Koch

Tetranychus urticae Koch, 1836: Fasc. 1; Tuttle and Baker, 1968:129.
Tetranychus telarius (Linn.) of various authors.

The common green two-spotted spider mite was found on *Manihot* sp. and corn (*Zea mays* L.).

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NEW NEOTROPICAL SANDFLIES OF THE CULICOIDES DEBILIPALPIS GROUP[1]

(DIPTERA: CERATOPOGONIDAE)

WILLIS W. WIRTH, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[2]

and

FRANKLIN S. BLANTON, *Department of Entomology, University of Florida, Gainesville, Florida 32601*

ABSTRACT—Three new species of Neotropical *Culicoides* are described: *C.* **eadsi** reared from tree holes in Texas and Mexico; *C.* **darlingtonae** taken in a bat cave in Trinidad; and *C.* **guerrai** from light traps in Trinidad. Diagnostic characters of *C. debilipalpis* Lutz and *C. hoffmani* Fox are summarized for comparison with these species.

At this time we are describing several new *Culicoides* related to *C. debilipalpis* Lutz in order to make the names available for general reviews of the biting midges of the West Indies and Trinidad. We wish to thank Miss Linda Heath and Dr. Niphan Ratanaworabhan for making the drawings.

Antennal Ratio (abbreviated AR) is the combined length of the five elongated distal antennomeres (for convenience hereafter referred to as segments) divided by the combined length of the eight short preceding segments. Palpal Ratio (PR) is the length of the third palpal segment divided by its greatest breadth. Proboscis/Head Ratio (P/H Ratio) is the length of the proboscis measured from the distal end of the labrum-epipharynx to the anterior margin of the tormae, divided by the length measured from the anterior margin of the tormae to the median hair socket between the eyes. Wing length is measured from the basal arculus to the wing tip; Costal Ratio (CR) is the length of the costa measured from the basal arculus to the tip of the second radial cell (2RC) divided by the wing length.

Culicoides debilipalpis Lutz

Culicoides debilipalpis Lutz, 1913, Mem. Inst. Oswaldo Cruz 5:60 (female; Brazil; figure wing); Costa Lima, 1937, idem. 32:415 (figure palpus); Macfie, 1937, Ann. Mag. Nat. Hist. 20:7 (Trinidad; female redescribed); Forattini, 1957, Arq. Fac. Hig. S. Pub. Univ. São Paulo 11:383 (redescribed; figures); Wirth and Blanton, 1959, Proc. U.S. Nat. Mus. 109:442 (redescribed; figures).

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[1] This investigation was supported in part by U.S. Army Medical Department Contract No. DA-49-193-MD-2177.

[2] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

The precise identity of *C. debilipalpis* has been subject to considerable confusion in the literature because of the lack of a description of a male from the type series. Lutz' original syntypes came from "some females and a male from Anhemby in the State of Sao Paulo and I collected others in Formoso (Serra de Bocaina) in evenings on horses. They also seem to attack man." Costa Lima figured the palpus "from a specimen of the typical series, from Saltos de Iguassu (Parana)." Apparently Lutz studied material from localities not mentioned originally by him. Wirth and Blanton reported on the characters of four females from "Amazonas de Cima, 1913, Lutz" borrowed from the Lutz collection in the Instituto Oswaldo Cruz.

Lutz' figure of the wing of *C. debilipalpis* shows a very hairy wing with two rows of macrotrichia extending to the base of the cell M2, the distal pale spot in cell R5 distinctly transverse, the poststigmatic pale spots with the posterior one located slightly proximad of the anterior, and a large pale area extending from in front of the mediocubital fork to the back side of the medial fork. Costa Lima's two figures of the female palpus show a sensory pit deeper than the diameter of the pore opening. Wirth and Blanton (l. c.) added the following information from the four females studied by them: Wing length, 0.68 mm; CR 0.62; eyes broadly separated, with short interfacetal hairs; antenna with flagellar segments in proportion of 14-10-11-12-13-13-13-13-13-14-15-16-22, AR 0.81; distal sensory tufts present on segments 3, 8–10; palpal segments in proportion of 8-17-22-9-11, PR 2.2; mandible with 18–20 teeth; spermathecae measuring 0.050 by 0.034 mm and 0.043 by 0.037 mm. Forattini's redescription appears to be partly of *C. debilipalpis* as recognized here, and partly of *C. hoffmani* Fox (male genitalia, after Wirth and Blanton 1956), and *C. equatoriensis* Barbosa (figure of wing), which together with *C. glabrior* Macfie he reduced to synonymy with *C. debilipalpis*. Following the conclusions reached in our Panama revision, we would amplify or emend our own observations of Lutz' material to characterize the species as follows, the measurements based on means of about 35 specimens.

Female.—Moderately small, wing 0.80 mm long. Eyes moderately separated, with very short interfacetal hairs, appearing bare in profile of eye. AR 0.83; distal sensory tufts present on antennal segments 3, 8–10. Third palpal segment long and slender, PR 2.2, the sensory pit small and deep, with pit deeper than the diameter of the pore opening. Mandible with 15 teeth. Scutum with moderately prominent dark brown sublateral patches. Halter brownish. Wing moderately hairy, the macrotrichia extending to base of cell M2 in two rows; distal pale spot in cell R5 transverse, not filling space between anterior wing margin and vein M1, the poststigmatic pale spots fairly close together, the posterior one located slightly proximad of the other; one pale spot in distal part of anal cell; pale spot lying behind medial fork distinct but the one lying in front of mediocubital fork indistinct or absent. Legs with narrow pale rings subapically on fore and mid femora, subbasal pale rings on all tibiae; apex of hind tibia pale. Spermathecae slightly unequal, ovoid with long, rather stout necks; measuring 0.060 by 0.039 mm and 0.050 by 0.032 mm.

Male.—Ninth sternum with broad, very shallow caudomedian excavation; ninth tergum long and tapering with short, triangular apicolateral processes. Basistyle with "foot-shaped" ventral root, dorsal root slender; dististyle slender and curving. Aedeagus with basal arch extending to more than two-thirds of total length, the mesal apex of arch narrow, the basal arms straight; distal process pointed apically without apparent subapical projections. Parameres each with knobbed base, stem bent near base, very slender and straight in midportion, with a well developed ventral lobe; distal portion not greatly elongated, with slender pointed tip and 4–6 lateral fringing spines.

Our association of the male is based on rearing records in the southeastern United States and on specimens trapped at the same time and place in numerous locations over the range of the species. The male genitalia are identical with those of *C. paraensis* (Goeldi), which the species closely resembles in all respects except the wing pattern, and there is a distinct possibility that the two forms are wing pattern phenotypes of the same species, in which case *C. paraensis* has priority.

C. debilipalpis occurs in the southeastern United States from Maryland to Florida and Louisiana, in Central America from Honduras to Panama and in South America to Trinidad, Brazil, and Argentina. In Texas and Mexico this species is apparently replaced by *C. eadsi,* new species, and in the West Indies by *C. hoffmani* Fox.

Culicoides hoffmani Fox

Culicoides hoffmani Fox, 1946, Ann. Ent. Soc. Amer. 39:251 (female; Trinidad; biting man; fig. wing, scutal pattern); Fox, 1949, Bull. Brooklyn Ent. Soc. 44: 29 (male, female; Puerto Rico, reared, tree hole; fig. palpus, spermathecae, male genitalia); Wirth and Blanton, 1956, Jour. Washington Acad. Sci. 46:189 (male, female redescribed; distribution; fig. wing, scutum, palpus, spermathecae, tibial comb, male genitalia); Linley and Kettle, 1964, Ann. Mag. Nat. Hist. Ser. 13, 7:129 (Jamaica; larva, pupa; figs.).

Our separation of the female of *C. hoffmani* from that of *C. debilipalpis* is made on the basis of the following characterization of females of *C. hoffmani* from Puerto Rico and Jamaica, where *C. debilipalpis* does not occur:

Female.—Slightly smaller than *C. debilipalpis*, wing 0.76 mm long. Eyes moderately separated, with longer interfacetal hairs than in *C. debilipalpis*. Third palpal segment shorter and broader, PR 1.6. Wing not as hairy, the macrotrichia in cell M2 rarely extending to base of cell, usually confined to apical half of wing; poststigmatic pale spots in cell R5 usually more widely separated and not so obliquely located. Spermathecae subequal to very slightly unequal, measuring 0.048 by 0.034 mm and 0.043 by 0.031 mm.

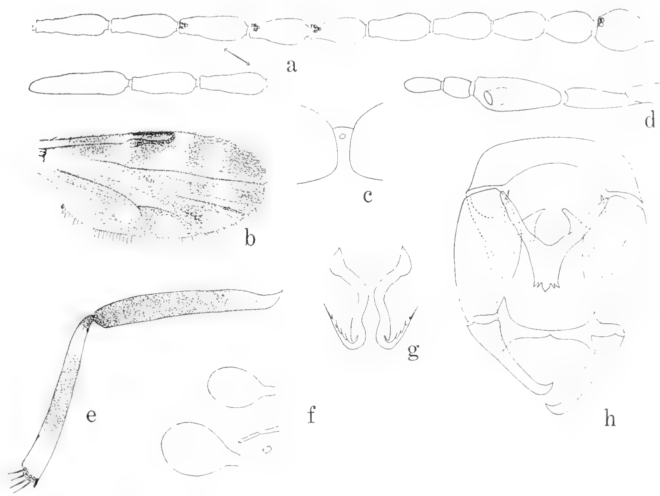

Fig. 1, *Culicoides eadsi*, n. sp.: a, female antenna; b, female wing; c, female eye separation; d, female palpus; e, female hind femur and tibia; f, female spermathecae; g, male parameres; h, male genitalia, parameres removed.

Male.—Genitalia quite distinctive: Aedeagus with basal arms relatively stout, distal portion stout with three strongly sclerotized distal points. Parameres each with slender midportion without ventral lobe.

Distribution.—Dominica, Jamaica, Panama, Puerto Rico, St. Lucia, Trinidad, Virgin Islands.

Culicoides eadsi Wirth and Blanton, n. sp.
(Fig. 1)

Female.—Length of wing 0.81 mm.

Head: Eyes (fig. 1c) broadly separated, with short interfacetal hairs. Antenna (fig. 1a) with lengths of flagellar segments in proportion of 25-20-22-25-25-25-25-26-26-26-28-28-43, AR 0.78; no sharp increase in lengths of segments in distal series; distal sensory tufts prominent, located on segments 3, 8–10. Palpal segments (fig. 1d) with lengths in proportion of 15-30-42-13-15, PR 2.8; third segment moderately swollen, with a small, deep sensory pit opening by a round pore. Proboscis moderately long, P/H Ratio 0.83; mandible with 15 teeth.

Thorax: Brownish, scutum as seen in slide mounted specimens without conspicuous pattern. Legs brown, knee spots blackish; fore and mid femora with narrow subapical pale rings, all tibiae with narrow subbasal pale rings, and hind tibia with distal fourth pale; hind tibial comb with four spines, the second from the spur longest (fig. 1e).

Wing (fig. 1b): Pattern as figured; distal pale spot in cell R5 transverse, the two poststigmatic pale spots separated, the posterior one located slightly proximad of the other; distal pale spot in anal cell slightly angular; distinct pale spots present behind medial fork and in front of mediocubital fork. CR 0.57; 2 RC narrow but with distinct lumen; macrotrichia moderately numerous on distal half of wing and extending in a double line to base of cell M2. Halter dark.

Abdomen: Dark brown. Spermathecae (fig. 1f) unequal, measuring 0.052 by 0.030 mm and 0.042 by 0.025 mm, oval; the necks relatively long, stout, and slightly tapering.

Male.—Similar to the female, with the usual sexual differences, antennal plume well developed. Genitalia (fig. 1h): Ninth sternum with well developed caudomedian excavation, the ventral membrane not spiculate; ninth tergum moderately long and tapering, apicolateral processes short and angular with sharp apical point, the caudal margin between them slightly notched. Basistyle with ventral root "foot-shaped," dorsal root slender and pointed; dististyle quite slender, only slightly curved, with bent, pointed tip. Aedeagus with basal arch extending to about half of total length, basal arms relatively stout and nearly straight; distal portion broad and stout, slightly tapered to broad truncated apex bearing five distal points, the median one distinctly larger and blunter. Parameres (fig. 1g) each with distinct basal knob, main portion long and slender, bent near base, with a distinct ventral lobe distally, distal portion abruptly bent ventromesad, tapering to slender point with 4–5 lateral fringing spines.

Distribution.—Mexico, southern Texas.

Types.—Holotype female, allotype male, Cameron Co., Texas, 25 October 1964, R. B. Eads, reared from tree hole (Type no. 70639, USNM). Paratypes, 40 males, 55 females, same data but also with dates June to October 1963, some with associated larvae and pupae.

Other Specimens Examined.—MEXICO: Acaponeta, Nayarit, 15 August 1960, Arnaud, Ross and Rentz, biting man, 7 females; Alamos (5 mi w), Sonora, 14 August 1959, Werner and Nutting, light trap, 2 females; El Salto, San Luis Potosi, G. W. Byers, biting man, 10 females; Hermosillo, Sonora, 8 August 1960, Arnaud, Ross and Rentz, biting man, 4 females; Merida, Yucatan, 31 July 1964, P. J. Spangler, light trap, 8 males, 32 females; Perico (26 mi n), Sonora, 13 August 1960, Arnaud, Ross and Rentz, biting man, 3 females.

Discussion.—This species is named in honor of Dr. Richard B. Eads of the U.S. Public Health Service who has collected *Culicoides* for us extensively in the Brownsville area of the Texas Rio Grande Valley. The several reared series of *C. eadsi* has helped us immensely in clarifying the taxonomic status of *C. debilipalpis* Lutz, *C. hoffmani* Fox, and this seemingly intermediate species.

Culicoides eadsi is intermediate in female characters between *C. debilipalpis* which has a slender third palpal segment, spermathecae unequal in size, more abundant wing macrotrichia, and more obliquely placed poststigmatic pale spots, and *C. hoffmani*, in which the third palpal segment is shorter and broader, the spermathecae subequal in size, both small, the wing macrotrichia sparser, and the poststigmatic pale spots usually located further apart and more in line transversely. The male genitalia of *C. eadsi* are practically identical with those of *C. hoffmani*, but the latter species lacks the ventral lobe on the parameres. The relative development and ventrally bent position of the sublateral pair of distal points on the aedeagus is subject to some variation in both *C. hoffmani* and *C. eadsi*, and in both species individuals are often found in which only three prominent distal points are apparent. The pupal respiratory horn of *C. eadsi* is practically identical with that described for *C. hoffmani* by Linley and Kettle (1964, Ann. Mag. Nat. Hist. Ser. 13, 7:129–149).

The available data show that this species is apparently allopatric with the closely related *C. debilipalpis* and *C. hoffmani*. *C. debilipalpis* has a wide range, in the eastern United States from Maryland to Florida and Louisiana, then skipping Texas and Mexico and appearing again from Honduras through Central and South America and Trinidad to Argentina. *C. hoffmani* is found in the West Indies from Jamaica and Puerto Rico south to Trinidad and appearing again in Panama. Much of the published distribution of these two species has been confused by possibly erroneous determinations of the females which are very difficult to separate and apparently overlap somewhat in the ranges of some characters. The above distribution includes only localities represented by males which can be easily distinguished. The females of all three species readily bite man, and the males are seldom taken except by light traps and treehole rearings. Therefore much of the distribution must remain questionable until documented by male records.

Culicoides darlingtonae Wirth and Blanton, n. sp.

(Fig. 2)

Female.—Length of wing 0.86 mm.

Head: Eyes (fig. 2c) narrowly separated, with short interfacetal hairs. Antenna (fig. 2a) with lengths of flagellar segments in proportion of 22-18-22-27-27-27-28-28-29-30-32-30-50, AR 0.86, segments thus in a continuous series of gradually increasing lengths; distal sensory tufts present on segments 3, 8–10. Palpal segments (fig. 2d) with lengths in proportion of 10-25-30-12-13, PR 2.1; third segment considerably swollen its entire length, with a shallow, round sensory pit. Proboscis moderately short, P/H Ratio 0.76; mandible with 16 very fine teeth.

Thorax: Dark brown, scutal pattern not discernible in slide specimens. Legs brown, knee spots blackish, all tibiae with narrow basal pale rings; hind tibial comb with four spines, the one nearest the spur longest.

Wing (fig. 2b): Pattern as figured; second radial cell included in a dark spot to its apex; pale spot lying over r-m crossvein large and extending to costal margin; cell R5 with two slightly contiguous poststigmatic pale spots, the posterior one located slightly proximad, a large transverse pale spot in distal portion of cell, broadly meet-

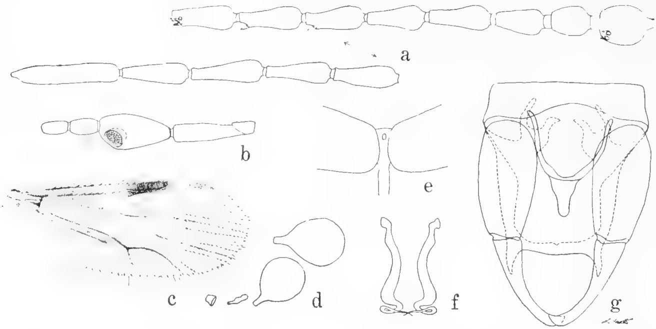

Fig. 2, *Culicoides darlingtonae*, n. sp.: a, female antenna; b, female wing; c, female eye separation; d, female palpus; e, female spermathecae; f, male parameres; g, male genitalia, parameres removed.

ing anterior wing margin and distinctly concave on distal side; cell M1 with two pale spots; cell M2 with small pale spot lying behind medial fork and another in front of mediocubital fork, a large rounded pale spot at wing margin; cell M4 with a large pale spot in distal portion; anal cell with a double pale spot in distal portion; apices of veins M1, M2, M3 + 4 and Cu1 without pale spots at wing margin. CR 0.61; 2RC with narrow lumen; macrotrichia sparse, mostly in rows, confined to distal third of wing. Halter infuscated.

Abdomen: Blackish. Spermathecae (fig. 2e) two plus rudimentary third and sclerotized ring; the two functional ones oval with long slender necks; slightly unequal, measuring 0.051 by 0.033 mm and 0.043 by 0.032 mm.

Male.—Similar to the female with the usual sexual differences; antennal plume well developed; sensory tufts present on antennal segments 3 and 12; last three segments with lengths in proportion of 60-50-60. Genitalia (fig. 2g): Ninth sternum with scarcely perceptible caudomedian excavation, the ventral membrane not spiculate; ninth tergum moderately long, tapering, with moderately long, pointed, apicolateral processes, the caudal margin between them nearly straight. Basistyle moderately stout, ventral root with posterior hook not well-developed, the anterior point moderately stout, dorsal root longer and more slender; dististyle slender, curving to bent, pointed tip. Aedeagus with basal arch broader than high, basal arms slender and curving; distal portion short and tapering to simple tip, flanked by a pair of appressed, lateral leaves. Parameres (fig. 2f) each with strong basal knob, slender and nearly straight in midportion, with a low ventral lobe near tip, beyond which it is greatly narrowed and twisted ventromesad to filamentous tip without fringing spines.

Distribution.—Trinidad.

Types.—Holotype female, allotype male, Tamana Caves, Trinidad, 17 November 1966, Johanna Darlington (Type no. 70643, USNM). Paratypes, 9 males, 12 females, same data.

Discussion.—This species is dedicated to Miss Johanna Darlington of the University of the West Indies in St. Augustine, Trinidad, who collected the type series. She writes: "They appear in fairly large numbers (150–700 in an hour) in light trap samples from both upper and deep parts of the main cave. Both parts contain dense bat roosts and beds of guano. We have tried unsucessfully to rear the flies from samples of moist guano. Small stagnant pools in the upper part have yielded numerous psychodids but no ceratopogonids. I think that moist guano is the more likely breeding site, as there is no stagnant water in the deep part. I have no evidence as to whether or not the adult flies take blood from the bats, but they do not attempt to bite humans."

C. darlingtonae is closely related to *C. debilipalpis* Lutz and *C. hoffmani* Fox, both of which are common in Trinidad in the forest. The wing is not as hairy as in *debilipalpis*, and the distal pale spot in cell R5 reaches the anterior wing margin and is concave on the distal side; the third palpal segment is broader, much as in *hoffmani*. The male genitalia can readily be distinguished by the short aedeagus with broad basal arch and the very short distal process with appressed lateral leaves, the parameres are much as in *debilipalpis*, but the slender distal portion is more tightly twisted and appressed to the ventral lobe and there are no fringing distal spines.

Culicoides guerrai Wirth and Blanton, n. sp.

(Fig. 3)

Female.—Length of wing 0.95 mm.

Head: Eyes (fig. 3c) narrowly separated, nearly contiguous, with short interfacetal hairs. Antenna (fig. 3a) with lengths of flagellar segments in proportion of 30-25-28-30-30-30-30-32-32-33-35-32-60, AR 0.83; segments long, slender, tapering, in nearly a continuous series of gradually increasing lengths, penultimate segment unusually short; distal sensory tufts present on segments 3, 8–10 (2 each), with strong fringing setae. Palpal segments (fig. 3d) with lengths in proportion of 10-25-38-12-12, PR 2.1; third segment considerably swollen, with a round, shallow sensory pit. Proboscis short, P/H Ratio 0.67; mandible with 15 teeth.

Thorax: Dark brown, scutal pattern not discernible in slide specimens. Legs brown, knee spots blackish; tibiae with narrow basal and hind tibia with apical pale bands; hind tibial comb with four spines, the second from the spur longest.

Wing (fig. 3b): Pattern as figured; second radial cell included in a very dark spot to its apex; pale spot over r-m crossvein extending to costal margin; cell R5 with a small round poststigmatic pale spot lying at tip of 2RC, and a contiguous, longitudinal, arcuate pale spot lying just behind 2RC, a small, transverse pale spot in distal part of cell not meeting anterior wing margin; cell M1 with two pale spots; cell M2 with a faint pale spot lying behind medial fork but none lying in front of mediocubital fork, a small round pale spot lying at wing margin in tip of cell; cell M4 with a small round pale spot in distal portion; anal cell with a single pale spot in distal portion; apices of veins M1, M2, M3 + 4 and Cu1 without

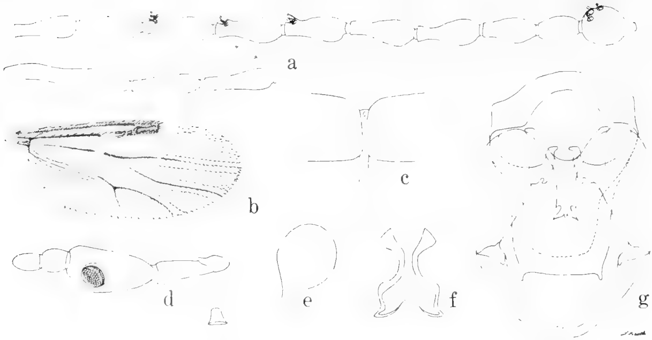

Fig. 3, *Culicoides guerrai*, n. sp.: a, female antenna; b, female wing; c, female eye separation; d, female palpus; e, female spermathecae; f, male parameres; g, male genitalia, parameres removed.

pale spots at wing margin. CR 0.62; 2RC with moderately broad lumen; macrotrichia strong but moderately sparse, confined to distal third of wing. Halter brownish.

Abdomen: Dark brown. Spermatheca (fig. 3e) single, oval with a long slender sclerotized neck; measuring 0.072 by 0.038 mm.

Male.—Similar to the female with the usual sexual differences; antennal plume well developed, brownish; sensory tufts present on antennal segments 3, 10–12, last three segments with lengths in proportion of 56-48-60. Genitalia (fig. 3g): Ninth sternum with broad, deep, caudomedian excavation, the ventral membrane not spiculate; ninth tergum long and tapering, apicolateral processes small, slender and pointed, the caudal margin between them nearly straight. Aedeagus with basal arch extending to about two-fifths of total length, the basal arms slightly curved; distal portion a long, slightly tapering process with bifid tip, the apical points sharp and slightly flaring, also a pair of small, sharp, subapical lateral points, and a small, sharp, median point at tip. Parameres (fig. 3f) each with strong basal knob, midportion quite slender and distinctly curved, swollen at about midlength or slightly past, bent caudad at the swelling and narrowed, then twisted ventromesad and drawn out into a filamentous tip.

Distribution.—Trinidad.

Types.—Holotype male, Tucker Valley, Trinidad, 10 August 1956, T. H. G. Aitken, light trap (Type no. 70644, USNM). Allotype female, same except 22 November 1957. Paratypes, 4 males, 9 females, as follows: TRINIDAD: Same data as type, some with date October 1955, 3 males, 5 females; Chaguaramas Naval Station, 2 November 1956, 1 female; Macqueripe Naval Station, 27 October 1955, 11 January 1956, 14 February 1958, 25 April 1958, 1 male, 3 females; all collected by T. H. G. Aitken in light traps.

Discussion.—This species is named for Mr. Ambrose Guerra of the Trinidad Virus Research Laboratory of the Rockefeller Foundation in appreciation for his collection of much of the Trinidad material studied by Dr. Aitken and ourselves.

Culicoides guerrai differs from the other known species of the *debilipalpis* group in the presence of the arcuate longitudinal poststigmatic pale spot in cell R5 of the wing. The male genitalia are also very distinctive in the unusual shapes of the aedeagus and parameres.

NEW HYMENOPTERAN ENEMIES OF ANTHIDIUM MACULOSUM CRESSON

(HYMENOPTERA: MEGACHILIDAE)

Leucospis affinis Say is known to be a parasite of *Anthidium maculosum* Cresson (Parker and Bohart, 1966, Pan-Pac. Ent. 42(2):91–98). Two newly associated enemies of *A. maculosum* were reared by Schuh (pers. comm.) from several wooden trap-nest blocks set out in 1964 at Montague, Siskiyou County, California.

Each block was made of seven 2 cm thick wooden boards bolted together to form a finished size of $14 \times 36 \times 9$ cm. Approximately 90 holes of 0.47 to 0.95 cm diameter were drilled to a depth of 7.6 cm. The mixed hole sizes were evenly spaced in a linear pattern six holes down and 17 or 18 holes across the face of the nest block. They were fastened to fence posts and other upright objects 0.90–1.20 m off the ground. Approximately 150 *A. maculosum* and 10 specimens of the following two newly associated parasites were reared from these blocks.

Determinations were made by Drs. R. M. Bohart (*Chrysis*), A. A. Grigarick (*Anthidium*), University of California, Davis, and me (*Dioxys*). I wish to thank Joe Schuh, Klamath Falls, Oregon, for setting out and collecting the trap-nest blocks, and for rearing the insects. All specimens are in his personal collection.

Dioxys aurifusca (Titus) (Megachilidae)—One specimen of this parasitic bee was reared from a nest of *A. maculosum.* Hurd (1958, Univ. Calif. Pub. Ent. 14(4):275–302) stated that Cockerell recorded *D. aurifusca* found at Golden, Colorado in a nest of cottony tomentum, evidently made by a species of *Anthidium.* However, this was an unconfirmed association. The rearing record from Montague, California now confirms the relationship. Hurd also suggested a probable affiliation between *D. aurifusca* and *Callanthidium illustre* (Cresson). Because of the large size of the parasitic bee, its comparable distribution with *Callanthidium*, and the similar nesting habits of *Anthidium* and *Callanthidium*, this association is possible but unconfirmed.

Chrysis tripartita Aaron (Chrysididae)—Nine specimens of this chrysidid were also reared from nests of *A. maculosum* by Schuh. Grigarick and Stange (1968, Bull. Calif. Ins. Surv. 9:1–113) listed this species and *C. coloradica* Bohart as parasites of *A. collectum* Huard. They also listed *C. florissanticola* Rohwer as a parasite of *A. banningense* Cockerell. Custer (1928, Ent. News 39:123–125) recorded *A. porterae* Cockerell as a host for *C. lauta* Cresson. These four chrysidid species are in the *lauta* group of *Chrysis*, as defined by Bohart (1964, Proc. Biol. Soc. Wash. 77:223–236).—DONALD S. HORNING, JR., *Department of Zoology, University of Canterbury, Christchurch, New Zealand.*

A NEW GENUS OF ORIBATID MITE

(Cryptostigmata: Oribatellidae)

William B. Grabowski, *Zoology Department, Colorado State University, Fort Collins, Colorado 80521*

ABSTRACT—**Ferolocella**, n. gen., is proposed for *Oribatella carolina* Banks, 1947. This genus departs from *Oribatella* in having greatly reduced mesial dentes and the posterior reflection of the translamella to form a box. Other features which differ from those characteristic for *Oribatella* are discussed.

The family Oribatellidae as established by Jacot (1925) was partially reviewed by Woolley (1958) and this review completed by Grabowski (1967). During this investigation, I found a specimen identified by Banks (1947) as belonging to the type genus *Oribatella*. It was designated *Oribatella carolina* Banks, 1947. Detailed study of the specimens has shown that this oribatid does not fit the characteristics set forth for the genus, although its inclusion in the Oribatellidae is valid.

Ferolocella, n. gen.

Type-species: *Oribatella carolina* Banks, 1947.

The translamella in this oribatid is reflected posteriorly under the dorsosejugal suture to form a box or cell-like structure. Certain modifications of the lamellae also set this representative apart from *Oribatella*.

The name is derived from the Latin *feros*, to bear or carry, and *locella*, a tiny box or cell.

Ferolocella carolina (Banks), n. comb.
(Figs. 1–6)

Oribatella carolina Banks, 1947, Psyche 54(2):112.

Lamellar cusps broad, distinctly striated; lateral dentes pointed, mesal dentes greatly reduced and pointed; auxiliary dens ("aux," fig. 3) arises laterally to mesal dens; lamellar cleft triangular posteriorly; lamellar hairs medium length, thin, barbed, originating between mesal and auxiliary dentes; interlamellar hairs thin, pectinate, extending just beyond tips of lateral dentes; lateral arms of translamella reflected posteriorly and extending underneath dorsosejugal suture forming prominent cell-like configuration (figs. 2, 3); pseudostigmatic organ long, fusiform, barbed.

Hysterosoma broader than long, dorsum finely punctate; pteromorphs short, shallowly decurved, with finely striated anterolateral borders; eight pairs of short, simple setae, no porose areas (fig. 1).

Camerostome (fig. 2) rectangular in outline with curved posterolateral margins; one pair of mental setae, rutellar setae located in posterolateral corners (fig. 4);

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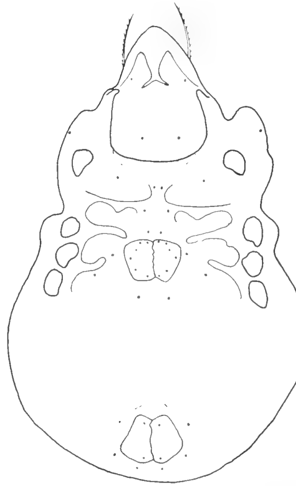

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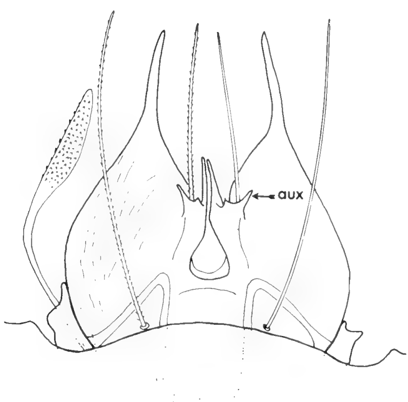

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Figs. 1–3, *Ferolocella carolina* (Banks): 1, dorsal view, legs omitted, stipled area indicates fine punctations on dorsum of hysterosoma; 2, ventral view, legs omitted, dots indicate setal insertions; 3, detail of lamellar and translamella morphology (aux = auxiliary mesal dens).

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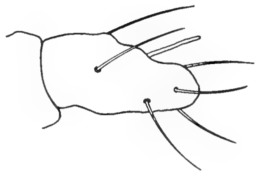

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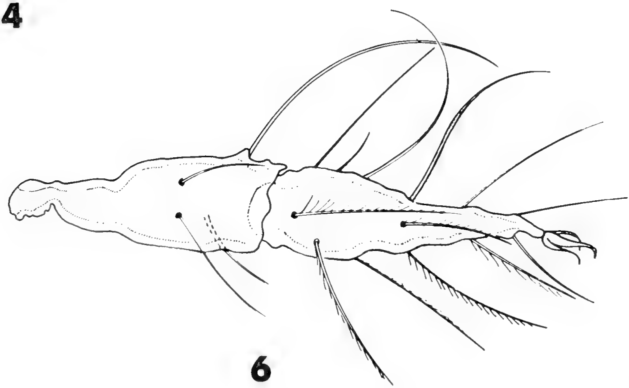

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Figs. 4–6, *Ferolocella carolina* (Banks): 4, detail of infracapitulum, palp segments and their setation, and placement of mental and rutellar setae; 5, greatly enlarged view of palp tarsus; 6, tibia and tarsus, leg I, showing placement and morphology of setae.

adoral setae not visible on any specimens observed; chelicerae chelate; setation of pedipalp as given in fig. 4; palp tarsus with seven setae, solenidion placed anteriorly (fig. 5).

Ventral surface of hysterosoma finely punctate; placement of coxisternal setae as given in fig. 2; coxisternal setae 2b-c not evident in any specimens examined; genital plate with six pairs of short, simple setae (fig. 2): g_1 and g_2 far anterior on leading edge of each cover, g_3 and g_4 anterior and in a line running obliquely laterad from g_2, g_5 and g_6 posterior and in a line running obliquely mesad towards opening; one pair of short aggenital setae; anal plate with two pairs of setae, three pairs of adanal setae laterad and posterior to plate, fissure "iad" just anterior to each cover (fig. 2).

All legs tridactylous, lateral tynes very thin; subtarsals, subinguinals, and inguinals of tarsus one all distinctly barbed on one side, famulus setose and elongate (fig. 6).

Color, pale yellow; length, 275.5 μ, width, 190.5 μ. Specimens supplied by Dr. Louis G. Metz, Research Triangle Park, North Carolina. I collected four specimens five miles west of Huntington, Wayne County, West Virginia, 5 June 1967, in damp moss on a rock overhanging a seepage area, and in moist oak litter mixed with topsoil.

This species is not a valid member of the genus *Oribatella* for the following reasons: (1) the mesal dentes on each lamellar cusp are greatly reduced and spinous, (2) an auxiliary mesal dens is present, and (3) the translamella is reflected posteriorly to form a box configuration. Members of the genus *Oribatella* possess lamellar cusps which are deeply bifid, dentes which may be slightly subequal but neither mesal nor lateral dentes are greatly reduced in size, and a translamella that extends laterally and posteriorly from the lamellar cleft to the pseudostigmata without becoming reflected upon itself.

The apparent absence of adoral setae and coxisternal setae 2b-c cannot be explained at this time owing to lack of information concerning the developmental stages in this family. Reports concerning the presence or absence of porose areas in this family have been inconsistent throughout the literature (Grabowski, 1967). I consider the lateral displacement of the rutellar setae rather unusual when compared to the more central orientation of these setae in other members of the family.

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THE SUBGENUS TRITOLESTES GHESQUIÈRE OF THE GENUS CRYPTOCHETUM RONDANI WITH A NEW SPECIES FROM PAKISTAN

(Diptera: Cryptochetidae)

George C. Steyskal, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—The subgenus *Tritolestes* of the genus *Cryptochetum* is shown to consist of 5 species, 4 from Africa and *C.* (*T.*) **ghanii**, new species, from Karachi, Pakistan, and a key to the species is given.

The family Cryptochetidae consists of the single genus *Cryptochetum* Rondani (1875:167). The name of the genus has usually been spelled *Cryptochaetum*, but Rondani's original spelling on page 167 and in the index on page 190 was with the simple "e", although on page 172 it is spelled *Cryptochoetum.* Ghesquière (1942:405) established the subgenus *Tritolestes* for species with the frontal triangle acutely pointed anteriorly and not attaining the frontal margin. He included the 2 species *C. melanum* Ghesquière and *C. aspidoprocti* Ghesquière and designated the former as type of the subgenus. The name *melanum* should be emended to *melan* because the gender forms of that adjective are *melas* (masc.), *melaena* (fem.), and *melan* (neuter). In a paper that appeared only the year before Ghesquière's, Thorpe (1941) described 2 new species, *C. striatum* and *C. idiocerum*, without reference to subgenera. It is obvious however that those 2 species should be referred to *Tritolestes.*

The following new species is very similar to the type of *Tritolestes*, and represents the first record of a species of that subgenus from outside Africa.

Cryptochetum (Tritolestes) ghanii, n. sp.

(Figs. 1–4)

Female. Length of body 1.3–1.4 mm, of wing 1.07–1.18 mm. Color generally more or less shining black, only tarsi yellowish; thorax and frontal triangle with slight dark bluish glint; abdomen rather strongly metallic greenish to bluish; front outside triangle matt black; face and antenna grayish tomentose; wing hyaline; all bristles and hairs black.

Head as in figs. 1 and 2; frontal triangle abruptly narrowed forward to aculeate point not attaining anterior frontal margin; antenna 2.4 times as long as wide, elliptical, with subapical dorsal spinule; cheeks very narrow, scarcely apparent in profile, bearing several short bristles; eyes with short sparse hairs.

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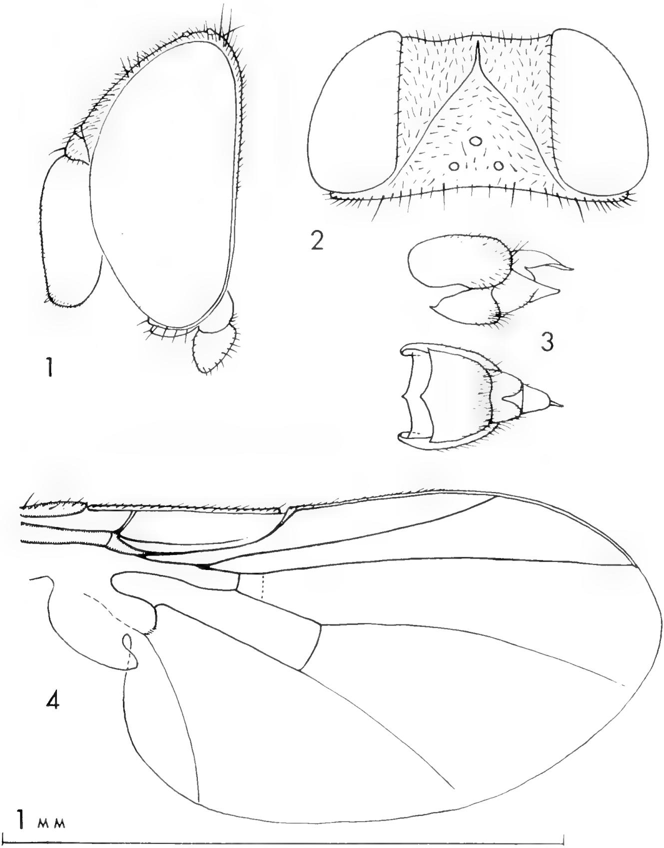
[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.



Figs. 1–4, *Cryptochetum* (*Tritolestes*) *ghanii*, n. sp.: 1, head in profile; 2, same, dorsal view; 3, lateral and ventral views of female postabdomen; 4, right wing (dotted line indicates position of *ta* in one paratype).

Thorax as in most species of the genus; mesoscutum covered with rather dense short hairs, those in middle approximately 0.035 mm long. Legs without distinctive characters; tarsal segments of fore leg from base distad as 3.7, 1.3, 1.0, 0.8, 1.2.

Wing as in fig. 4; tip of discal cell convex because *tp* is bent outward or at least somewhat retracted before meeting 5th vein; costa hardly surpassing tip of

3rd vein; length of *tp* not more than ¼ that of last section of 5th vein; 3rd and 4th veins arcuate and divergent, their tips 2.3 times as far apart as width of submarginal cell at *tp*.

Abdomen without apparent distinctive characters; postabdomen as in fig. 3 (drawn in water from preparation macerated in NaOH solution).

Holotype and 5 paratypes, ♀, Karachi, Pakistan, 13 August 1969 (M. A. Ghani), ex scale insect *Icerya seychellarum* (Westwood) on grass *Cynodon dactylon* Rich., no. 70849 in U.S. National Museum; right wings of holotype and 2 paratypes on microscope slides in euparal, postabdomen of holotype in glycerine in microvial attached to pin bearing remainder of specimen.

I am pleased to dedicate the name of the species to its collector. *C. ghanii* is apparently most similar to the type of the subgenus *Tritolestes*, *C. melan* Ghesquière, differing as shown in the key below.

Key to Species of **Cryptochetum** Subgenus **Tritolestes**

1 (2) Area of front adjacent to frontal triangle with broad zone of fine striae parallel to margins of triangle; shortest distance between ocelli greater than shortest distance from ocellus to margin of triangle; 3rd antennal segment not tapering, with acute anterior apex, 2.3 times as long as wide, not attaining level of lower margin of eye; wing with costa extending to 4th vein, 3rd and 4th veins parallel distally, anterior distal corner of discal cell 110°, *tp* equal in length to last section of 5th vein; length of body 2.75 mm, of wing 1.9 mm .... **C. striatum** Thorpe

2 (1) Front without striation; shortest distance between ocelli less than shortest distance from ocellus to margin of triangle; antenna rounded apically, either strongly tapering and extending below level of lower margin of eye or oval and not attaining level of lower margin of eye; wing venation and size various.

3 (4) Third antennal segment 3.6 times as long as wide, strongly tapering to narrow rounded tip ventrad of lower margin of eye; wing with costa extending no more than slightly beyond 3rd vein, 3rd and 4th veins arcuate, gently diverging, anterior distal corner of discal cell rectangular, *tp* ⅓ length of last section of 5th vein; large species, body length 5 mm, wing length nearly 3 mm .... **C. idiocerum** Thorpe

4 (3) Third antennal segment oval or elliptical, not more than 2.5 times as long as wide, not attaining level of lower margin of eye; wing venation various; smaller species, length of body not more than 2.2 mm.

5 (6) Costa attenuate beyond tip of 3rd vein, but attaining 4th vein; 4th vein sinuate, distally parallel to 3rd vein; anterior distal corner of discal cell 130°; *tp* a little longer than last section of 5th vein; length of body 2.1–2.2 mm, of wing ? (known only from male) .... **C. aspidoprocti** Ghesquière

6 (5) Costa at most slightly exceeding 3rd vein; 3rd and 4th veins gently arcuate, divergent; anterior distal corner of discal cell approximately 100°; *tp* much shorter than last section of 5th vein; length of body not more than 1.6 mm (known only from females).

7 (8) *Tp* ½ length of last section of 5th vein; tip of discal cell concave, lower corner acute; length of body 1.4–1.6 mm, of wing ? (Congo) .... **C. melan** Ghesquière

8 (7) *Tp* approximately ¼ length of last section of 5th vein; tip of discal cell convex, lower corner obtuse; length of body 1.3–1.4 mm, of wing 1.07–1.18 mm (coastal Pakistan) .... **C. ghanii,** n. sp.

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A NOTE ON THE SYNONYMY OF ANTISSOPS DENTICULATA ENDERLEIN

(Diptera: Stratiomyidae)

In 1914, Enderlein erected the genus *Antissops* on the basis of a single male specimen from Costa Rica which he described as *Antissops denticulata.* Apparently Enderlein was unsure of the correct placement of this genus and after including it in the subfamily Pachygastrinae, he later (Enderlein, 1920) transferred it to the Beridinae. At this time he added a second species, *Antissops barbiellinii,* which had been previously described by Bezzi in 1908, as *Allognosta barbiellinii.*

In association with my studies on the Stratiomyidae of Mexico, I found a specimen from the state of Chiapas in Mexico that had been identified as *Antissops denticulata* but which was remarkably similar to another species, *Berismyia fusca,* which had been described by Giglio-Tos in 1893.

With the gracious assistance of Frau A. Draber-Monko of the Institute of Zoology at the Polish Academy of Sciences in Warsaw, I was able to determine that except for sexual differences, the type of *Antissops denticulata* and the specimen from Chiapas, Mexico, are conspecific and therefore, *Antissops denticulata* Enderlein must be considered as a junior synonym of *Berismyia fusca* Giglio-Tos.

On the basis of Enderlein's illustration of the wing and antenna of *Antissops barbiellinii* (= *Allognosta barbiellinii* Bezzi) I am reasonably confident that this species is not congeneric with *Antissops* (= *Berismyia*) but final disposition must await examination of the holotype.

Information Paper, College of Agriculture, Washington State University. Work was conducted under Projects 9043 and 1939. The author is indebted to the National Science Foundation Grant GB-15774 for partial financial support of this project.—M. W. McFadden, *Department of Entomology, Washington State University, Pullman, Washington 99163.*

THE OVERWINTERING OF SOME MUSCOIDEAN DIPTERA IN THE AMHERST AREA OF MASSACHUSETTS

LISA DONDERO, *Department of Entomology, University of Georgia, Athens, Georgia 30601*

and

FRANK R. SHAW, *Department of Entomology, University of Massachusetts, Amherst, Massachusetts 01002*

ABSTRACT—Collections of adult flies in the Amherst area of Massachusetts from Oct. 4, 1968 to March 20, 1969 showed that *Pollenia rudis* (F.) (the cluster fly), *Phormia regina* (Meig.) (the black blow fly), *Pararicia pascuorum* (Meig.), *Muscina assimilis* (Fallén) and *Lispocephala alma* (Meig.) all overwintered in the adult stage in unheated attics or similar places and were present in a descending series in that order.

A number of entomologists including Hewitt (1915), Kisliuk (1917), Roberts (1930) and Wallis (1962), have discussed the overwintering of some of the higher Diptera but no published data are available on this subject in the Amherst area of Massachusetts.

In order to obtain some information on the overwintering of flies in the Amherst area, three buildings were selected and collections were made preferably in the afternoon following a warm day. The flies would collect at the windows of attics and could be readily captured. The greatest number of flies was collected from a house in Amherst 70–80 years old. Comparatively few flies were taken in a recently built house in Hadley and the collection of flies from the third building, a school in Cushman, was reduced by an application of an insecticide in the early fall. However, by November, the effects of the treatment had apparently worn off and a population of flies had built up.

The flies were taken to the laboratory and identified.[1] The data obtained appear in Table 1. The two species most commonly found were the cluster fly (*Pollenia rudis* (F.)) and the black blow fly (*Phormia regina* (Meig.)). It is of interest that 22.4 per cent of all the cluster flies were taken at the Cushman School which had been sprayed in the early fall.

In previous seasons collections from the house in Amherst, a few houseflies *Musca domestica* L. and *Musca autumnalis* De Geer, were collected in the fall. No house flies were found in the spring and the number of face flies was less than that of *Muscina assimilis* (Fallén).

[1] We wish to acknowledge the assistance of Drs. R. J. Gagné and C. W. Sabrosky for the identification of some of the specimens.

Table 1. Number of flies collected in attics of buildings in 3 locations in Amherst area of Massachusetts

Date	Species and Abundance of Flies					
	P. rudis	*P. regina*	*P. pascuorum*	*M. assimilis*	*L. alma*	Total
10–4–68 Amherst	18	27	6	0	0	51
10–13–68 Amherst	22	47	27	0	0	96
10–19–68 Amherst	13	49	16	1	0	79
10–27–68 Amherst	23	53	32	5	0	113
11–3–68 Amherst	21	1	13	0	0	35
11–4–68 Cushman	50	2	10	1	1	64
11–8–68 Hadley	1	1	0	0	0	2
1–14–69 Cushman	33	3	10	0	0	46
2–23–69 Amherst	11	9	8	8	2	38
3–20–69 Amherst	31	8	5	7	0	51
Total	223	200	127	22	3	575

In conclusion, collections of adult flies taken from October 4, 1968 to March 20, 1969 showed that the cluster fly, the black blow fly, *Pararicia pascuorum* (Meig.), *Muscina assimilis* and *Lispocephala alma* (Meig.) all overwintered as adults in attics in the Amherst area of Massachusetts. Their abundance is indicated in a descending series.

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NORTH AMERICAN SCIARIDAE, II. A NEW SPECIES OF EUGNORISTE FROM TEXAS[1]

(DIPTERA)

WALLACE A. STEFFAN, *B. P. Bishop Museum, Honolulu, Hawaii 96818*

ABSTRACT—A new sciarid, *Eugnoriste* **planiforceps** Steffan, from Texas is described and figured. The adults were found on flowers of *Prosopis glandulosa.*

The genus *Eugnoriste* is largely restricted to the Nearctic and Neotropical regions with one species, *Eugnoriste capensis* Steffan (1967) known from South Africa. The following new species from Big Bend National Park, Texas, was sent to me for identification by Dr. R. Gagné, U.S. Department of Agriculture. Two other species are known from North America, *E. occidentalis* Coquillett (1896) and *E. brevirostris* Coquillett (1904). One species, *E. pernitens* Edwards (1941), is known from Brazil.

Eugnoriste planiforceps, n. sp.

(Fig. 1)

This species is easily distinguished from other *Eugnoriste* by the flattened distimere, the divided lobes of tergum X, and other characters mentioned below.

Male. *Head* (fig. 1a). Interfacetal hairs abundant, extending slightly beyond outer curvature of facets; eye bridge 3 facets wide. Anterior vertex bare. Antenna: flagellomeres with distinct necks, hairs less than ½ width, hyaline sensilla apparently absent; flagellomere 4 (fig. 1b) about 1.4 times longer than wide, flagellomeres 7–8 on right antenna partially fused in holotype. Prefrons with 13 short setae roughly arranged in three groups. Clypeus with 11 short setae. Labium elongate, about 0.21 length of fore femur with numerous very short spicules. Proboscis length 0.11 mm. Palpus 3-segmented (fig. 1d), segment 1 with 5–9 setae and numerous dorsal hyaline sensilla. *Thorax.* Acrostichals and dorsocentrals weak. Posterior pronotum bare; anterior pronotum generally pale yellow as contrasted to the dark notum, with 7 strong setae; proepisternum with 9 strong setae. Posterior mesepimerite (= posterior epimeron of the mesothorax, Steffan, 1966) short and broad. *Legs.* Fore legs: length of coxa, 0.45 mm; femur, 0.52 mm; tibia, 0.61 mm; basitarsomere, 0.27 mm; fore tibial comb (fig. 1c) composed of triangular patch of setae set in a shallow pit. Hind tibia with enlarged anterodorsal, posterodorsal, dorsal and ventral setae; apical comb consisting of single row of 7 strong setae, spur slightly shorter than width of tibial apex. Pretarsal claws simple. *Wing.* Length 1.9 mm, width 0.9 mm. Venation as in fig. 1f. R-M index 1.8; C-M index 0.5. *Abdomen.* Tergal setae strong and evenly distributed; sternal setae largely restricted to lateral and posterior margins of sterna. Terminalia as in fig. 1i, distimere distinctly flattened laterally (fig. 1g). Tergum IX as in fig. 1h. Tergum X bilobed and each lobe bilobed.

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[1] The first of this series was published in Pacific Insects 10:37–41.

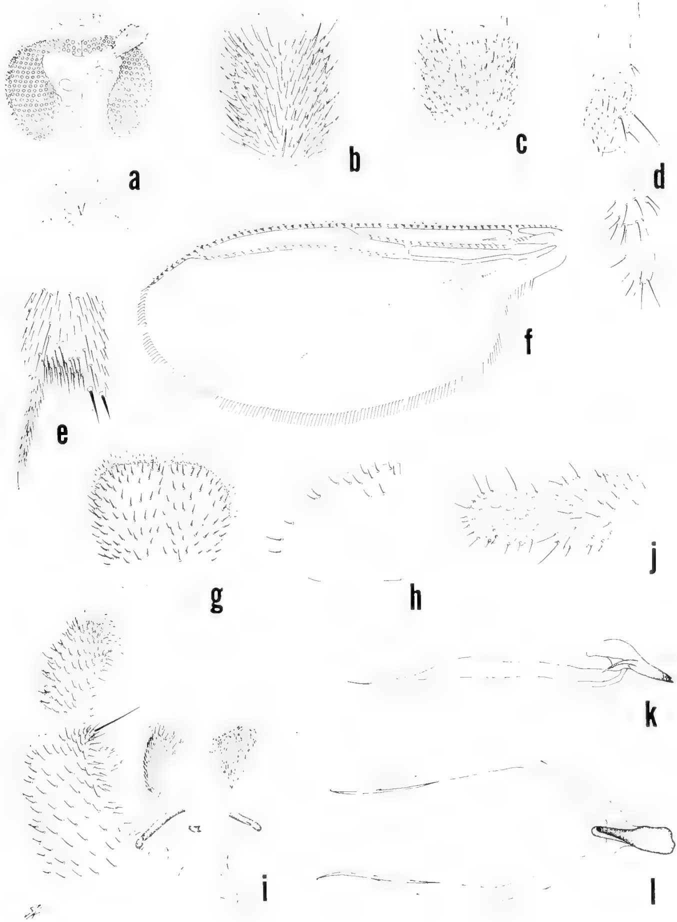

Fig. 1. *Eugnoriste planiforceps* n. sp.: a, head of male; b, flagellomere 4 of male; c, flagellomere 4 of female; d, palpus of male; e, apex of fore tibia of male; f, wing of male; g, distimere; h, lateral half of tergum IX of male; i, male terminalia, ventral view; j, female cercus, lateral view; k and l, female vaginal furca, lateral and ventral views respectively.

Female. Essentially as male with following differences: flagellomere 4 (fig. 1c) shorter, about as long as wide with numerous hyaline sensilla. Prefrons with 19–21 setae. *Wing.* Length 2.5–2.6 mm, width 1.0 mm. *Legs.* Fore leg measurements: coxa, femur, tibia, basitarsomere—0.45, 0.64, 0.72, 0.31 mm respectively; range of femoral length 0.60–0.64. Sternal setae of abdomen more abundant, sternum VIII divided longitudinally by wide non-sclerotized area, terga VII and VIII partially divided transversely near anterior third by median non-sclerotized band. Cercus and vaginal furca as in fig. 1j and fig. 1k, 1 respectively.

Type data. Holotype male (slide-mounted), Rio Grande Camping area, Big Bend National Park, Texas, 14 July 1968, D. R. Bennett, on *Prosopis glandulosa* blooms. Allotype female, same data as holotype (on slide). Holotype and allotype deposited in the U.S. National Museum (No. 70999). Paratypes: 3♀♀ (mounted on slides), 7♀♀ (mounted on pins), same data as holotype. Paratypes deposited in Texas Technological College, California Academy of Sciences, Cornell University and Bishop Museum.

Remarks. This species appears closely related to the neotropical species *E. pernitens* Edwards from which it differs by the shorter flagellomeres. In *E. pernitens*, flagellomere 4 is about twice as long as wide, whereas in *E. planiforceps*, it is scarcely as long as wide. There may be differences in the shape of the vaginal furca but this structure has not been examined in *E. pernitens*. *E. planiforceps* is also similar to *E. capensis* but differs in the size of the prefrons which is much wider below the compound eyes in *E. capensis*; in the relative length of the hind tibial spurs which are almost twice as long as the tibial apex is wide in *E. capensis*, whereas in *E. planiforceps*, they are shorter than the width of the tibial apex; and in the shape of the vaginal furca.

Acknowledgments

I wish to thank Dr. Raymond Gagné of the U.S. Department of Agriculture and Mr. Joaquin Tenario of Texas Technological College (now at the University of Hawaii) for the opportunity to describe this species. I also wish to thank Dr. Jean Laffoon for his suggestion of the term "posterior mesepimerite" in place of "posterior epimeron of the mesothorax" and for his review of this paper. This term is equivalent to Tuomikoski's "Hinterfortsatz des mesothorakalen epimerits" (1960). I also wish to acknowledge the talents of my illustrator, Miss Suzanne Keenan and typist, Mrs. Dorothy Hoxie.

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POLYDRUSUS CERVINUS (L.), A EUROPEAN WEEVIL DISCOVERED IN NORTH AMERICA

(Coleoptera: Curculionidae)

Polydrusus cervinus (Linnaeus) (1758, Syst. Nat. ed. 10. p. 384 (*Curculio*)), not known previously from America, was found in New Hampshire and New Jersey. The New Jersey specimen was in a miscellaneous collection of weevils brought to my office in June 1970 by the late Dr. E. Avery Richmond of Moorestown, N. J. Dr. Richmond told me the weevil was probably taken from the windshield of his car sometime during 1969. Seven examples from Hanover, New Hampshire, collected by Dr. Kenneth W. Cooper, were found among unsorted material in the U.S. National Museum. One of the specimens was taken by Dr. Cooper while collecting cyrtid flies on birch twigs during August 1963. According to Dr. Cooper the specimen most certainly came from the birch, the shrubs interspersed among them, or the grass immediately adjacent; the birches fringed hardwoods that margined the lacrosse playing fields of Dartmouth College. The other six specimens were collected in the environs of Hanover from late April to mid-October.

This species is readily distinguished from our native North American species and from our other two introduced European species, *impressifrons* Gyllenhall and *sericeus* (Schaller). Four to 5 mm long, it is black with the exception of the testaceous antennae and the dark brown tarsi; the vestiture is sparse, consisting of small, greenish-blue scales and fine, appressed, hair-like, dark setae; the elytra is distinctly mottled or checkered by the scales and the seemingly denuded black spots; the femoral tooth is acute and large; in the male, the pygidium is deeply excavated, rugosely punctured, and has fine setae. The species is figured in Reitter (1916, Fauna Germanica. Die Käfer des Deutschen Reiches, vol. 5, pl. 155. fig. 3.).

Polydrusus cervinus is widely distributed in the Old World, ranging from the British Isles across most of Europe to Siberia. According to Hoffmann (1950, Faune de France, 52, Coléoptères Curculionides, premiere partie, p. 280) the larvae live in the roots of orchard grass, *Dactylis glomerata* L., and the adults feed on the leaves of birch, oak, hazel, and maples. The species is widespread in Europe on *Betula* and is listed in the key to economically important forest pests in Germany by Schimitschel (1937, Schlüssel zur Bestimmung der wichtigsten forstlich schädlichen Käfer. p. 36). The most recent biology is that of Scherf (1964, Die Entwicklungsstadien der mitteleuropäischen Curculioniden (Morphologie, Bionomie, Ökologie), Abh. Senckenb. Naturf. Ges. 506. p. 221).—Rose Ella Warner, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560.*

FOUR NEW SPECIES OF NEOTROPICAL BAETIS
(EPHEMEROPTERA: BAETIDAE)

JAY R. TRAVER,[1] *19 Moorland St., Amherst, Massachusetts 01002*

ABSTRACT—Four new species of *Baetis* are described and figured from Uruguay.

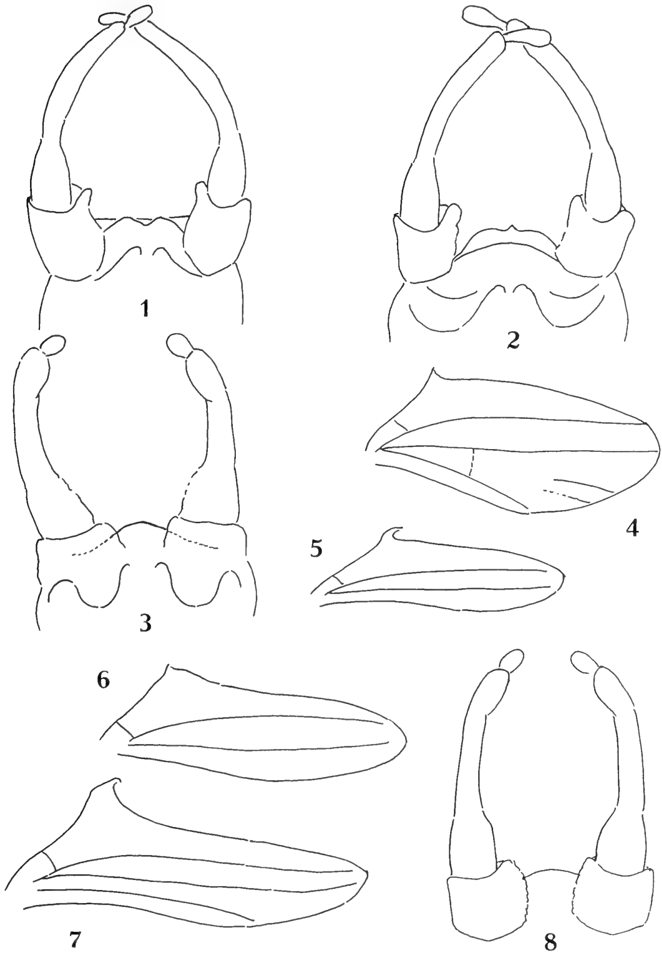
The specimens of *Baetis* described herein were collected in Uruguay by Dr. C. S. Carbonell of the Department of Entomology, Faculty of the Humanities and Sciences of the University of the Republic of Uruguay. Representatives of each species will be placed in the entomological collection of that university.

Baetis aneto, n. sp.
(Figs. 1, 4)

Represented by ♂ and ♀ imagos and subimagos. Costal angulation of hind wing acute but not hooked, 3 longitudinal veins; dark brown dorsal or dorsolateral markings on certain abdominal terga.

Male imago.—Body 4–5 mm.; fore wing 3.5–4 mm. Head pale reddish brown. Scape and pedicel of antenna pale reddish brown, darker at joinings; flagellum yellowish brown. Turbinate eyes yellowish orange; in dorsal view, hemipheroidal (inner margin straight); not contiguous dorsally; on moderate stalks. Pronotum yellowish to pale reddish brown, shaded along postero-median and lateral areas with smoky brown. Meso- and metathorax bright to dark reddish brown; yellowish brown in areas around and preceding wing bases, also on membrane between pro- and mesosterna; metanotal shield brighter reddish brown than other areas. Wings hyaline whitish: both fore and hind wings very narrowly reddish brown at extreme bases, this color continued for a short distance along Sc and Rl of fore wing. Stigmatic cross veins of fore wing 4–5 in number, slanting, a few may be incomplete; some anastomosis; stigmatic area semi-opaque. No marginal intercalaries in Sc space, those in radial space quite short. Costal angulation of hind wing acute; 3 longitudinal veins, 3 shorter than 1 and 2; usually 1, sometimes 2 marginal intercalaries between veins 2 and 3. Hind wing as in fig. 4. Legs yellowish; claws and tarsal joinings dusky. Abdomen yellowish; apical segments shaded with pale reddish brown. Anterior and posterior margins of basal and middle segments (terga and sterna) may be very narrowly darker, on terga principally in dorsal areas; posterior margins of terga 8–10 may be very narrowly darkened. Narrow black hairline, with short lateral extensions on terga and sterna, along pleural fold on basal and middle segments. Terga variously marked with grayish to dark brown patches, some variations of these as noted: (1) wedged-shaped submedian marks on tergum 3 only; (2) squarish blotches open at anterior margin and enclosing a yellow patch, on terga 2 and 3, narrow dark gray posterior margin on tergum 5, crescent-shaped blotch across tergum 6; (3) irregularly shaped dark

[1] Emeritus Professor of Zoology, University of Massachusetts, Amherst, Massachusetts.



Figs. 1–8. 1 and 4, *Baetis aneto*, n. sp.: 1, ♂ genitalia; 4, hind wing. 5 and 8, *B. aymara*, n. sp.; 5, hind wing; 8, ♂ genitalia. 2 and 6, *B. coveloae*, n. sp.; 2, ♂ genitalia; 6, hind wing. 3 and 7, *B. yaro*, n. sp.; 3, ♂ genitalia; 7, hind wing.

brown blotches each side of terga 2, 3 and 6, smaller and more lateral on 4 and 5, plus triangular dark brown blotches at mid-areas on 3 and 6; (4) brown blotches on terga 2 and 3, smaller marks on 3 and 6, these lateral on 2, median on 3 and 6. Other variations also occur. Cerci whitish, not darkened at joinings. Genitalia as in fig. 1.

Female imago.—Body 3.5–4.5 mm.; fore wing 3.75–4.25 mm. Head flesh color to yellowish; may have dark shading between eyes on vertex. Thorax yellowish to flesh color on pleura and venter, pale reddish brown dorsally; mesonotal shield generally narrowly dark-margined; pronotum slightly paler than mesonotum. Wings essentially as in ♂; 4–6 stigmatic cross veins in fore wing, anastomosis very slight. Legs as in ♂. Abdomen (when not filled with ova) yellowish; pleural hairline as in ♂. Tergal markings as variable as in ♂; may be even more extensive or confined to submedian oblique streaks on terga 2 and 3, or on tergum 3 only. Cerci as in ♂.

Holotype, male.—Uruguay, Prov. Salto. Salto Grande, Rio Uruguay; 10–XI–55. C. S. Carbonell, collector. In collection of Department of Entomology, University of Uruguay, Montevideo, Uruguay.

Allotype, female.—Same data as holotype; in private collection of J. R. Traver.

Paratypes, 5♂♂ and 62♀♀ imagos.—Uruguay, Prov. Paysandu; Santa Rita, Rio Uruguay, 8–XI–55; 9♂♂ and 20♀♀.—same data as holotype. Specimens equally divided between Dept. of Entomology, Univ. of Uruguay, and private collection of JRT.

This species is named for a South American Indian tribe. Many other females and subimagos of both sexes taken at the above localities are not included among the paratypes.

South American species described in *Baetis* having 3 veins in the hind wing, none of these veins forked, include *opacus* (1915), *abundans* (1912), and *gloriosus* (1923), all described by Navas; it is now known that all 3 of these are *Callibaetis*, not *Baetis*. *Baetis melleus* Needham and Murphy (1924) is quite unlike *B. aneto* as to hind wing, genitalia and body coloration. From Costa Rica, Navas described *B. sinuosus* (1924); it differs markedly in coloration from *aneto*.

Baetis aymara, n. sp.

(Figs. 5, 8)

Represented by ♂ and ♀ imagos. Costal angulation of hind wing hooked, 2 longitudinal veins only; abdominal terga pale, unmarked.

Male imago.—Body 5 mm.; fore wing 4.5 mm. Head and antennae yellowish. Ocelli black-ringed at base, most prominent on middle ocellus. Turbinate eyes quite large, yellow-orange, in dorsal view somewhat hemispheroidal; on stalks of moderate height. Thorax yellowish to pale reddish brown. Pronotum paler than mesonotum, inconspicuous oblique black submedian streaks from anterior margin; no other distinctive markings on thorax. Mesoscutellum paler than shield, margined narrowly with dusky. Wings whitish, hyaline; stigmatic area of fore wing semi-opaque; no marginal intercalaries in Sc space; 4–6 stigmatic cross veins, somewhat slanting, 1 of these may be incomplete. Hind wing slender, 2 longitudinal veins only; costal angulation hooked, as in fig. 5. Legs yellowish; tarsal segments may be very narrowly darkened at joinings. Abdomen whitish with faint yellowish tinge, apical segments very pale reddish brown, semi-opaque, basal and middle segments translucent. Tiny black stigmatic dots on basal and middle segments, connected along pleural fold by a faint blackish hairline. Terga 9 and 10, and in 1 specimen 7 and 8 also, very narrowly darker on posterior margins. Cerci pale yellowish white, not darker at joinings. Genitalia as in fig. 8.

Female imago.—Body 4 mm.; fore wing 5 mm. Smaller than ♂ but similiarly colored; hind wing similar but more slender.

Holotype, male.—Uruguay, Prov. Treinta y Tres. Quebrada de los Cuervos, 17–XII–52. C. S. Carbonell, collector. In collection of Department of Entomology, University of Uruguay.

Paratypes.—2♂♂ and 1♀ imago; same data as holotype. One ♂ in collection of Department of Entomology, University of Uruguay; others in private collection of J. R. Traver.

This species is named for a South American Indian tribe. The only previously described Neotropical species of *Baetis* known to have only 2 longitudinal veins in the hind wing and a strongly hooked costal angulation on that wing is *B. garcianus* Traver (1938) from Puerto Rico. *B. aymara* lacks the lateral blotches on abdominal terga present in *garcianus*; the genitalia of these 2 species are dissimilar.

Baetis coveloae, n. sp.

(Figs. 2, 6)

Represented by 32♂♂ imagos. Costal angulation of hind wing rather blunt, 2 longitudinal veins only; abdominal terga fawn-color, unmarked; median spine on penis cover.

Male imago.—Body 5 mm.; fore wing 4.5–5.25 mm. Head reddish brown; scape of antenna dark brown, pedicel paler brown, each narrowly darker at joinings; flagellum yellowish. Turbinate eyes orange, narrow dark ring at base of each; oval in dorsal aspect, well separated dorsally; on rather tall stalks. Thorax rather dark reddish brown above and below; metanotum and in some specimens mesonotal area brighter red-brown. Legs yellowish; femora may be slightly brown-tinged; femora and tibiae narrowly darker at joining; tarsi very pale. Wings whitish, hyaline; reddish brown tinge at extreme wing bases; longitudinal veins faintly yellowish; stigmatic area of fore wing opaque; 4–6 slanting stigmatic cross veins often widely spaced, 1 or 2 may be incomplete, 1 may be forked, incomplete anastomosis may be present. In Sc marginal space, 1 or 2 short intercalaries. Hind wing 2-veined, occasionally 1 or more cross veins faintly indicated; costal angulation and adjacent area reminiscent of genus *Dactylobaetis* Traver and Edmunds (1968). See fig. 6. Abdomen fawn-color, pale reddish brown, venter slightly paler than dorsum; apical segments darker, somewhat opaque. Posterior margins of all segments narrowly dark brown, darker on terga than sterna; narrow dark line along pleural fold. Cerci very pale yellowish white, unmarked. Genitalia as in fig. 2.

Holotype, male.—Uruguay, Prov. Maldonado. Cerro Animas, 14–IX–50, C. S. Carbonell, collector. In collection of Department of Entomology, University of Uruguay .

Paratypes.—31 ♂ imagos; all from same locality as holotype. 1 ♂, 13–VIII–50; 3 ♂♂, 16–VII–50; 27 ♂♂, same date as holotype. C. S. Carbonell, collector. Specimens divided equally between Entomological collection of the University of Uruguay and private collection of J. R. Traver.

This species is named in honor of Señora Lucrezia Covelo.

Although the hind wing is very similar to many species of *Dactylobatis*, Traver and Edmunds (1968), this species is placed tentatively in *Baetis* rather than *Dactylobaetis*, since the presence of intercalaries in the Sc space of the fore wing and the spine on the penis cover distinguish it from any species thus far known in *Dactylobaetis*. Immature nymphs of the latter genus are known to occur in Maldonado Province; only the rearing of mature nymphs would determine to which genus the species *coveloae* really belongs.

Baetis yaro, n. sp.
(Figs. 3, 7)

Represented by a single ♂ imago. Costal angulation of hind wing hooked, 3 longitudinal veins; abdominal terga fawn-color, chestnut brown submedian patches on 2–7.

Male imago.—Body 7 mm.; fore wing 7 mm. Head pale reddish brown, flagellum of antenna yellowish. Turbinate eyes orange, oval in dorsal aspect, not quite contiguous dorsally; on rather low stalks. Thorax reddish brown; median dorsal stripe on mesonotum slightly darker than other areas, enclosing a very narrow black streak in posterior half. Meso- and metasterna darker than other parts of sterna. Femora and fore tibia very pale reddish brown, other tibiae and all tarsi yellowish; femoro-tibial joining, tarsal joinings and claws reddish brown. Wings whitish, hyaline. No marginal intercalaries in Sc space of fore wing; about 8 slanting cross veins in opaque stigmatic area, spaced unevenly, 1 of these incomplete, not reaching Sc. Hind wing 3 veined, 3rd vein shortest; costal angulation prominent, hooked at tip, widened at base, as in fig. 7. Abdomen fawn-color, light reddish brown, venter somewhat paler than dorsum, terga 8 and 9 darker than those preceding. Abdominal terga 2–7 with wedge-shaped chestnut brown patches laterally, these largest and most distinct on basal segments, leaving antero-lateral angles paler. Intersegmental areas pale; very narrow black hairline along pleural fold, darkest on basal segments; submedian oblique streaks from anterior margins on sterna 7 and 8, faint indications of shorter streaks from anterior margins laterad of oblique dashes. Cerci pale yellowish white, the 2 basal segments darkened at joinings. Genitalia as in fig. 3.

Holotype, male.—Uruguay, Prov. Maldonado. Cerro Animas, 16–VII–50, C. S. Carbonell, collector. In collection of Department of Entomology, University of Uruguay.

This species is named for an Uruguayan Indian tribe. The hind wing of *B. yaro* is quite similar to that of *B. melleus* Needham and Murphy (1924), and the genitalia of these 2 species are not unlike. The strikingly marked abdomen of *yaro* distinguishes it at once from *B. melleus*, to which species is seems most closely allied.

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OLIGOCARICIS LEA A SYNONYM OF SMICRONYX SCHOENHERR

(Coleoptera: Curculionidae)

Lea (1926, Proc. Linn. Soc. New South Wales 51:327–362) described *Oligocaricis* and the single included species, *O. longirostris*, from two male specimens, of which one, in the R. Helms collection, was from the Behn River in northwestern Australia and the other, in the British Museum, from the Adelaide River in Northern Territory, Australia. In examining the latter specimen at the British Museum, I found that it is quite typical of the genus *Smicronyx* Schoenherr, 1843. It shows the usual external characters of *Smicronyx*, including the fine constriction separating the rostrum from the rest of the head and the small partly connate tarsal claws. It also has the exodont mandibles that I noted (1962, Proc. U.S. Nat. Mus. 113:200) in many species of *Smicronyx*. I have not seen or located the other of Lea's two specimens, but I have also seen nothing in the original description that would indicate a significant difference between the specimens.

In addition to proposing the transfer of *Oligocaricis longirostris* Lea to *Smicronyx*, I am here designating the specimen from the Adelaide River as lectotype of that species. According to the accessions catalog of the British Museum, the specimen was collected at the Adelaide River on August 8–13, 1890 by Mr. J. J. Walker during a cruise of the H.M.S. Penguin. This is the first record of the occurrence of any species of *Smicronyx* in Australia.

I thank the staff of the Department of Entomology, British Museum (Nat. History) for the aid and courtesies extended to me when these observations were made.—D. M. Anderson, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560.*

A REDESCRIPTION OF TESSAROBELUS GUERINI MONTROUSIER

(HOMOPTERA: COCCOIDEA: MARGARODIDAE)

DOUGLASS R. MILLER, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C. 20250*

ABSTRACT—A redescription of the little known margarodid *Tessarobelus guerini* Montrousier is presented along with a key to the genera of the tribe Monophlebulini. A small type of tubular duct is recorded for the first time in the Margarodidae.

Tessarobelus Montrousier has been virtually unknown since it was described from New Caledonia. Morrison (1928) did not see samples of the genus and was unable to include it in his comprehensive study of the family Margarodidae. He suggested, however, that *Tessarobelus* belonged in the tribe Monophlebulini. Recently I have examined several specimens and confirm Morrison's tentative assignment. There are three genera in this tribe, two of which occur in Australia.

The following key is adapted from Morrison (1928).

KEY TO THE GENERA OF THE TRIBE MONOPHLEBULINI
ADULT FEMALES

1. Ventral cicatrices in transverse rows on anterior abdominal segments; anal opening not surrounded by a dense band of short setae 2
   Ventral cicatrices, if present, not forming transverse rows on anterior abdominal segments; anal opening surrounded by a dense band of short setae .... **Nodulicoccus** Morrison

2(1). Some antennal segments fused; tubular trilocular pores absent .... **Tessarobelus** Montrousier
   Antennal segments not fused; tubular trilocular pores present .... **Monophlebulus** Cockerell

Genus **Tessarobelus** Montrousier

Tessarobelus Montrousier, 1864:246. Type-species, *Tessarobelus guerini* Montrousier, orig. desig. and monotypy.

Tessarobelus contains only *T. guerini*. A Panama species, *Monophlebus championi* Cockerell, transferred to *Tessarobelus* by Cockerell (1902a) on the basis of the male, apparently belongs in the tribe Llaveiini (Morrison, 1928) and perhaps even in the genus *Llaveia* Signoret (MacGillivray, 1921).

Diagnosis. Adult female approximately 10 to 20 mm long. Anal tube with unspecialized dermal orifice and polygonal wax pores. Spines, setae, small tubular ducts, trilocular pores, and multilocular pores present on both body surfaces. Cicatrices present over venter except near body margin. Abdominal spiracles in 7 pairs; thoracic and abdominal pairs with pores in atria. Rostrum 2-segmented. Antennae with terminal segments fused.

Fig. 1. *Tessarobelus guerini*, adult ♀: A and F, trilocular pores; B, enlarged section of indicated portion of lateral margin; C, anal tube; D, detail of polygonal wax pores of anal tube; E, enlarged section of indicated portion of dorsum; G, ventral cicatrix; H, enlarged section of indicated portion of venter; I, antenna; J and P, multilocular disk pores; K, thoracic spiracle; L, middle leg; M, claw; N, abdominal spiracle; O, enlarged section of indicated portion of venter; Q, body outline, dorsal and ventral surfaces; R, small tubular duct.

Tessarobelus may be distinguished from all other margarodid genera by the following combination of characters: with apical antennal segments fused, with tubular ducts, without tubular pores.

In addition to *Nodulicoccus* and *Monophlebulus*, *Tessarobelus* resembles *Monophlebidus* Morrison (tribe Monophlebini), but the latter genus lacks the above combination of characters and possesses a 3-segmented rostrum.

The presence of tubular ducts of the type shown in the illustration (fig. 1R) apparently has not been recorded in the Margarodidae. Tubular ducts do occur in genera such as *Matsucoccus* Cockerell, *Pityococcus* McKenzie, and *Desmococcus* McKenzie, but these ducts are very different from those in *Tessarobelus*. Examination of the available material within the subfamily Monophlebinae has revealed that the *Tessarobelus* type of tubular duct also is present in *Aspidoproctus* Newstead, *Monophlebidus* Morrison, *Monophlebulus*, and *Nietnera* Green.

Tessarobelus guerini Montrousier

Tessarobelus guerini Montrousier, 1864:247.
Monophlebus guerini (Montrousier): Cockerell, 1902b:232.

Specimens of *T. guerini* apparently have been examined previously only by Montrousier and Cohic (1958). Though the name has appeared in the literature approximately 15 times, most of the references merely reiterate the original description.

Type Material: Apparently lost.

Field Features: The orange body of the adult female is covered with a white, cottony wax; the legs, antennae, and mouthparts are black. The known stages of the female occur on the foliage.

According to the original description, the red body of the adult male is lightly dusted with a white wax, the antennae are plumose and slightly shorter than the length of the body, the wings are gray and semi-transparent, and there are four fleshy tubercules on the posterior end of the abdomen.

Recognition Characters: Adult female, mounted, 10.8 to 21.0 mm long, 6.4 to 10.8 mm wide. Body elongate oval; anal lobes slightly protruding.

Dorsum densely covered with spines, most abundant near anal opening, those on lateral margins of abdomen longest and with rounded apices. Body setae lightly scattered over surface, longest setae present near anal opening, with single seta of approximately same size present on margin between anterior leg and anterior spiracle. Tubular ducts scattered over entire surface, approximately 4.0 μ long, 2.5 μ wide. Trilocular pores in nearly all areas except along body margin. Multilocular pores present only near anal ring; with 6 to 10 loculi in outside row of pores and 0 to 5 loculi in central hub. Small raised areas each possess cluster of indistinct cellular structures; raised areas present along body margin. Anal ring situated 8 to 12 times its diameter from abdominal apex; anal tube with dermal orifice unmodified; narrow collar of polygonal wax pores present on medial portion of tube; inner apex of tube with 0 to 4 lightly sclerotized rings.

Venter densely covered with spines, more slender and elongate than those on dorsum. Body setae more numerous than on dorsum, most abundant near anal opening. Tubular ducts less numerous and larger than on dorsum (approximately 7.5 μ long, 5.0 μ wide), most abundant on abdominal segment IX and along lateral margins. Trilocular pores present from abdominal segment V or IV through head. Multilocular pores present from abdominal segment IX through IV, with a few present on head. Raised areas present along body margin. Cicatrices present in transverse rows over entire venter except along body margin. Abdominal spiracles in 7 pairs, each spiracle with apical portion constricted and with complete band of multilocular pores in atrium. Thoracic spiracles with large cluster of multilocular pores in each atrium. Legs robust, densely matted with setae; digitules not extending to tip of claw. Antennae 3-segmented, third segment formed from fused 6 to 8 apical "segments." Rostrum 2-segmented.

Third instar female similar to adult except tubular ducts absent, multilocular pores less numerous, third antennal segment composed of fused 5 to 6 apical "segment."

According to Cohic (1958) and Matile-Ferrero (personal communication) the type material of *T. guerini* has been lost.

I feel confident that the specimens examined are *T. guerini.* Some specimens seen were collected on the host of Montrousier's type specimens; also, the species described above is the only monophlebine margarodid known from New Caledonia where it is widely dispersed and relatively common. The species agrees well with Montrousier's original description with one exception. Montrousier states that the antennae are 10-segmented in the female and at least 16-segmented in the male. In available specimens, the antennae of adult females possesses only 3 distinct segments. However, it is impossible to determine the true segmentation without carefully examining the antennae under a microscope. Although I have been unable to examine males, it has been stated by Morrison (1928) that the antennae of margarodids are not more than 13-segmented. Therefore, it is probable that the original description of *T. guerini* is inaccurate in regard to the number of antennal segments.

Specimens Examined: New Caledonia—Amieu Pass Cascade, XII–20–67, on "wild rainy forest tree," P. Cochereau (17 ad. ♀♀); Ponerihouen, X–6–69, on *Jambosa pseudomalaccensis* (Myrtaceae), P. Cochereau (11 ad. ♀♀); Ouegoa, V–?–58, on *Melaleuca leucadendron* (Myrtaceae), F. Cohic (1 third instar ♀♀).

Specimens are being deposited in the collections of the British Museum (Natural History), London; Institut Francais d'Oceanie, Noumea, New Caledonia; Museum National d'Histoire Naturelle, Paris; University of California, Davis; University of California, Riverside; Virginia Polytechnic Institute, Blacksburg; Zoological Institute, Academy of Sciences of USSR, Leningrad; the U.S. National Museum, Washington.

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THE NEARCTIC SPECIES OF HORISMENUS WALKER

(HYMENOPTERA: EULOPHIDAE)

B. D. BURKS, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—A redefinition of the genus *Horismenus* Walker, with a key to the Nearctic species. Several species of this genus are primary parasites of bruchid beetles and others are primary or secondary parasites of Lepidoptera. Other species parasitize curculionid larvae, buprestid or cerambycid larvae, or Diptera living in grass stems. Two species are secondary parasites in the egg cases of spiders. *H.* **bruchophagus**, **carolinensis**, **ignotus**, **latrodecti** n. spp.; (*euplectri* Howard) = *fraternus* (Fitch), (*violacea* Ashmead) = *fraternus* (Fitch), (*ancylae* Girault) = *microgaster* (Ashmead), (*flavipes* Ashmead) = *sardus* (Walker) n. syn.; *Galeopsomyia haemon* (Walker) n. comb. for *Horismenus haemon*.

The Nearctic species of the genus *Horismenus* Walker have never before been revised, although this is a genus of common eulophid parasites in North America. *Horismenus*, *Pediobius*, and *Tetrastichus* are

[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

probably the three most commonly encountered eulophid chalcidoids in the Nearctic region; the latter two genera have already been revised (Burks, 1966, 1943).

The biological relationships of the species of *Horismenus* are rather diverse. Specimens are often reared as primary or secondary parasites of small Lepidoptera, or as primary parasites of Coleoptera belonging to the families Bruchidae or Curculionidae. They are extremely common parasites of bruchids. One Nearctic species of *Horismenus* is a probable secondary parasite of the larvae of round-headed and flat-headed wood-boring beetles. Another species emerges from small Diptera living in the stems of grasses. Two Nearctic species are secondary parasites in the egg cases of spiders.

I am greatly indebted to Dr. G. J. Kerrich, Commonwealth Institute of Entomology, London, for sending me detailed information about *Horismenus cleodora* Walker, the type-species of *Horismenus*. The single type specimen of *cleodora*, from Lima, Perú, is in the British Museum (Natural History) collections and was presented by C. Darwin, Esq. I also am grateful to the authorities of the British Museum (Natural History) for making it possible for me to study the type of *Entedon sardus* Walker.

Horismenus Walker

Horismenus Walker, 1843, Ann. Mag. Nat. Hist. 11:117.—Ashmead, 1904, Mem. Carnegie Mus. 1(4):341.—Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 432.—Crawford, 1911, Proc. U.S. Natl. Mus. 40:445.—Girault, 1913, Mem. Queensland Mus. 2:152.—Girault, 1915, Can. Ent. 47:234.—Viereck, 1916, Conn. Geol. Nat. Hist. Sur. Bull. 22, p. 456.—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Nikolskaya, 1952, Chalcid Fauna USSR, Akad. Nauk USSR, Fauna USSR 44, p. 268.—Bouček *in* Kratochvíl, 1957, Klič Zvířeny ČSR, 2:277.—Peck, 1963, Can. Ent. Suppl. 30:217.—Bouček and Hoffer (trans. Peck), 1964, Mem. Ent. Soc. Can. 34:103.—Bouček, 1965, Acta Ent. Mus. Nat. Prag. 36:84. Type-species: *Horismenus cleodora* Walker; monotypic.

Pseudomphale Schrottky, 1909, Ann. Soc. Cient. Arg. 67:209.—Girault, 1915, Can. Ent. 47:234 (syn. of *Horismenus*). Type-species: *Pseudomphale opsiphanis* Schrottky; monotypic.

Pediobioidea Girault, 1911, Can. Ent. 43:407 (syn. under *Horismenus* when descr.). Type-species: *Pediobioidea cyanea* Girault; monotypic.

Triolynx Cameron, 1913, Timehri, Jour. R. Agr. Com. Soc. Brit. Guiana 3:130.—Bouček, 1965, Acta Ent. Mus. Nat. Prag. 36:84 (syn. of *Horismenus*). Type-species: *Triolynx clavicornis* Cameron; monotypic.

Akonda Cameron, 1913, Timehri, Jour. R. Agr. Com. Soc. Brit. Guiana 3:131.—Bouček, 1965, Acta Ent. Mus. Nat. Prag. 36:84 (syn. of *Horismenus*). Type-species: *Akonda hipparchia* Cameron; monotypic.

Dirphiphagus Brèthes, 1917, Ann. Zool. Apl. 4:25. **New synonymy.** Type-species: *Dirphiphagus ancilla* Brèthes; orig. desig.

Holcopeltomorpha Blanchard, 1942, Ann. Soc. Cient. Arg. 134:126.—Bouček, 1965, Acta Ent. Mus. Nat. Prag. 36:84 (syn. of *Horismenus*). Type-species: *Holcopeltomorpha christenseni* Blanchard; orig. desig.

In the literature the genus *Holcopelte* Foerster, 1856, has long been listed as a synonym of *Horismenus* (see Ashmead, 1904, p. 377; Peck, 1951, p. 467, and numerous other authors). As Graham, 1959, and Bouček, 1965, have pointed out, however, this is a mistake. *Holcopelte* differs generically from *Horismenus* in having the occiput sharply carinate and in having a scutellum that lacks lateral carinate.

The name *Horismenus* itself spent most of the last century in synonymy. Three years after he described it, Walker (1846, p. 66) synonymized it under *Entedon* Dalman. Subsequent authors left it in synonymy until Ashmead (1904) resurrected it and employed it as a valid genus. Cresson (1887, p. 344) listed *Horismenus* as a synonym of *Euderus* Haliday, but that almost certainly was an error in citation.

Generic description.—Head with a prominent transverse frontal carina, parascrobal areas always sculptured; eyes large and more or less hairy; malar furrow absent, malar space and cheeks narrow, temples narrow; occiput not margined; antennae inserted below center of frons, at or slightly above level of ventral margins of compound eyes; scape short, its apex never exceeding level of anterior ocellus; female with 3 funicular segments, male with 4, club with 2 segments and an apical spicule in both sexes.

Anterior margin of pronotum dorsally carinate, this carina sometimes weak or interrupted; notaulices complete, often weak anteriorly, terminating posteriorly in a pair of vaguely defined, elongate depressions, each depression bearing a single strong bristle; prepectus large, triangular; scutellum with a median longitudinal carina, a pair of lateral carinae (these formed from series of more or less coalesced punctures), and an apical carina (the latter may or may not be interrupted on the meson); postscutellum prominent, usually sculptured near base, smooth at apex; forewing with marginal vein very long, submarginal vein short, stigmal vein budlike, sessile, postmarginal vein very short, its apex vaguely defined; hindwing with 3 hamuli; each tarsus with 4 segments, these may be subequal in length or the apical one may be slightly the longest.

Propodeum with a pair of circular or slitlike spiracles, paraspiracular carinae present or absent; a narrow, longitudinal smooth area present on meson of propodeum in almost all species, this smooth area bordered on each side by a narrow shagreened area; apex of scutellum necklike, surface of this neck sculptured, rest of propodeum smooth and shining except for a pair of small shagreened areas at anterior margin between meson and spiracles that is present in some species. Petiole stout, its surface sculptured, a median, longitudinal, dorsal carina usually present. Gaster dorsally smooth and shining, usually with narrow shagreened areas near posterior margins of terga, lateral and ventral areas of gaster with lineolate, longitudinal sculpture; first gastral tergum comprising a large part of the gaster, often comprising ½ or more its extent.

Body heavily sclerotized and deeply punctured, typically compact and beetle-like. Heads and bodies having no tendency to shrink or collapse in drying after death.

Horismenus, Key to Nearctic Species, Females

1. Hind tibiae partly or mostly dark 2
   Hind tibiae entirely pale yellow or white 5
2. Scutellum uniformly sculptured over all its surface with a sculpturing that is almost as strong as that of the praescutum .... **lixivorus** (Crawford)
   Scutellum very faintly sculptured or smooth and shining over most of its surface; strong sculpture, if present, limited to lateral areas 3
3. First gastral tergum entirely smooth or with extremely faint apical sculpture .... **latrodecti**, n. sp.
   First gastral tergum with strong apical sculpturing 4
4. First gastral tergum with apical ⅔ sculptured; hind tibia dark only at base .... **microgaster** (Ashmead)
   First gastral tergum with a narrow cross-band of sculpturing near apex, otherwise smooth; hind tibia with basal ½ to ⅔ dark .... **carolinensis**, n. sp.
5. Hind femora black or dark with metallic luster 6
   Hind femora entirely pale yellow or white 7
6. First gastral tergum constituting more than ½ the length of gaster; hind femur with dusky, non-metallic shading .... **floridanus** (Ashmead)
   First gastral tergum constituting ½ or less the length of gaster; hind femur with very dark, metallic blue or blue-green shading .... **texanus** (Girault)
7. Scutellum flattened and in the same plane as the propodeum; scutellar sculpture faint; general color dark metallic green .... **depressus** Gahan
   Not as above; scutellum not flattened and in the same plane as the propodeum 8
8. Face and median area of propodeum reticulated .... **ignotus**, n. sp.
   Face, at least in median area, smooth and shining; narrow, elongate area on meson of propodeum smooth and shining 9
9. Basal gastral tergum constituting ¾ or more dorsal length of gaster; apical ⅔ of basal gastral tergum sculptured 10
   Basal gastral tergum constituting less than ¾ the dorsal length of gaster 11
10. Thorax bright metallic green .... **missouriensis** (Ashmead)
    Thorax black, sometimes with a faint blue tinge .... **bruchophagus**, n. sp.
11. Head, thorax, and gaster bright metallic blue-green; basal gastral tergum smooth except for a narrow, reticulate crossband just before apex .... **fraternus** (Fitch)
    Head, thorax, and gaster shining black, or head and thorax metallic green with gaster mostly shining black and apical half of basal gastral tergum sculptured 12
12. Head and thorax metallic green, gaster mostly shining black; apical half of basal gastral tergum sculptured .... **productus** (Ashmead)
    Head, thorax, and gaster shining black; less than apical half of basal gastral tergum sculptured 13
13. Antennal scape dark brown to black .... **atroscapus** (Girault)
    Antennal scape pale yellow to white 14

14. Scutellum strongly sculptured and lateral groove formed from single row of punctures .... **nitens** (Howard)
    Scutellum weakly sculptured, almost smooth and with multiple crenulate grooves at lateral margins .... **sardus** (Walker)

Horismenus atroscapus (Girault)

Pseudomphale atroscapus Girault, 1917, Descr. Stell. Nov., p. 20.
Horismenus atroscapus (Girault): Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Peck, 1963, Can. Ent. Suppl. 30, p. 217.

Described from 2 female specimens. Lectotype ♀, U.S.N.M. catalog no. 20105, labeled, "Bred from *T. subcanalis* Wlk., 31–VIII–1915, Monticello, Fla., 20–VIII–15, Quaintance No. 10566, Al. Fabis collector." Present designation of lectotype.

Distribution.—N. C., Fla.

This seems to be a primary parasite of the small pyralids, *Tetralopha subcanalis* (Walker) and *Acrobasis rubrifasciella* (Packard). It is likely that it also will be found to parasitize other pyralids.

Horismenus bruchophagus, n. sp.

This species agrees with *missouriensis* Ashmead in having the legs beyond the coxae entirely pale yellow or white, in not having the scutellum flattened, and in having the basal gastral tergum sculptured over its apical ⅔ with this tergum comprising ¾ the length of the gaster; they differ in that *missouriensis* has the thorax bright metallic green, but the thorax of this species is shining, jet black, with a faint blue tinge sometimes visible, and in *missouriensis* the sculpture on the vertex is much finer than on the parascrobal spaces, but the sculpture is equally coarse on these two areas in *bruchophagus*.

Female.—Length, 1.6–2.0 mm. Frons faintly metallic blue, otherwise head and body shining, jet black with a faint blue tinge sometimes visible; antennal scapes and legs beyond coxae light yellow or white, antennal flagellum with faint metallic blue sheen; wing veins brown.

Face and genae smooth, shining; parascrobal area below frontal groove strongly shagreened, narrow area on meson of vertex smooth, shagreened laterally, occiput shagreened; temples smooth ventrally, lightly reticulated dorsally. Eyes rather sparsely hairy. Apex of antennal scape surpassing frontal groove, but not reaching level of anterior ocellus; relative proportionate lengths of parts of antenna—pedicel, 60; first funicular segment, 60; second, 50; third, 50; club, 100.

Praescutum and scutum strongly sculptured, axillae weakly sculptured, scutellum shining, with very weak sculpture; lateral and apical margins of scutellum formed by rows of punctures, apical margin interrupted on meson; postscutellum smooth and shining, sculptured areas at base more or less hidden. Propleuron and anterior part of mesopleuron sculptured, rest of mesopleuron smooth and shining; coxae faintly sculptured with irregular striae.

Propodeum lying on a plane parallel to horizontal axis of body; narrow median area and anterior half of lateral area smooth; circular area near each anterolateral angle, narrow, elongate area on each side of median smooth area, and posterior half of lateral area, reticulated. Petiole vertical, only slightly longer than broad, a median, dorsal, longitudinal carina present; surface of petiole minutely and closely reticulated. Gaster normally slightly shorter than thorax, but posterior terga may be distended; apex acute; basal gastral tergum sculptured over its apical ⅔ and this tergum comprising ¾ the length of the gaster.

Male.—Length, 1.2–1.8 mm. Frons, genae, and vertex bright metallic blue, coxae with faint metallic blue sheen, otherwise head and body shining, jet black; legs beyond coxae pale yellow or white; entire antenna brown with metallic blue luster. Antennal scape greatly inflated, its apex just surpassing level of frontal groove; relative proportionate lengths of parts of antenna—pedicel, 50; first funicular segment 50; second, 50; third, 50; fourth, 50; club, 70; face faintly reticulated; petiole 1½ times as long as wide; gaster ⅔ as long as thorax, basal gastral tergum normally comprising the entire gaster, with apical terga withdrawn beneath it and only genitalia protruding.

Type locality.—Brownsville, Texas.

Type.—U.S.N.M. catalog no. 70847.

Described from 211 female and 53 male specimens, as follows. Holotype (♀), allotype (♂), and 192 paratypes (148♀, 44♂), reared at Brownsville, Texas, in 1921 from seeds of *Acacia tortosa* infested by the bruchid *Mimosestes sallaei* (Sharp) by J. C. Bridwell; 62♀, 7♂ paratypes, reared at Kingsville, Texas, May 1923, from beans of huisache [*Acacia*], by M. M. High; 2♀ paratypes, reared at Victoria, Texas, Sept. 6, 1907, possibly from *Mimosestes sallaei*, under Hunter number 1410.

Biological relationships.—This species is a primary parasite of bruchids infesting the seeds of acacias.

Horismenus carolinensis, n. sp.

Horismenus sp., Leiby, 1925, Bull. N. C. Dept. Agr., Feb., p. 60.
Horismenus n. sp., Beal and Massey, 1942, Jour. For. 40:318.

This species agrees with *lixivorus* Crawford in having dark colored legs, in having the antennal scape dark, and in having the basal gastral tergum provided with strong apical sculpturing. It differs from *lixivorus* in having the scutellum almost smooth, very faintly sculptured, rather than strongly sculptured, in having the funicular segments slender, longer than wide, rather than slightly wider than long, and in having the vertex black rather than metallic green.

Female.—Length, 1.8–2.2 mm. Black, without metallic luster; apices of femora, bases and apices of tibiae, and basal tarsal segments, white, legs otherwise very dark brown to black; wing veins dark brown.

Face and genae smooth and shining; parascrobal areas below transverse frontal groove shagreened; vertex shining, faintly reticulated; occiput and temples reticulated. Eyes densely hairy. Apex of antennal scape almost reaching level of anterior ocellus, surpassing level of frontal groove; relative proportionate lengths of parts of antenna—pedicel, 60; first funicular segment, 50; second, 40; third, 30; club, 70.

Praescutum and scutum reticulated, axillae very faintly sculptured, almost smooth; scutellum smooth medially, faintly sculptured laterally; lateral grooves of scutellum formed of elongate punctures, apical groove crenulate near lateral margins, obsolete on meson; postscutellum with a pair of elongate submedian, shagreened areas at base, apex smooth and shining; propleuron reticulated, mesopleuron smooth and shining; hind coxae faintly reticulated.

Propodeum smooth laterally and on narrow median area, the latter with a shagreened area on each side, apical third of propodeum shagreened. Petiole vertical, as wide as long, its surface closely and minutely sculptured; median, dorsal, longitudinal carina present on petiole. Gaster slightly longer than thorax, its apex acute; basal gastral tergum with a narrow band of strong sculpturing near its posterior margin, this tergum comprising ½ the length of gaster.

Male.—Length, 1.5–2.0 mm. Apex of antennal scape almost reaching level of anterior ocellus; relative proportionate lengths of parts of antenna—pedicel, 50; first funicular segment, 70; second, 40; third, 40; fourth, 40; club, 80, petiole 1½ times as long as wide; gaster ⅔ as long as thorax; basal gastral tergum reticulated near apex and this tergum comprising almost all of gaster.

Type locality.—Lake Waccamaw, North Carolina.

Types.—U.S.N.M. catalog no. 70845.

Described from 5 female and 4 male specimens. Holotype (♀), allotype (♂), and 1♂ paratype, Lake Waccamaw, North Carolina, reared April 23, 1917, from larva of the flat-head appletree borer, *Chrysobothris femorata* (Olivier); 4♀, 2♂ paratypes, Durham, North Carolina, reared from the twig girdler, *Oncideres cingulata* (Say).

Biological relationships.—Although the specimens from which this species is described are labeled as having been reared directly from a buprestid beetle and a cerambycid beetle, it is likely that this is actually a secondary parasite.

Horismenus depressus Gahan

Horismenus depressus Gahan, 1930, Proc. U.S.N.M. 77(8):8.—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Peck, 1963, Can. Ent. Suppl. 30, p. 217.

Described from 18 female and male specimens; type (♀), U.S.N.M. no. 41101.

Distribution.—Tex., Calif.

This is a primary parasite of the bruchid *Stator pruininus* (Horn), infesting the seeds of *Acacia* and Mexican ironwood, *Olneya.* It has also been reared from a "*Bruchus* sp." in *Acacia* seeds in South Texas.

Horismenus floridanus (Ashmead)

Holcopelte floridana Ashmead, 1888, Can. Ent. 20:102.—Dalla Torre, 1898, Cat. Hym. 5:28.

Horismenus floridanus (Ashmead): Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 432.—Gahan, 1933, U.S. Dept. Agr. Misc. Pub. 174, p. 128.—Gilmore, 1938, Jour. Econ. Ent. 31:715.—Fulton, 1940, Ann. Ent. Soc. Amer. 32:233.—Brimley, 1942, Ins. N. C. Suppl., p. 34.—Nickels, 1951, Jour. Econ. Ent. 44:434.—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Painter, 1955, Jour. Econ. Ent. 48:41.—Burks *in* Krombein *et al.*, 1958, U.S. Dept. Agr. Monog. 2, Suppl. 1, p. 68.—Peck, 1963, Can. Ent. Suppl. 30, p. 218.

Described from a single female specimen; type U.S.N.M. no. 41371.

Distribution.—From N. J. west to Ind., Ill., and Kans., south to Fla. and Tex.

This is a secondary parasite of Lepidoptera. It is known to attack *Apanteles*, but it probably also attacks other primary parasites.

Horismenus fraternus (Fitch)

Trichogramma? *fraterna* Fitch, 1856, Country Gentleman 7:235.—Fitch, 1856, Trans. N.Y. State Agr. Soc. 15:449.—Fitch, 1856, Rpt. Nox. Ins. N.Y., p. 217. —Howard, 1885, U.S. Dept. Agr. Div. Ent. Bull. 5, p. 47.—Lintner, 1886, Rpt. Inj. Ins. N.Y., 2, p. 79.—Cresson, 1887, Synopsis Hym. Amer. N. of Mex., p. 246.—Riley, 1888, U.S. Dept. Agr. Div. Ent. Bull. 10, p. 34.—Packard, 1890, U.S. Dept. Agr. Rpt. Ent. Com. 5, p. 265.—Dalla Torre, 1898, Cat. Hym. 5:3 (*fraternum*).—Girault, 1907, Psyche 14:33.—Schmiedeknecht, 1909, Gen. Ins. fasc. 97, p. 485 (*fraternum*).—Girault, 1912, Bull. Wis. Nat. Hist. Soc. 10:96.

Holcopelte fraterna (Fitch): Ashmead *in* Smith, 1900, Ins. N.J., p. 560.

Horismenus fraternus (Fitch): Viereck *in* Smith, 1910, Ins. N.J., p. 641.—Viereck, 1916, Conn. State Geol. Nat. Hist. Sur. Bull. 22, p. 458.—Dunnam, 1924, Iowa Agr. Expt. Sta. Bull. 220, p. 65.—Doner, 1936, Ann. Ent. Soc. Amer. 29: 234.—Copenhafer and Parker, 1938, Jour. Kans. Ent. Soc. 11:46.—Glick, 1939, U.S. Dept. Agr. Tech. Bull. 673, p. 48.—Nickels, 1948, Jour. Econ. Ent. 41: 114.—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Peck, 1963, Can. Ent. Suppl. 30, p. 218.

Elachistus euplectri Howard *in* Riley, 1885, U.S. Dept. Agr. Rpt. 4, Ent. Com., Appendix, p. 108.—Cresson, 1887, Synopsis Hym. Amer. N. of Mex., p. 243.—Dalla Torre, 1898, Cat. Hym. 5:78. —Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 394 (*Elachertus*). **New synonymy**.

Holcopelte euplectri (Howard): Ashmead, 1894, Trans. Amer. Ent. Soc. 21:342. —Ashmead *in* Smith, 1900, Ins. N.J., p. 560.—Schulz, 1906, Spol. Hym., p. 143.

Horismenus euplectri (Howard): Viereck, 1916, Conn. State Geol. Nat. Hist. Sur. Bull. 22, p. 458.—Britton, 1938, Conn. State Geol. Nat. Hist. Sur. Bull. 60, p. 144.—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Peck, 1963, Can. Ent. Suppl. 30, p. 217.

Holcopelte violacea Ashmead, 1887, Trans. Amer. Ent. Soc. 14:200.—Dalla Torre, Cat. Hym. 5:29.—Bridwell, 1899, Trans. Kans. Acad. Sci. 16:206. **New synonymy.**

Horismenus violaceus (Ashmead): Marshall and Musgrave, 1937, Can. Ent. 69: 101.—Nickels, 1948, Jour. Econ. Ent. 41:114.—Beckham *et al.*, 1950, Va. Agr. Expt. Sta. Tech. Bull. 114, p. 12—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 468.—Schaffner, 1959, U.S. Dept Agr. Misc. Pub. 767, p. 85. —Peck, 1963, Can. Ent. Suppl. 30, p. 223.—Burks *in* Krombein and Burks, 1967, U.S. Dept. Agr. Monog. 2, Suppl. 2, p. 234.

Trichogramma? *fraterna* Fitch was described from an unknown number of specimens. A single female type specimen is now preserved in the U.S.N.M. collection. This is labeled, "5837, Fitch's Type, From Fitch's Collection, Type No. 1837 U.S.N.M. Trichogramma? Westwood, fraterna, Fitch, New York." This specimen should be considered to be the lectotype if other type specimens are discovered elsewhere. *E. euplectri* Howard was described from 2 specimens. Lectotype (♀), 41374 U.S.N.M., labeled, "2395°, *Elachistus euplectri* Howard ♀ E. A. S. coll." Present designation of lectotype. *H. violacea* Ashmead was described from 3 specimens. Lectotype female, 41372 U.S.N.M., labeled, "Jacksonville, Fla., Holcopelte violacea Ashm." Present designation of lectotype.

Distribution.—Conn. south to Fla. west to Wis., Iowa, Kans., and Tex.

This is principally a secondary parasite of Lepidoptera, attacking braconid and chalcidoid primary parasites. It also has been reared, however, as a primary parasite from lepidopterous leafminers and other minute lepidopterous hosts.

Horismenus ignotus, n. sp.

Horismenus n. sp., Creighton, 1937, Jour. Econ. Ent. 30:595.

This species differs from all others in this genus in North America in having both the face and the median area of the propodeum sculptured rather than smooth and shining. It resembles *productus* Ashmead in having the legs beyond the coxae light yellow or white and in having an elongate, slender gaster.

Female.—Length, 2.0–2.5 mm. Shining black, sometimes with a metallic red-bronze luster on head, thoracic dorsum, propodeum, and basal gastral tergum; legs beyond coxae pale yellow or white; antennae and wing veins pale yellow. Body hairs noticeably long, legs hairy.

Face reticulated, genae smooth; parascrobal areas below frontal groove minutely reticulated; vertex minutely roughened, occiput more strongly so; temples smooth. Eyes with dense, short hair. Apex of antennal scape just surpassing frontal groove; relative proportionate lengths of parts of antenna—pedicel, 70; first funicular segment, 60; second, 50; third, 50; club, 100.

Entire thoracic dorsum shining, but faintly reticulated; lateral and apical margins of scutellum somewhat irregular and poorly defined, formed of rows of flattened punctures; postscutellum with a pair of elongate, submedian, shagreened areas at base, apex smooth and shining. Propleuron, prepectus, and area of mesopleuron ventral to base of forewing sculptured, rest of mesopleuron smooth; coxae minutely sculptured.

Propodeum lacking the usual narrow, smooth, longitudinal area, a rather broad, sculptured median area present instead, this limited laterally by a pair of parenthesis-shaped carinae; a pair of large, shagreened areas at anterior margin of propodeum, between median figure and spiracles; posterior neck of propodeum also shagreened, elsewhere propodeum smooth and shining; spiracles minute, round; paraspiracular carinae wanting. Petiole wider than long, lacking the median, dorsal, longitudinal carina; surface of petiole closely and minutely reticulated. Gaster slender, elongate, its length slightly greater than that of thorax and propodeum;

first gastral tergum comprising ½ the dorsal length of gaster; posterior ⅓ of first gastral tergum sculptured on dorsum.

Male.—Unknown.

Type locality.—Gainesville, Florida.

Type.—U.S.N.M. catalog no. 70846.

Described from 51 female specimens. Type and 3 paratypes, Gainesville, Florida, reared from material of the palm leaf skeletonizer, *Homaledra sabalella* (Chambers), G. L. Creighton; 34 paratypes, Orlando, Florida, reared May 2, 1914, from *Homaledra sabalella* on *Thrinax*; 13 paratypes, Hammond, Louisiana, reared June 11, 1923, by H. F. Cassell, possibly from *Homaledra sabalella*.

Biological relationships.—This may be a primary parasite of the larva of the palm leaf skeletonizer, *Homaledra sabalella* (Chambers).

Horismenus latrodecti, n. sp.

This species agrees with *lixivorus* Crawford in having the legs and the antennal scape dark and in having the funicular segments broad, slightly wider than long. They differ in that this species has the scutellum mostly smooth, rather than strongly reticulated, and the basal gastral tergum of this species comprises ½ the gaster, while it comprises only ⅓ of it in *lixivorus*.

Female.—Length, 1.5–1.8 mm. Shining black, without metallic luster; antennae brown; apices of femora, bases and apices of tibiae, and basal segments of tarsi white, legs otherwise dark brown to black; wing veins brown.

Face and genae smooth and shining; parascrobal areas below frontal groove shagreened; vertex reticulated, occiput and temples shagreened. Eyes densely hairy. Apex of antennal scape not quite reaching level of vertex; relative proportionate lengths of parts of antenna—pedicel, 50; first funicular segment, 30; second, 30; third, 30; club, 70.

Praescutum, scutum, and axillae lightly sculptured, scutellum smooth and shining in median area, very faintly reticulated at lateral margins; lateral and apical scutellar grooves minutely crenulate; postscutellum with a pair of elongate, submedian, shagreened areas at base, apex smooth and shining, propleuron reticulated, mesopleuron smooth and shining. All coxae smooth.

Propodeum smooth laterally and on narrow, elongate median area, the latter surrounded by a narrow shagreened area, this extending posteriorly to encircle apical neck of propodeum; propodeal spiracles small, oval, paraspiracular carinae present, but poorly defined anteriorly. Petiole as broad as long, its surface minutely shagreened. Gaster as long as thorax, its apex acute; basal gastral tergum lightly sculptured apically and comprising basal ½ of gaster; apical terga more heavily sculptured than basal one and clothed with conspicuously white, short bristles.

Male.—Length, 0.7–1.3 mm. Apex of antennal scape just reaching level of vertex; relative proportionate lengths of parts of antenna—pedicel, 40; first funicular segment, 30; second, 30; third, 30; fourth, 30; club, 50; petiole 1½ times as long as wide; gaster ⅔ as long as thorax, basal gastral tergum very faintly or not at all sculptured at apex and comprising from ¾ to 9/10 of the gaster.

Type locality.—Uvalde, Texas.

Types.—Holotype (♀) and paratypes, U.S.N.M. catalog no. 70844.

Described from 22 female and 9 male specimens reared at Uvalde, Texas, September 12, 1941, from an egg sac of the black widow spider, *Latrodectus mactans* (Fabricius), by H. M. Brundrett.

Biological relationships.—This is a secondary parasite. The egg sac from which the *Horismenus* specimens emerged contains puparia of chloropid flies that show emergence holes of parasites. The chloropid was undoubtedly the primary parasite; it probably was *Pseudogaurax signatus* (Loew).

Horismenus lixivorus (Crawford)

Horisemus lixivorus Crawford, 1907, Jour. N.Y. Ent. Soc. 15:180.

Horismenus lixivorus (Crawford): Pierce, 1908, Jour. Econ. Ent. 1:385.—Pierce, 1910, Jour. Econ. Ent. 3:453.—Mitchell and Pierce, 1911, Proc. Ent. Soc. Wash. 13:51.—Pierce *et al.*, 1912, U.S. Dept. Agr. Bur. Ent. Bull. 100, p. 75.—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Peck, 1963, Can. Ent. Suppl. 30, p. 219.—Burks *in* Krombein and Burks, 1967, U.S. Dept. Agr. Monog. 2, Suppl. 2, p. 234.

When he described this species, Crawford undoubtedly spelled the generic name *Horismenus* as *Horisemus* only in error. The fact, however, that he used that spelling along with the description of a valid species must, unfortunately, make *Horisemus* a published name, unavailable for use again elsewhere in Zoological nomenclature. Neave (1939) lists *Horisemus* Crawford, 1907, in vol. II of Nomenclator Zoologicus as a published generic name.

H. lixivorus was described from an unstated number of male and female specimens. There are now 5 type specimens in the U.S.N.M. Collection. Lectotype (♀), U.S.N.M. 10046, labeled, "Hunter No. 1082, Par. *Lixus musculus*, P. 1906, p. V.11.a 10/16, Dallas, Tx., X.2.06." Present designation of lectotype.

Distribution.—Tex., Ariz.

This is a primary parasite of curculionid beetles. It has been reared from *Lixus perforatus* LeConte, *L. musculus* Say, and *L. scrobicollis* Boheman. Mitchell and Pierce, 1911, *loc. cit.*, have also recorded this species from *Cylindrocopturus*, but I have not been able to locate the material on which that record was based. Published records of this species from a lepidopterous leafminer (Proctor, 1938, and a later edition) are based on a misidentification.

Horismenus microgaster (Ashmead)

Holcopelte microgaster Ashmead, 1888, Can. Ent. 20:102.—Dalla Torre, 1898, Cat. Hym. 5:28.

Horismenus microgastri (!) Burgess, 1906, Ohio Dept. Agr. Div. N. and O. I., Ann. Rpt. 4, p. 14.—Cotton, 1906, Ohio Dept. Agr., Div. N. and O. I., Bull. 7, p. 51.—Washburn, 1906, U.S. Dept. Agr. Bur. Ent. Bull. 60, p. 73.—Howard and Chittenden, 1907, U.S. Dept. Agr. Bur. Ent. Cir. 96, p. 5.—Howard and Chittenden, 1916, U.S. Dept. Agr. F. Bull. 705, p. 5.

Horismenus microgaster (Ashmead): Crawford, 1907, Jour. N.Y. Ent. Soc. 15: 180.—Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 433.—Girault, 1911, Can. Ent. 43:407. —Proper, 1934, Jour. Agr. Res. 48:365.—Langford, 1937, Jour. Econ. Ent. 30:322.—Bissell, 1938, Jour. Econ. Ent. 31:536.—Procter, 1938, Biol. Surv. Mt. Des. Reg., p. 429.—Reinhart, 1938, Tex. Agr. Expt. Sta. Bull. 559, p. 31.—Summerland, 1938, Trans. Kans. Acad. Sci. 40:167.—Parker and Lamerson, 1939, Verh. VII Int. Cong. Ent. 4:2384.—Gould and Geissler, 1940, Jour. Econ. Ent. 33:815.—Schread *et al.*, Conn. Agr. Expt. Sta. Bull. 461, p. 492.—Whitcomb *et al.*, 1943, Mass. Agr. Expt. Sta. Bull. 409, p. 8.—Procter, 1946, Biol. Surv. Mt. Des. Reg., p. 490.—Peck *in* Muesebeck, *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Beal, 1952, Duke Univ. For. Bull. 14, p. 29.—Hill and Hough, 1957, Va. Agr. Expt. Sta. Tech. Bull. 130, p. 16.—Schaffner, 1959, U.S. Dept. Agr. Misc. Pub. 767, p. 85.—Peck, 1963, Can. Ent. Suppl. 30, p. 220.—Burks *in* Krombein and Burks, 1967, U.S. Dept. Agr. Monog. 2, Suppl. 2, p. 234.

Pediobioidea cyanea Webster, 1909, Iowa Agr. Expt. Sta. Bull. 102, p. 207 (ms. name). —Girault, 1911, Can. Ent. 43:407 (syn. under *Horismenus microgaster* when described).

Pseudomphale ancylae Girault, 1916, Ent. News 27:223.—Leach, 1916, U.S. Dept. Agr. Dept. Bull. 435, p. 11. **New synonymy.**

Horismenus ancylae (Girault): Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.

It is debatable whether or not the name *Pediobioidea cyanea* Girault should be listed in the bibliography. In his 1911 paper Girault states that he gave this name to Webster in 1909 and that Webster used it in a paper. (In Webster's paper the name was accompanied only by host records, so it was not validated.) After 1909, Girault realized that *cyanea* was a synonym of *Horismenus microgaster*, and he did not publish a description of *cyanea*. Instead, in his 1911 paper, Girault listed *Pediobioidea cyanea* as a synonym of *Horismenus microgaster* and gave a lengthy description of *microgaster*, being careful to state that this description was drawn not from the type of *microgaster* but from the specimens on which he had intended to base the description of *Pediobioidea cyanea*. Thus Girault certainly came as near as he possibly could to describing a new genus and species while stating that he was not doing it.

H. microgaster Ashmead was described from a single male specimen; the type is U.S.N.M. 12205. *P. ancylae* Girault was described from 1 male and 1 female specimens. Lectotype (♀), 20131 U.S.N.M., labeled, "Winchester, Va., IV–10–1915, Reared from Ancylus nubeculana, Quaintance No. 7867, B. R. Leach Coll." Specimen on a point, but head and one pair of wings mounted on a slide. Present designation of lectotype. No types were designated for the stillborn *P. cyanea* Girault, although Webster's original material is preserved in the U.S.N.M. collection.

Distribution.—Maine south to N.C., west to Iowa, Kans., and Tex.

This is a common secondary parasite of Lepidoptera, attacking ichneumonoid and chalcidoid primary parasites. It also has been reared, apparently as a primary parasite, from lepidopterous leafminers and other minute Lepidoptera.

Horismenus missouriensis (Ashmead)

Holcopelte missouriensis Ashmead, 1888, Can. Ent. 20:101.—Dalla Torre, 1898, Cat. Hym. 5:28.

Horismenus missouriensis (Ashmead): Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 433.—Girault, 1934, Mir. et Hym. Nova Austr., p. 3.—Bissell, 1938, Jour. Econ. Ent. 31:536.—Brimley, 1938, Ins. N. C., p. 424.—Brett, 1946, Jour. Agr. Res. 73:84.—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467. —Burks *in* Krombein *et al.*, 1958, U.S. Dept. Agr. Monog. 2, Suppl. 1, p. 68.—Peck, 1963, Can. Ent. Suppl. 30, p. 221.

Holcopelte popenoei Ashmead, 1888, Can. Ent. 20:101.—Wickham, 1895, Bull. Iowa Lab. Nat. Hist. 3:35.—Dalla Torre, 1898, Cat. Hym. 5:28.—Bridwell, 1899, Trans. Kans. Acad. Sci. 16:206.

Horismenus popenoei (Ashmead): Quaintance, 1907, U.S. Dept. Agr. Bur. Ent. Bull. 68, p. 29.—Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 433.—Viereck, 1916, Bull. Conn. State Geol. Nat. Hist. Sur. 22, p. 458.—Gahan, 1930, Proc. U.S. Natl. Mus. 77(8):8.—Girault, 1934, Mir. et Hym. Nova Austr., p. 3 (syn. of *missouriensis*).—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Peck, 1963, Can. Ent. Suppl. 30, p. 221.

H. missouriensis Ashmead was described from 2 female specimens. Lectotype (♀), U.S.N.M. 41369, labeled, "Missouri, Holcopelte missouriensis Ashm. Type." Present designation of lectotype. Only this specimen can at present be located in the collection, but the other type specimen may be found later. Consequently it seems best to designate a lectotype. *H. popenoei* Ashmead was described from 4 female specimens. Lectotype (♀), U.S.N.M. 41370, labeled, "Mar. 15, Riley Co., F. Marlatt, 149, 1274." Present designation of lectotype.

Distribution.—N.Y. south to Ga., west to S. Dak., Kans. and Okla.

This is a primary parasite of bruchids, having been reared from *Acanthoscelides*, *Amblycerus*, *Gibbobruchus*, and "*Bruchus* sp."

Horismenus nitens (Howard)

Holcopelte nitens Howard, 1892, Proc. Ent. Soc. Wash. 2:298.—Dalla Torre, 1898, Cat. Hym. 5:28.

Horismenus nitens (Howard): Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 433.—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Peck, 1963, Can. Ent. Suppl. 30, p. 221.

H. nitens Howard was described from 2 male and 5 female specimens; these specimens are still in the U.S.N.M. collection, but all are more or less broken. Lectotype (♀), U.S.N.M. 2686, labeled, "Washington, D.C., Epeira, Holcopelte nitens How. ♀ type." Present designation of lectotype.

Distribution.—D.C.

This is a secondary parasite in the egg sacs of epeirid spiders.

Horismenus productus (Ashmead)

Holcopelte producta Ashmead, 1894, Trans. Amer. Ent. Soc. 21:342.—Townsend, 1895, Can. Ent. 27:277.—Dalla Torre, 1898, Cat. Hym. 5:28.—Cockerell, 1899, Trans. Kans. Acad. Sci. 16:214.

Horismenus productus (Ashmead): Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 433.—Crawford, 1911, Proc. U.S. Natl. Mus. 40:446.—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Peck, 1963, Can. Ent. Suppl. 30, p. 222.

H. producta Ashmead was described from "several" specimens of both sexes. There are now 1♀, 3♂ type specimens in the U.S.N.M. collection. Lectotype (♀), U.S.N.M. 2184, labeled, "N. Mex." Present designation of lectotype.

Distribution.—Tex., N. Mex., Ariz., Calif.

This is a primary parasite of bruchids. It has been reared from *Mimosestes amicus* (Horn), *Algarobius prosopis* (LeConte), *Acanthoscelides horni* (Pic), and an undetermined bruchid in *Astragalus*.

Horismenus sardus (Walker)

Entendon (*Horismenus*) *sardus* Walker, 1847, Ann. Mag. Nat. Hist., ser. 1, 20:23.—Cresson, 1862, Proc. Ent. Soc. Philad. 1:231.

Entedon sardus Walker: Howard, 1885, U.S. Dept. Agr. Bull. Div. Ent. 5, p. 47.—Cresson, 1887, Synopsis Hym. Amer. N. of Mex., p. 245.

Encyrtus sardus (Walker): Dalla Torre, 1898, Cat. Hym. 5:263.—Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 246.

Pseudomphale sardus (Walker): Girault, 1918, Ent. News 29:130.

Horismenus sardus (Walker): Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 468.—Peck, 1963, Can. Ent. Suppl. 30, p. 222.

Elachristus (!) *flavipes* Ashmead, 1886, Trans. Amer. Ent. Soc. 13:133.—Cresson, 1887, Synopsis Hym. Amer. N. of Mex., p. 244 (*Elachistus*). **New synonymy.**

Holcopelte flavipes (Ashmead): Ashmead, 1887, Trans. Amer. Ent. Soc. 14:200.—Dalla Torre, 1898, Cat. Hym. 5:28.

Horismenus flavipes (Ashmead): Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 432.—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Peck, 1963, Can. Ent. Suppl. 30, p. 218.

E. sardus was apparently described from one female specimen from "North America." A single ♀ type specimen, in good condition, is now in the British Museum (Natural History) collection and is labeled, "Sardus, Type, Horismenus sardus Walk. Type, G. J. Kerrich." *E. flavipes* Ashmead was described from one female specimen. The type is U.S.N.M. 41373.

Horismenus texanus (Girault)

Pseudomphale texana Girault, 1917 (1916), Ins. Ins. Mens. 4:120.

Horismenus texanus (Girault): Gahan, 1933, U.S. Dept. Agr. Misc. Pub. 174, p. 128.—Allen and Painter, 1937, Jour. Agr. Res. 55:225.—Britton, 1938, Conn. State Geol. Nat. Hist. Sur. Bull. 60, p. 144.—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 468.—Nikolskaya, 1952, Chalcid Fauna USSR, p. 268.—Peck, 1963, Can. Ent. Suppl. 30, p. 222.

P. texana Girault was described from one female specimen. Type, U.S.N.M. 20661. Specimen badly damaged, with fragmentary parts mounted on a slide and remains of thorax and abdomen on a card point.

Distribution.—Conn. south to Ga. and La., west to Iowa, Kans., Tex., N. Mex., and Ariz.

This is a primary parasite of small Diptera living in the stems of grasses. It has been reared from the Hessian fly, *Mayetiola destructor* (Say), the wheat stem maggot, *Meromyza americana* Fitch, and the otitid *Eumetopiella rufipes* (Macquart). Specimens have also been reared from grasses without a clear indication of their hosts, but the hosts were probably dipterous.

Excluded Species

Galeopsomyia haemon (Walker), n. comb.

Tetrastichus haemon Walker, 1847, Ann. Mag. Nat. Hist., ser. 1, 20:28.—Howard, 1885, U.S. Bur. Ent. Bull. 5, p. 47 [*laemon*].—Cresson, 1887, Synopsis Hym. Amer. N. of Mex., p. 245.—Dalla Torre, 1898, Cat. Hym. 5:16.—Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 475.

Horismenus haemon (Walker): Burks, 1943, Proc. U.S. Natl. Mus. 93:605.—Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 467.—Peck, 1963, Can. Ent. Suppl. 30, p. 219.

In 1938, when I was working on a revision of the North American species of *Tetrastichus*, I requested information about the type of *Tetrastichus haemon* Walker from Ch. Ferrière, who was at that time at the British Museum. The information he sent to me led me to believe that *haemon* was a *Horismenus*. Unfortunately, that is incorrect, and *haemon* actually belongs in *Galeopsomyia* Girault, according to recent information sent to me by G. J. Kerrich. Accordingly I am here transferring *haemon* to *Galeopsomyia*. It may be the same species as *G. columbiana* (Ashmead), 1888, although specific differences in the genus *Galeopsomyia* have not yet been worked out. *T. haemon* was described from 4 specimens from Florida; I here designate the lectotype. It is a female specimen, deposited in the British Museum (Natural History) type collection, and is labeled "haemon" in Walker's hand and "Type CF 1938." There are 3 other specimens of *haemon* in the main B. M. collection, a female and 2 males.

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NORTH AMERICAN DELTOCEPHALINE LEAFHOPPERS OF THE GENUS AMBLYSELLUS SLEESMAN

(Homoptera: Cicadellidae)

James P. Kramer, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—The North American genus *Amblysellus Sleesman* is redefined to include seven species: *A. curtisii* (Fitch); *A.* **wyomus**, n. sp.; *A. durus* (Beamer and Tuthill), n. comb.; *A. valens* (Beamer and Tuthill), n. comb.; *A. dorsti* (Oman), n. comb.; *A. punctatus* (Osborn and Ball), n. comb.; and *A. grex* (Oman), n. comb. All species are keyed and redescribed with all critical diagnostic features illustrated. New distributional records and host plant data are included.

The genus *Amblysellus* Sleesman has been long defined on the basis of the only included species, *Amblycephalus curtisii* Fitch, a common eastern North American deltocephaline leafhopper. A study of *Deltocephalus* Burmeister, *Amblysellus* and 16 related North American

[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

genera, including over 100 species, with the common character of a linear connective fused with the aedeagus, has convinced me that many of the presently accepted generic definitions, based heavily on the venation of the forewings, are neither inclusive nor exclusive. This paper is one of a series in which realignments and new definitions will be proposed for this group of deltocephaline leafhoppers.

Amblysellus, as here defined, includes seven species. Five of these were formally in *Deltocephalus*, and one is new. Except for *curtisii*, all of the species are western in distribution. Little is known concerning true host and/or food plants, but all are likely grass feeders.

Amblysellus Sleesman

Amblysellus Sleesman, 1929:93. Type-species: *Amblycephalus curtisii* Fitch, 1851:61.

Revised description. Moderately small (2.2–3.8 mm) and comparatively robust leafhoppers; head including eyes as wide as or slightly wider than pronotum; crown produced beyond eyes and acute to bluntly angular at apex; anterior margin of crown broadly and smoothly rounded to face, crown in lateral view slightly inflated or not, marginal ocelli small and rather remote from eyes, clypeal suture obscure, clypellus quadrate with sides parallel. Forewings long and extending well beyond apex of abdomen or shortened and exposing apex of abdomen; in forms with shortened forewings, the apical cells and each appendix are much reduced and at times nearly absent. Forewing usually with three anteapical cells; inner cell open or closed basally; central cell divided or not; outer cell normal, reduced or sometimes absent.

Male genitalia. Connective linear and fused with aedeagus; aedeagus in lateral view essentially transverse with distal portion of shaft obliquely upturned or shaft greatly elongated and smoothly upturned distally, extreme aedeagal apex elongated oval capitate (except *durus*), with finlike, hoodlike, or lanceolate processes near and extending beyond ventral margin of aedeagus (except *curtisii*), gonopore subapical and visible in ventral aspect at base of variously developed cleft or slit, extreme apex of aedeagus in dorsal view usually open on distal margin; style in dorsal view with mesal lobe moderately long, stout, and marginally irregular and lateral lobe rather short, broad, and blunt.

Diagnosis. *Amblysellus* can be separated from all other North American leafhoppers with a fused linear connective and aedeagus by the following combination of characters: aedeagus obliquely upturned distally with extreme apex enlarged and irregularly oval (except *durus*), with finlike, hoodlike, or lanceolate processes near and extending beyond ventral margin (except *curtisii*), gonopore subapical on ventral margin at base of variously developed cleft or notch; style in dorsal view with mesal lobe moderately long, stout, and marginally irregular and lateral lobe short, broad, and blunt. Forewings not appearing reticulate due to extra crossveins.

Key to the North American Species of **Amblysellus**

1. Aedeagus without a clearly defined finlike, hoodlike, or lanceolate process near and extending beyond ventral margin 2

Aedeagus with a clearly defined finlike, hoodlike, or lanceolate process near and extending beyond ventral margin 3

2. Forewings brown with veins yellowish green, strongly contrasting; markings of crown and pronotum as in fig. 1 .... **curtisii** (Fitch)

Forewings reddish brown with veins concolorous, not contrasting; markings of crown and pronotum as in fig. 8 .... **wyomus**, n. sp.

3. Processes closer to base of aedeagus than to apex of aedeagus 4

Processes closer to apex of aedeagus than to base of aedeagus 5

4. Process hoodlike and broad, aedeagal shaft narrow and greatly elongated (fig. 19) .... **durus** (Beamer & Tuthill)

Process lanceolate and acute, aedeagal shaft not as above (fig. 21) .... **valens** (Beamer & Tuthill)

5. Aedeagus without a long neckline area between ventral process and oval apical area (fig. 27) .... **dorsti** (Oman)

Aedeagus with a long necklike area between ventral process and oval apical area 6

6. Ventral process broad basally and finely serrated on distal margin (fig. 36); mesal lobe of style not clearly expanded near middle (figs. 39–40) .... **punctatus** (Osborn & Ball)

Ventral process narrow basally and coarsely serrated laterally and distally (fig. 44); mesal lobe of style strongly expanded near middle (figs. 42–43) .... **grex** (Oman)

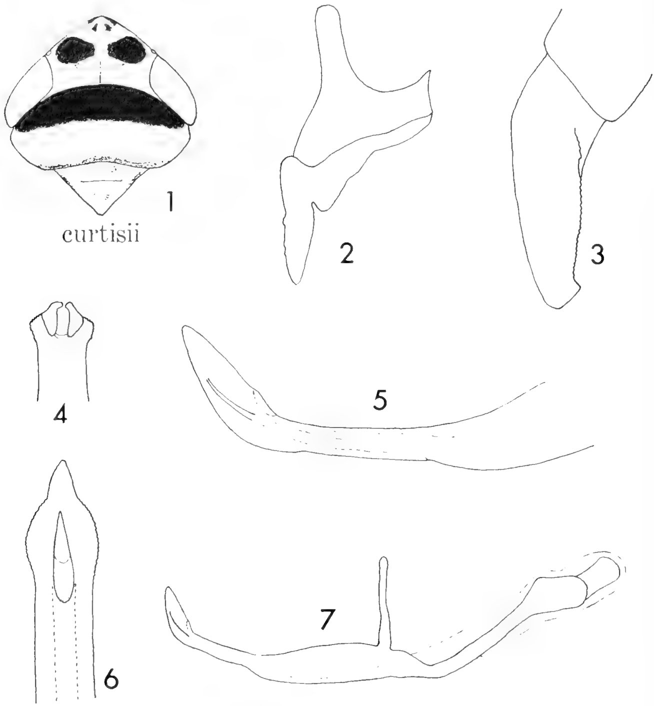
Amblysellus curtisii (Fitch)
(Figs. 1–7)

Amblycephalus curtisii Fitch, 1851:61.
Amblysellus curtisii (Fitch): Sleesman, 1929:131.

Length. Male 3.0–3.5 mm. Female 3.2–3.6 mm.

Structure. Crown varying from bluntly angular to acute at apex in dorsal view (fig. 1). Forewings long and extending well beyond abdomen (macropterous forms) or shortened and exposing at least a portion of the genital segment (submacropterous forms). Inner anteapical cell rarely closed basally, usually open; central anteapical cell undivided; outer anteapical cell rarely normal, usually much reduced, or entirely absent. Apical cells moderately long to distinctly shortened. Appendix small.

Coloration. Venter of abdomen and thorax dark fuscus to black and variably paler at segmental margins; legs pale brown to stramineous, all femora, except apices, and hind tibiae infuscated to blackened; face stramineous to pale yellowish green with all sutures, clypeal arcs above level of antennae, margins of clypeus below level of antennae, portions of genae under eyes and base of antennae, and most of clypellus broadly infuscated or blackened, darkened clypeal arcs often fused to form an irregular blotch, markings on lower portion of face considered together form an irregular "Y" with stalk on clypellus and an arm under each eye; crown, pronotum, and scutellum with same ground color as face and marked with fuscus to black (fig. 1), small spots at extreme coronal apex often reduced or absent, darkened portion of posterior pronotal margin variable, at times nearly absent; forewings brown or brown hyaline with veins strongly yellowish green, apical veins often concolorous with brown ground color.



Figs. 1–7. *Amblysellus curtisii* (Fitch): 1, head and thoracic dorsum; 2, style in dorsal view; 3, distal portion of style in lateral view; 4, aedeagal apex in dorsal view; 5, distal portion of aedeagus in lateral view; 6, distal portion of aedeagus in ventral view; 7, aedeagus and connective in lateral view.

Male genitalia. Aedeagus in lateral view (fig. 7) with shaft narrowed distally and obliquely upturned, extreme apical portion (fig. 5) elongated and oval. Gonopore below apex on venter of shaft (fig. 6). Aedeagal apex in dorsal view (fig. 4) usually slightly cleft. Style in dorsal view (fig. 2) with mesal lobe stout and irregular along inner margin. Mesal lobe of style in lateral view (fig. 3) with a blunt tooth near apex.

Female genitalia. Pregenital sternum with lateral margins narrowly rounded and obliquely directed mesad thus exposing underlying sclerites, posterior margin concave on middle third and at times with a vaguely defined broad blunt tooth at center of concavity.

Records. The type locality is [Salem?], New York. My confirmed records: CONNECTICUT, Stamford; DELAWARE), Wilmington; DISTRICT OF COLUMBIA, Washington; ILLINOIS, Algonquin, Carbondale, Elgin, Urbana; IOWA, Ames, Fairfax, Iowa City; KANSAS, Cherokee Co., Douglas Co.; MAINE, Portland; MARYLAND, Beltsville; MASSACHUSETTS, Chicopee, Monterey, Northboro, Waverly; MICHIGAN, East Lansing; MINNESOTA, Brandon; MISSOURI, Columbia; NEW HAMPSHIRE, Bath; NEW YORK, Ithaca, Lancaster, Remsen, Salem, West Nyack; OHIO, Barberton, Columbus, Delaware, Salineville; ONTARIO, Toronto, Vineland; PENNSYLVANIA, Echo Lake, Hazelton; VERMONT, Jay, Newport, Wells River, Woodstock; VIRGINIA, Arlington, Bluemont; WEST VIRGINIA, Randolph Co., Upshur Co.; WISCONSIN, Madison, Osceola.

Notes. The strongly bicolored forewings provide an easy basis for separating *curtisii* from its congeners; but the aedeagus of *curtisii* strongly resembles that of *wyomus*; compare fig. 7 and fig. 13. This is the only member of the genus known east of the Mississippi River, but the species is known as far west as the Dakotas, Nebraska, and Kansas. Even though *curtisii* is recorded for some southern states, Georgia and South Carolina, it appears to be most abundant in the northern part of its range. Recorded plant associations include bluegrass meadows, small grains, and legumes.

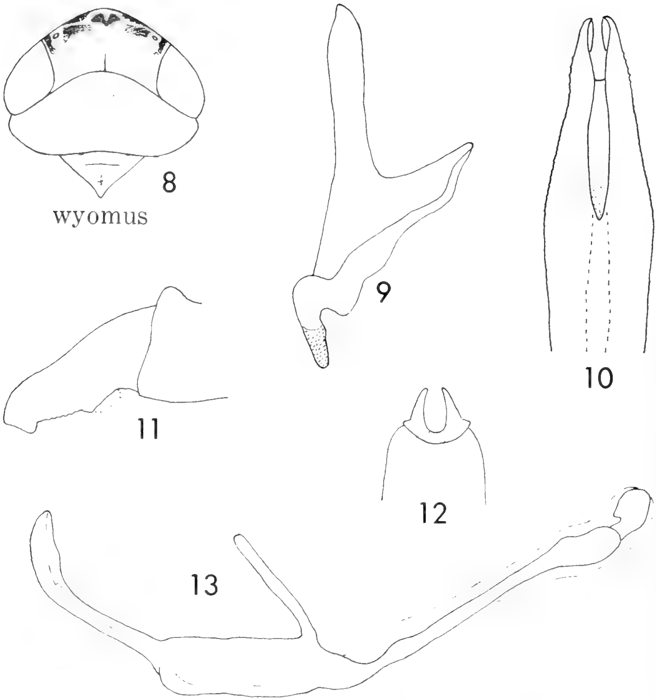
Amblysellus wyomus, n. sp.
(Figs. 8–13)

Length. Male 2.8–3.0 mm. Female 2.9–3.1 mm.

Structure. Crown bluntly angular at apex in dorsal view (fig. 8). Forewings long and extending just beyond abdomen (macropterous forms) or much shortened and entirely exposing genital and pregenital segments and middle portion of preceding abdominal segment with apical cells and each appendix greatly reduced (submacropterous forms). Inner anteapical cell usually closed basally; central anteapical cell not divided; outer anteapical cell normal, open basally, or reduced.

Coloration. Venter of abdomen dark fuscus to black, edges of segments variably paler or not; venter of thorax and legs reddish brown with tibiae and tarsi at times slightly darker; face reddish brown with clypeal arcs darkened; crown, pronotum, and scutellum reddish brown with four small dark spots along anterior margin of crown (fig. 8), lateral pair of spots often obscure or wanting; forewings reddish brown hyaline with veins concolorous, cells distally often darker; dorsum of abdomen dark fuscus to black with pregenital segment variably white or yellowish.

Male genitalia. Aedeagus in lateral view (fig. 13) with a weakly developed broad fin (actually paired structures but only one visible in lateral view) ventrally at base of long obliquely upturned distal shaft; extreme apex irregularly elongated oval. Apical portion of aedeagus in ventral view (fig. 10) with gonopore at base of elongated slit; apex of aedeagus in dorsal view (fig. 12) cleft;



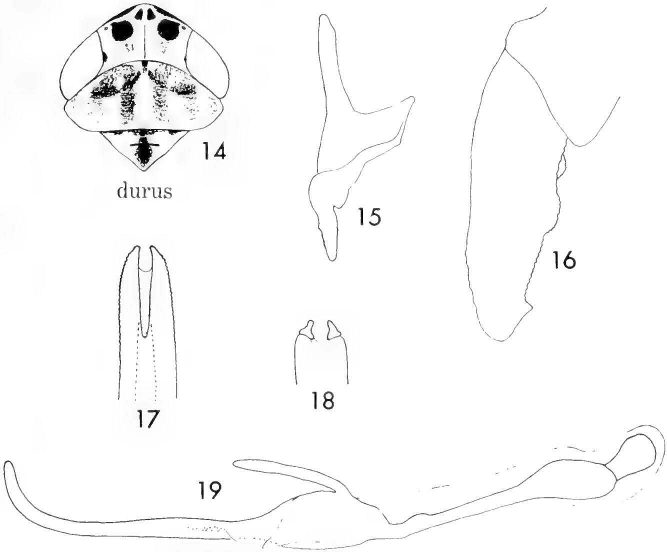
Figs. 8–13. *Amblysellus wyomus*, n. sp.: 8, head and thoracic dorsum; 9 style in dorsal view; 10, apical portion of aedeagus in ventral view; 11, distal portion of style in lateral view; 12, aedeagal apex in dorsal view; 13, aedeagus and connective in lateral view.

style in dorsal view (fig. 9) with mesal lobe slightly expanded on lateral margin and lateral lobe broad and blunt; mesal lobe of style in lateral view (fig. 11) with a tooth near apex on irregular ventral margin.

Female genitalia. Posterior margin of pregenital sternum appearing transverse to slightly concave.

Records. Holotype male (USNM type no. 70813) and allotype female, nine miles east of Laramie, Wyoming, 8,600 ft., 16 August 1968, P. W. Oman. Six male and six female paratypes with same data; one female paratype Hamilton, Montana, 19 July 1949, R. H. Beamer.

Notes. This species is distinctive on the easily observed coloration



Figs. 14–19. *Amblysellus durus* (Beamer and Tuthill): 14, head and thoracic dorsum; 15, style in dorsal view; 16, distal portion of style in lateral view; 17, apical portion of aedeagus in ventral view; 18, aedeagal apex in dorsal view; 19, aedeagus and connective in lateral view.

as well as on the unique features of the aedeagus. The reddish brown head, thorax, and forewings contrast rather sharply with the dark fuscus to black abdomen. In the short winged forms, dorsally, the pale pregenital segment is striking. The aedeagus of *wyomus* is most similar to that of *curtisii*, but the styles are different. The coloration and distribution are entirely dissimilar in the two species. No plant associations are known for *wyomus*.

Amblysellus durus (Beamer and Tuthill), n. comb.
(Figs. 14–19)

Deltocephalus durus Beamer and Tuthill, 1934:20.

Length. Male. 2.8–3.2 mm. Female 3.1–3.6 mm.

Structure. Crown bluntly angular at apex in dorsal view (fig. 14). Forewings shortened and exposing dorsum of genital segment and often much of pregenital segment (submacropterous forms). Inner anteapical cell rarely open basally, usually closed; central anteapical cell usually undivided; outer anteapical cell not reduced. Apical cells shortened; appendix small. Macropterous forms unknown.

Coloration. Venter of abdomen and thorax pale brown and variably infuscated or blackened, often appearing largely dark but always at least edges of segments paler; legs pale brown and variably infuscated, never appearing entirely fuscus; face pale brown to sordid stramineous with clypeal arcs, upper edges of genae, and central portion of clypellus variably infuscated or blackened, markings on clypeal arcs often fused but with central area of clypeus below level of antennae unmarked; crown, pronotum, and scutellum pale brown marked with black and various shades of brown (fig. 14), longitudinal stripes on pronotum often vague; forewings light brown hyaline with veins sordid whitish and cells variably infuscated.

Male genitalia. Aedeagus in lateral view (fig. 19) with an expansion near base of shaft projecting beyond margin; shaft elongated, slender, and smoothly upturned distally. Apical portion of aedeagus in ventral view (fig. 17) with gonopore much below cleft apex. Tip of aedeagus in dorsal view (fig. 18) cleft. Style in dorsal view (fig. 15) with mesal lobe irregular on inner margin and lateral lobe short and blunt. Mesal lobe of style in lateral view (fig. 16) irregularly serrated on ventral margin with a distinct tooth near apex.

Female genitalia. Posterior margin of pregenital sternum irregularly transverse or vaguely and broadly concave with the slightest suggestion of a tooth at middle.

Records. The type locality is Flagstaff, Arizona. My confirmed records: ARIZONA, Chiricahua Mts., Flagstaff, Mt. Graham, Santa Catalina Mts., Santa Rita Mts.; NEW MEXICO, Cloudcroft.

Notes. The aedeagus of *durus* is unique and provides the best characters for the identification of the species. The host plants of this southwestern species are unknown.

Amblysellus valens (Beamer and Tuthill), n. comb.
(Figs. 20–25)

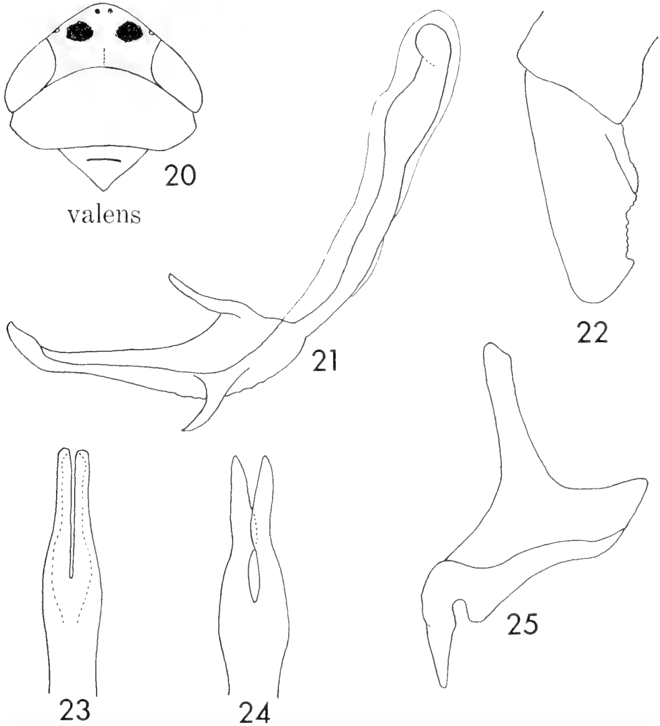
Deltocephalus valens Beamer and Tuthill, 1934:20.

Length. Male 2.4–2.8 mm. Female 2.8–3.0 mm.

Structure. Crown bluntly angular at apex in dorsal view (fig. 20). Forewings moderately long and barely exposing the tip of genital segment (macropterous forms) or shortened and exposing most of genital segment and part of pregenital segment with apical cells and each appendix reduced (submacropterous forms). Inner anteapical cell usually closed basally; central anteapical cell divided or not; outer anteapical cell normal.

Coloration. Venter of abdomen and thorax pale brown and variably infuscated or blackened, edges of segments broadly or narrowly paler; legs pale brown and not or only lightly infuscated; face pale brown and marked essentially like that of *durus* but with more minor variations; crown, pronotum, and scutellum sordid stramineous to pale brown marked with black and various shades of brown (fig. 20), minute spots at coronal apex at times obscure or wanting, pronotum and scutellum either vaguely darkened or not; forewings light brown hyaline with veins concolorous, cells not infuscated.

Male genitalia. Aedeagus in lateral view (fig. 21) with a moderately long sharp process projecting beyond ventral margin near base of shaft (actually paired processes but only one visible in lateral view), shaft tapering distally to an

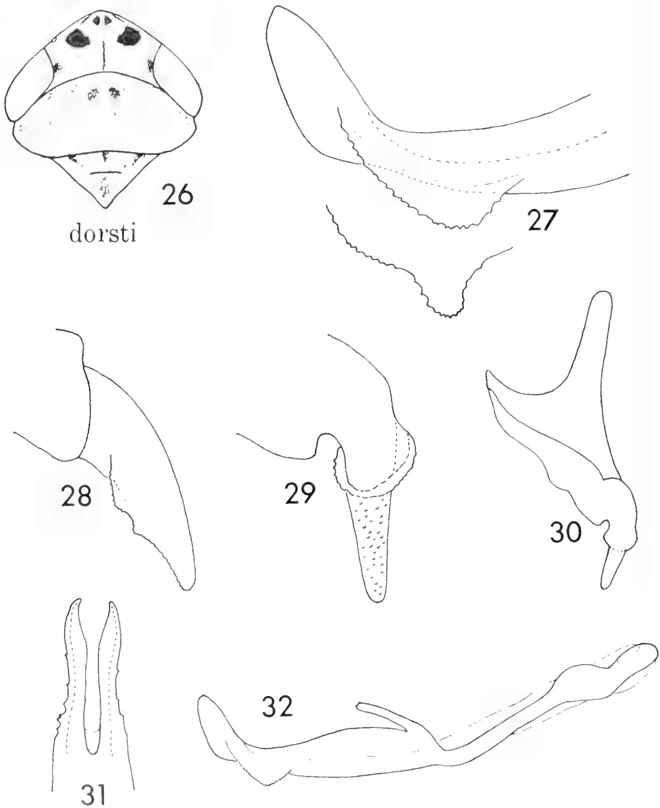


Figs. 20–25. *Amblysellus valens* (Beamer and Tuthill): 20, head and thoracic dorsum; 21, aedeagus and connective in lateral view; 22, distal portion of style in lateral view; 23, apical portion of aedeagus in ventral view; 24, same, variation; 25, style in dorsal view.

obliquely upturned irregularly oval apex. Apical portion of shaft in ventral view (figs. 23–24) with gonopore apparently at base of a variable deep slit or cleft. Style in dorsal view (fig. 25) with mesal lobe stout and lateral lobe broad and blunt. Mesal lobe of style in lateral view (fig. 22) irregularly serrated on ventral margin with a distinct tooth near apex.

Female genitalia. Posterior margin of pregenital segment essentially transverse with or without a small notch at center.

Records. The type locality is Grand Teton National Park, Wyoming. My confirmed records: COLORADO, Creede, El Paso Co., Northgate, Pingree Park, Steamboat Springs, Walden; WYOMING, Grand Teton



Figs. 26–32. *Amblysellus dorsti* (Oman): 26, head and thoracic dorsum; 27, distal portion of aedeagus in lateral view with variations in fin below; 28, distal portion of style in lateral view; 29, stylar lobes in dorsal view; 30, style in dorsal view; 31, apical portion of aedeagus in posterior view; 32, aedeagus and connective in lateral view.

National Park. Beirne (1956:112) reported *valens* from the grassland regions of Alberta and Saskatchewan.

Notes. The unique aedeagus distinguishes *valens*. However, there is some intraspecific variation in the length and curvature of the lateral aedeagal processes and in the outline of the aedeagal apex. Other than "grasses," the plant relationships of this western species are not known.

Amblysellus dorsti (Oman), n. comb.
(Figs. 26–32)

Deltocephalus dorsti Oman, 1940:202.

Length. Male 2.8–3.4 mm. Female 3.0–3.8 mm.

Structure. Crown bluntly angular at apex in dorsal view (fig. 26). Forewings long and extending well beyond abdomen (macropterous forms) or shortened and exposing at least tip of genital segment with apical cells and each appendix reduced (submacropterous forms). Inner anteapical cell usually closed basally, rarely open; central anteapical cell sometimes undivided, usually divided; outer anteapical cell normal or slightly reduced.

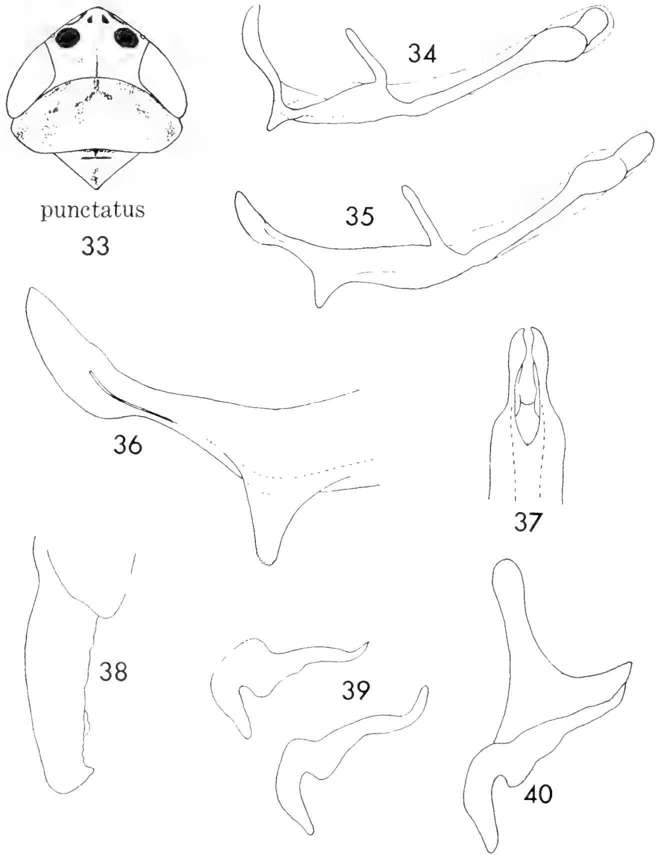
Coloration. Venter of abdomen and thorax dark fuscus to black and variably paler at edges of segments or not; legs light brown and variably infuscated or blackened; face light brown with clypeal arcs, all sutures, middle of clypellus, and upper edges of genae darkly infuscated or blackened; crown, pronotum, and scutellum sordid stramineous to pale brown and marked with black or various shades of brown (fig. 26), size and shape of apical coronal spots highly variable, longitudinal banding of pronotum often obscure and sometimes absent; forewings pale brown hyaline with veins concolorous and cells rather lightly infuscated or not.

Male genitalia. Aedeagus in lateral view (fig. 32) with a broad finlike projection (actually paired structures but only one visible laterally) extending beyond ventral margin near obliquely upturned broadly oval apex. Shape of fin variable (fig. 27); outline of apical oval portion variable. Apical portion of aedeagus in posterior view (fig. 31) deeply split with gonopore at base of split. Style in dorsal view (fig. 30) with mesal lobe expanded in basal half (fig. 29) and lateral lobe short and broad. Mesal lobe of style in lateral view (fig. 28) with a rather broad subapical tooth on irregular ventral margin.

Female genitalia. Posterior margin of pregenital sternum broadly concave on middle portion.

Records. The type locality is Brighton, Utah. My confirmed records: ARIZONA, Littlefield, Patagonia; COLORADO, Gould, Pingree Park, Rockwood; UTAH, Brighton, Duck Creek, Garden City, Herber City, Logan, Mantua, Morgan, Orton, Providence, Provo, Richfield, Salt Lake City, Snyderville, Springville, Strawberry Dam.

Notes. *A. dorsti* is most similar to *grex*, but it differs from that species in having a much wider ventral anterior aedeagal fin and by lacking a long narrow portion or "neck" between the fin and the elongate oval apex. Other than "grasses," the host plant relationships of *dorsti* are not established.



Figs. 33–40. *Amblysellus punctatus* (Osborn and Ball): 33, head and thoracic dorsum; 34, aedeagus and connective in lateral view, abnormal; 35, same, normal; 36, distal portion of aedeagus in lateral view; 37, apical portion of aedeagus in ventral view; 38, distal portion of style in lateral view; 39, distal portion of styles in dorsal view, variations; 40, style in dorsal view.

Amblysellus punctatus (Osborn and Ball), n. comb.
(Figs. 33–40)

Deltocephalus punctatus Osborn and Ball, 1898:94.

Length. Male 2.2–2.7 mm. Female 2.5–3.3 mm.

Structure. Crown bluntly angular at apex in dorsal view (fig. 33). Forewings moderately long and exposing most of genital segment (macropterous forms) or shortened and entirely exposing genital segment and most of pregenital segment with apical cells greatly reduced and each appendix nearly absent (submacropterous forms). Inner anteapical cell usually closed basally; central anteapical cell divided or not; outer anteapical cell normal to distinctly reduced.

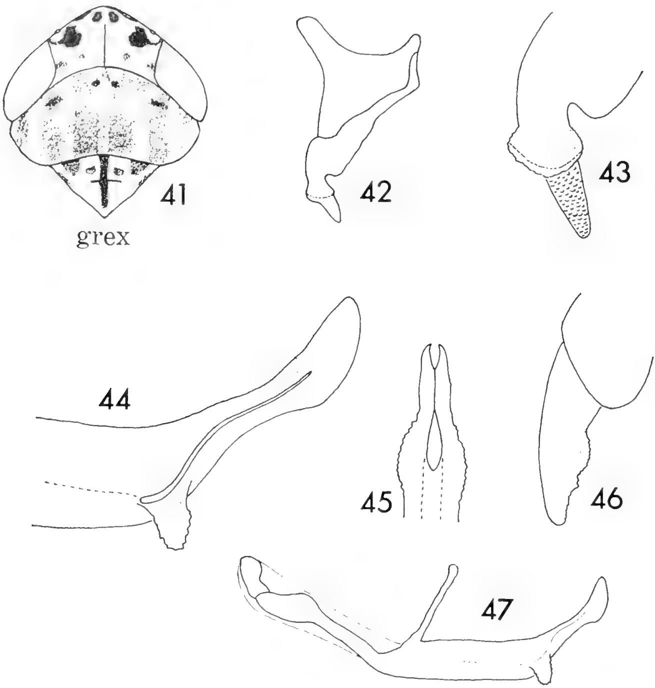
Coloration. Venter of abdomen and thorax pale yellowish brown to pale reddish brown and lightly to heavily infuscated and then appearing largely dark; legs with same ground color as venter and either not infuscated or lightly and irregularly so; face with same ground color as venter and varying from immaculate to with black clypeal arcs and other darkened areas on lower face; crown, pronotum, and scutellum varying from stramineous to pale reddish brown and marked with dark fuscus or black (fig. 33), in paler forms the minute pair of apical coronal spots and stripes on pronotum often obscure or absent, size and shape of apical coronal spots variable; forewings stramineous hyaline and either with or without a wash of pale reddish brown or a light infuscation of cells.

Male genitalia. Aedeagus in lateral view (fig. 35) with a finlike projection extending beyond ventral margin near distal portion of shaft (actually paired processes but only one visible in lateral view), shaft tapering distally to an obliquely upturned elongate oval apex (fig. 36). Apical portion of shaft in ventral view (fig. 37) with gonopore subapical at base of cleft. Style in dorsal view (fig. 40) with mesal lobe moderately long and stout with lateral lobe broad and blunt, shapes of lobes somewhat variable (fig. 39). Mesal lobe of style in lateral view (fig. 38) stout with a distinct tooth near apex.

Female genitalia. Posterior margin of pregenital sternum concave on central half with middle portion of concavity at times appearing transverse.

Records. The type locality is Little Rock, Iowa. My confirmed records: ARIZONA, Chiricahua Mts., Kaibab, Santa Catalina Mts., Santa Rita Mts., Springerville; COLORADO, Estes Park, Fort Collins, Pinecliffe; IOWA, Little Rock; SOUTH DAKOTA, Hot Springs.

Notes. *A. punctatus* is close to both *grex* and *dorsti* in characters of the aedeagus. In both of those species the serrations on the ventral fin are gross and extensive, whereas in *punctatus* the serrations are minute and limited to the apical portion of the fin. In an aberrantly developed male (fig. 34), the aedeagal shaft is upturned distally at nearly a right angle to its long axis. The coloration of *punctatus* is more variable than in any of its congeners. The specimens from Arizona are somewhat darker and/or more reddish brown than those from Iowa, South Dakota, and Colorado; but structurally I cannot separate them. The type series was swept from *Sporobolus*.



Figs. 41–47. *Amblysellus grex* (Oman): 41, head and thoracic dorsum; 42, style in dorsal view; 43, mesal lobe of style in dorsal view; 44, distal portion of aedeagus in lateral view; 45, apical portion of aedeagus in posterior view; 46, distal portion of style in lateral view; 47, aedeagus and connective in lateral view.

Amblysellus grex (Oman), n. comb.
(Figs. 41–47)

Deltocephalus grex Oman, 1940:201.

Length. Male 3.2–3.8 mm. Female 3.2–3.8 mm.

Structure. Crown bluntly angular at apex in dorsal view (fig. 41). Forewings long and extending well beyond abdomen (macropterous forms). Inner anteapical cell closed basally; central anteapical cell usually divided, rarely undivided; outer anteapical cell normal or reduced. Submacropterous forms unknown.

Coloration. Venter of abdomen and thorax stramineous to pale brown and essentially unmarked to heavily infuscated or blackened with edges of segments irregularly paler; legs with same ground color as venter and varying from unmarked to darkly marked on femora and hind tibiae; face varying from stramineous and unmarked to pale brown with all sutures, clypeal arcs, upper edges of genae, and central portion of clypellus variously infuscated or blackened; crown, pronotum, and scutellum stramineous to pale brown and varying from unmarked to marked with black or shades of brown (fig. 41), the minute apical coronal spots sometimes obscure or absent, the larger apical coronal spots variable in size and shape but rarely appearing clearly rounded, darker markings on pronotum and scutellum at times obscure; forewings varying from stramineous hyaline to sordid whitish hyaline with cells variably infuscated at edges, veins white to sordid white.

Male genitalia. Aedeagus in lateral view (fig. 47) with a narrow finlike projection (actually paired processes but only one visible laterally) extending beyond ventral margin near obliquely upturned distal portion of shaft; distal portion of aedeagus in lateral view (fig. 44) with a constricted neckline area between ventral fin and elongated oval apex. Apical portion of aedeagus in posterior view (fig. 45) cleft with gonopore at base of cleft. Style in dorsal view (fig. 42) with mesal lobe expanded in basal half (fig. 43) with lateral lobe short and broad. Mesal lobe of style in lateral view (fig. 46) with a rather broad subapical tooth on irregular ventral margin.

Female genitalia. Posterior margin of pregenital sternum appearing transverse or slightly concave.

Records. The type locality is Kirkland Junction, Arizona. My confirmed records: ARIZONA, Chiricahua Mts., Globe, Granite Dells, Herford, Huachuca Mts., Kirkland Junction, Littlefield, Long Valley, Mt. Graham, Oak Creek Canyon, Patagonia, Sabino Canyon, Santa Rita Mts., Superior, White Mts.; CALIFORNIA, Biggs, Bray, Cajon Pass, Califa, Del Mar, Dunsmuir, El Portal, Hondo, Idyllwild, Jacumba, Mariposa, Marysville, Montara, Nicolaus, Oxnard, Palo Alta, Palomar Mt., Pasadena, Petaluma, Pine Valley, Redding, Riverside, Roseville, San Francisco, San Jacinto Mts., San Mateo Co., Sequoia National Park, Taylorville, Three Rivers, Turlock, Weed, Winters, Woodland, Yosemite National Park; COLORADO, Denver, Durango; IDAHO, Rogerson; NEVADA, Caliente, Overton, Loganda; NEW MEXICO, Mesilla; OREGON, Ashland, Bend, Corvallis, Frenchglen, Glendale, Klamath Falls, Madras, Medford, Mt. Hood, Union, Worden; TEXAS, El Paso; UTAH, Brighton, Castle Valley, Grafton, Hurricane, Jordan Narrows, Leeds, Richfield, St. Clara, St. George, Washington, Zion National Park; WASHINGTON, Buckley, Fort Hood, Kalama, Puyallup, Ritzville, Sumner, Tacoma. Beirne (1956:112) recorded *grex* as widely distributed in southern British Columbia.

Notes. *A. grex* is closest to *punctatus* in the features of the male genitalia. The ventral aedeagal fin in *grex* is much narrower and coarsely serrated with the mesal lobe of the style clearly expanded in its basal half, whereas the ventral aedeagal fin in *punctatus* is broad and only finely serrated at its apex with the mesal lobe of the style only vaguely or not expanded in its basal half. *A. grex* is one of the most common and abundant leafhoppers in the West. Plant associations include alfalfa, dandelion, sour cherry, sweet cherry, peach, rye, barley, and various grasses.

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EDWARD ALBERT CHAPIN
1894–1969

Edward Albert Chapin was born on January 4, 1894, in Springfield, Mass. His father was a surgeon and practicing physician there, and that was in a day when one could make a good living practicing medicine and still have ample leisure time. So Ed grew up learning about nature, and especially about botany, in long walks over the countryside around Springfield with his father. Ed's father was an enthusiastic amateur botanist and knew all the plants of the vicinity. They also had as a near neighbor the well known, but somewhat eccentric, entomologist George Dimmock. Ed learned many things about insects from him. As a boy Ed was already strongly influenced toward a career in biology, although at the time, as he said afterwards, he thought he would be an engineer.

While he was a very young child he contracted polio, from which he seemed to recover completely. But as a result of the infection some foot surgery was required for him to be able to walk comfortably. Later on, when he was just grown, his feet caused him to be rejected for military service in World War I (the Army doctors said he could not march). Many years later, when he was an old man, subtle but serious damage to the nerves in his legs became apparent. This very likely was due to the childhood infection. This nerve damage caused him very great difficulty in walking and standing, and at the last, led to his death. While he was young and vigorous it caused him no trouble at all. He grew up a healthy boy and handsome young man, with a tall, straight body, wavy black hair, and flashing black eyes.

After he finished grade school in Springfield he went to Yale, taking his bachelor's degree in the class of 1916. The following year he took a M. Sc. from Massachusetts State, at Amherst. Then, turned down for military service, he came to Washington and began service in the old Bureau of the Biological Survey. He was associated there with L. L. Buchanan and Alexander Wetmore, men with whom he formed life friendships.

In 1918 he married Clara Cutler, a former newspaper woman, and they set up housekeeping amid wartime shortages and high prices. As they said afterwards, they managed somehow, with some improvisation and many makeshifts. Later, after the war, Ed bought land in Virginia and, undaunted, built his own house. He did not contract it, he built it, hiring only the excavation of the basement. The house still stands today.

In 1920 he transferred to the Bureau of Animal Industry, and in 1926 he joined the Bureau of Entomology as a taxonomist in Coleoptera. With this assignment he began working in the U.S. National Museum. In 1934, J. M. Aldrich, Curator of Insects for the National Museum, died and Ed was appointed to fill the vacancy. He remained Curator for 20 years, retiring in 1954, with 36 years of government service.

During all the years he was Curator on the National Museum staff, he had to work with the staff of the Division of Insect Identification, USDA, most members of which also worked in the National Museum. During his tenure a most cordial harmony was maintained between those two organizations. When difficulties arose, as naturally they did, Ed, with his ready wit and keen intelligence, was ready to adjust matters. He was a past master of the gentle but penetrating remark that calms anger, although he could very effectively use the same sort of observation to deflate an overblown self importance.

During his time as Curator he made three trips to South America. In 1942 he went to Colombia, in 1945 to Chile, and in 1946 to Colombia again. On the last trip to Colombia the Colombian government gave him an honorary title of Entomologist. He also received honorary memberships in both the Entomological Society of Chile and the Colombian Academy of Exact Sciences. On his trips to South America he was accompanied by his wife, whose facile Spanish was most helpful. Ed himself was an indifferent linguist.

He also made two collecting trips to Jamaica, in 1937 and 1941, and he made a quick trip to Europe in 1948 as a delegate to the International Entomological Congress in Stockholm and the International Zoological Congress in Paris. Throughout he kept up with his Smithsonian paper work and carried on research on the classification of scarabaeid, coccinellid and clerid beetles. He also kept abreast of the identification work in his groups for the USDA.

He was a wonderful companion on a hike, a collecting trip, or a camping trip. He collected almost everything—insects, of course, but also plants (especially ferns), snails, minerals. The botany he had learned as a boy stood him in good stead as long as he stayed inside the territory of Gray's Manual, essentially New England south to Virginia. His memory was quick and accurate.

Politically his attitudes were somewhat left of center. To some of his conservative associates he seemed a Radical, but a fairer assessment would be Uncommitted Liberal. He was quite capable of despising both the Republican and Democratic parties in an election and throwing away his vote on some splinter party that had no chance at all of winning. While he was a resident of Virginia he naturally found the Poll Tax contemptible. During his later years he lived in the District of Columbia, which in effect disenfranchised him.

Two years before his retirement he bought a fine old house on five acres of ground in West Medway, Mass. This house was in good repair and had been somewhat modernized, but he spent a considerable sum remodeling it to make it suitable for his home after retirement. Then, when he reached the age of 60, he retired and moved from Washington to West Medway.

The next 10 years were, in many ways, the best of his life. His health was good, and he could do as he pleased. He became an Associate at the Museum of Comparative Zoology, Harvard, and drove in to Cambridge about once a week to work there on coccinellid taxonomy. He had a microscope and excellent reprint file in West Medway and also worked there on his research. He likewise kept up the identification work in coccinellids for the USDA—Washington continued to send material to him for naming up to the time of his death.

As Clara said, "We did all sorts of things." They participated in community affairs of West Medway. Ed was even induced to take parts in some local amateur theatrical presentations. He took camping trips. He gardened.

There were no financial problems. His government salary at no time had been high, but they had always lived modestly. By the continual exercise of New England thrift, Ed and Clara accumulated a quite respectable principal during their 36 years in the Washington area. Clara inherited some sound securities from her father. Ed, rather to his surprise, inherited a large block of valuable stock from his mother's family, as residuary legatee.

After he was 70, Ed began to be troubled by the failure of the nerves in his lower extremities. There seemed to be no effective treatment. He had to restrict his activities because he often would fall suddenly and find himself virtually helpless. Yet, he kept on with many activities, especially his research on Coccinellidae. One thing he always wished to do was to take a walk around the borders of his property every day that the weather permitted him to get out. He wanted to see how things looked. As he grew older, this took longer and longer, because he had to walk slowly to avoid falling.

By the time he was 75 he needed an hour to make the circuit. On May 13, 1969, he set out to make the rounds of his boundaries. When he had not returned in well over an hour, Clara became worried. She went to look for him, and she found him where he had fallen in a spot where he had been caught in a grass fire. He had fallen and had been unable to rise. He was badly burned and unconscious. She summoned help and Ed was taken to Boston, the nearest place where there were facilities for emergency treatment of massive burns. He died without regaining consciousness.

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C. F. W. Muesebeck
R. D. Gordon
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of the
ENTOMOLOGICAL SOCIETY of WASHINGTON

DEPARTMENT OF ENTOMOLOGY
SMITHSONIAN INSTITUTION
WASHINGTON, D.C. 20560

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PROCEEDINGS OF THE

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Vol. 73 JUNE 1971 No. 2

TWO NEW SPECIES OF ECHINISCUS FROM THE PACIFIC NORTHWEST
(TARDIGRADA: ECHINISCIDAE)

ROBERT O. SCHUSTER *and* ALBERT A. GRIGARICK, *Department of Entomology, University of California, Davis, California 95616*

ABSTRACT—Two new species are described in the tardigrade genus *Echiniscus*. One species, **horningi**, occurs along the north coast of California and in western Oregon. The other, **knowltoni**, appears to be restricted to desert areas of southern Idaho and northern Utah.

In a previous study, Schuster and Grigarick (1965) recorded the presence of *Echiniscus* (*Echiniscus*) *multispinosus* Cunha in five localities in Oregon and California. The absence of spine B^d and the presence of barbs on lateral spines D and E were noted for these specimens but these discrepancies from the described form were attributed to intraspecific variation. Additional material has been collected recently from this general area and these specimens are essentially identical to those collected previously. The characters distinguishing these populations now appear to be constant and sufficient to allow recognition of a species distinct from *multispinosus*.

Echiniscus (Echiniscus) horningi Schuster and Grigarick, n. sp.
(Figs. 1–3)

Holotype (slide): Length excluding legs IV 250 μ, including legs IV 280 μ; width 125 μ; eye spots present. Distribution of dorsal plates as illustrated (fig. 1); cuticle of plates composed of polygons 1 μ to 1.7 μ across, with pores of ca 1 μ diameter unevenly distributed (fig. 1, 8.5 μ square). Head with internal cirrus 28 μ long; external cirrus 34 μ long; papilla 10 μ long, 6 μ wide. Spines present at lateral and dorsolateral positions A, B, C, D, E and at dorsal positions C, D; lateral spines D, E distinctly barbed. Legs I and IV with papillae ca 5 μ long; leg IV with dentate collar of 13 teeth; internal claws of legs I–IV with recurved spur, external claws simple.

Supplementary descriptive information (fig. 2, head, and fig. 3, tail) are photographs of a paratopotype taken with a Stereoscan microscope. The specimen was prepared by fixing in boiling water-formalin, freeze drying, and gold plating. Facets of the terminal plate are apparent on dried specimens but are not evident on slide mounted examples.

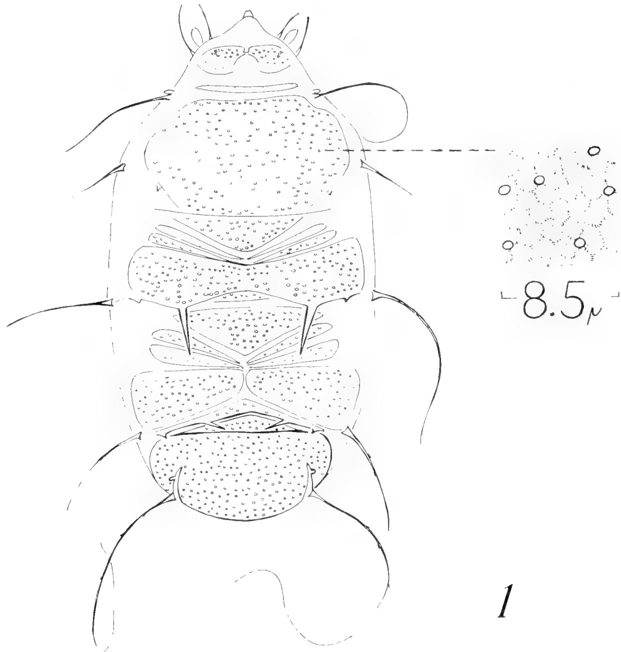
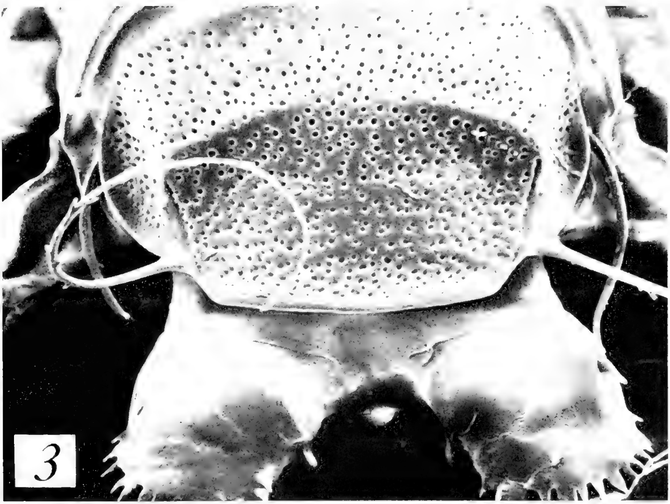


Fig. 1. *Echiniscus horningi* Schuster and Grigarick, n. sp., holotype, dorsal.

The holotype (UCD 401) was collected in Silver Falls State Park, Marion County, Oregon 1-10-1970, by D. S. Horning, Jr. Ten paratypes are designated: 2 specimens collected with the holotype; 4 specimens 1 mi S Newport, Lincoln County, Oregon, X-17-1962, K. Goeden; 1 specimen 3 mi S Florence, Lane County, Oregon, XII-20-1969, C. J. and D. S. Horning; 3 specimens 4 mi SW Camas Valley, Douglas County, Oregon, XII-20-1969, D. S. Horning. Specimens from Marin and San Mateo counties are apparently conspecific but are not included in the type series.

Echiniscus multispinosus is described as having a uniformly pitted cuticle, dorsal spine B, and simple lateral spines D and E. *Echiniscus horningi* has a cuticular sculpture of irregularly spaced pores and uni-



Figs. 2–3. *Echiniscus horningi* Schuster and Grigarick, n. sp.: 2, paratopotype, anterior aspect 1,750×; 3, paratopotype, posterior aspect 2,150×.

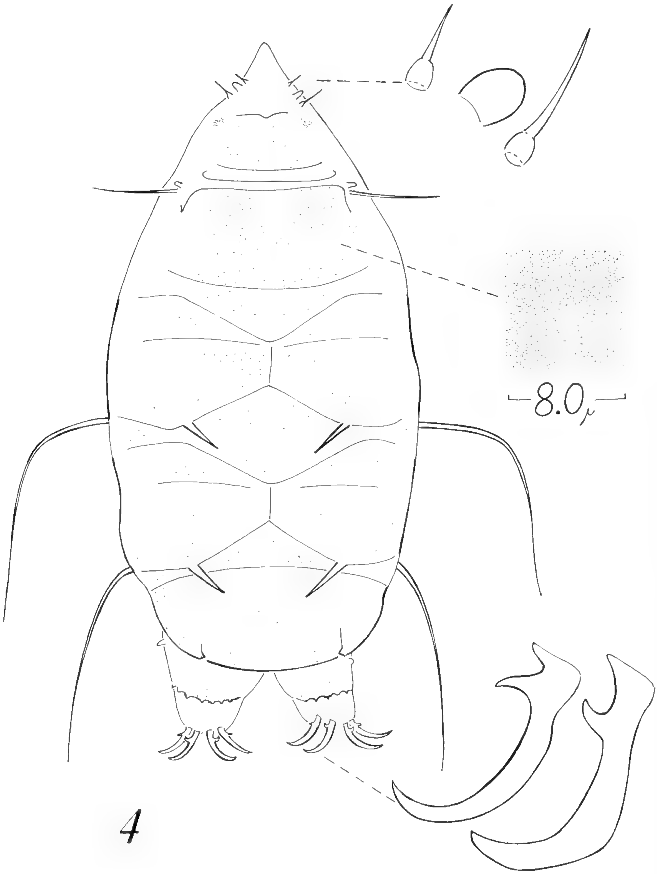


Fig. 4. *Echiniscus knowltoni* Schuster and Grigarick, n. sp., holotype, dorsal.

formly spaced polygons, lacks dorsal spine B, and has barbed lateral spines D and E. The species is named for Dr. Donald S. Horning, Jr. in appreciation of his effort in collecting nearly 200 samples of Tardigrada in Oregon.

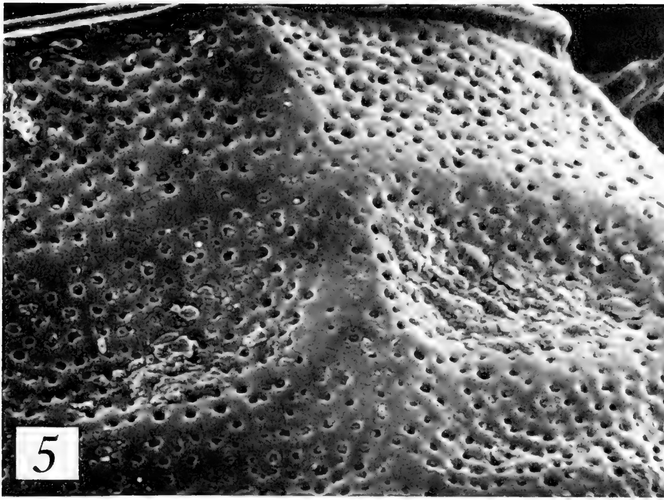


Fig. 5. *Echiniscus knowltoni* Schuster and Grigarick, n. sp., paratype, scapular plate 2,520×.

Echiniscus (Echiniscus) knowltoni Schuster and Grigarick, n. sp.

(Figs. 4, 5)

Holotype (slide): Length excluding legs IV 255 μ, including legs IV 290 μ; width 120 μ; eye spots present. Distribution of dorsal plates as illustrated (fig. 4); cuticle of plates essentially smooth between unevenly spaced pores of less than 1 μ diameter. Head with internal cirrus 9 μ long; external cirrus 17 μ long; papilla 6 μ long, 5 μ wide. Scapular plate with 2 transverse and 3 longitudinal stripes of reduced punctation (fig. 5). End plate with 4 longitudinal stripes, 1 distinct transverse stripe at anterior one-third, 1 obscure stripe at posterior one-third. Anterior areas of plates C, D, anterior area of median plate II, and all of median plate III with uneven texture. Lateral filaments ca 120 μ long, and dorsal spines ca 30 μ long present on plates C, D. Legs I and IV with papilla 4 μ long; leg IV with narrow plate and dentate collar of 9 to 12 indistinctly separated teeth; internal claws of leg IV with large recurved spur, external claw IV with perpendicular spur.

The holotype (UCD 402) is from Black Pine, Oneida County, Idaho, IX-29-1969, collected by G. F. Knowlton. Thirty-eight paratypes are from: Black Pine, Oneida County, Idaho, IX-29-1969, moss under *Juniperus osteosperma* (Torr.) Little; 8 mi NW Kelton, Box Elder County, Utah, XI-8-1969, moss under *J. osteosperma*; Kelton Pass, Box Elder County, Utah; VII-8-1969; moss beneath juniper; 5 mi SW Juniper, Oneida County, Idaho, XI-22-1969, moss on *J. osteosperma*; all by G. F. Knowlton.

Echiniscus knowltoni will key to *E. trisetosus* Cuénot in Ramazzotti's monograph (1962). The cuticular sculpture of *trisetosus* is polygonal, similar to *E. blumi* Richters, and therefore completely distinct from the sculpturing of this species. The sculpture of *knowltoni* closely resembles that of *E. quadrispinosus* Richters but the relationship is obscured by the absence of filaments B and E.

Specimens range in length from 190 μ to 300 μ. Most of the individuals fall within two size ranges, 200–210 μ and 235–260 μ.

This species is named for Dr. George F. Knowlton who collected the specimens during a study of invertebrate fauna for the IBP Desert Biome Project, Arthropod Survey.

The holotypes are in the Department of Entomology Museum at Davis, paratypes in the California Academy of Sciences and the Smithsonian Institution.

Acknowledgments

The photographs were taken by us, with the assistance of Marvin G. Kinsey, using the Cambridge Stereoscan in the Facility for Advanced Instrumentation at Davis. Financial assistance was received from the American Philosophical Society, Penrose Fund.

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Schuster, Robert O. *and* **Albert A. Grigarick.** 1965. Tardigrada from Western North America with emphasis on the fauna of California. Univ. Calif. Publ. Zool. 76:1–67.

A NOTE ON CAMPTOPROSOPELLA EQUATORIALIS SHEWELL
(Diptera: Lauxaniidae)

A series of *Camptoprosopella equatorialis* Shewell (1939, Can. Ent. 71:140) was received for determination from the Instituto Colombiano Agropecuario, with the following data: Bello, Antioquia, Colombia, 11 October 1970 (Guillermo Sánchez G.), host *Manihot utilissima*. Eight specimens were retained for the U. S. National Museum collections.

This species was described from a single damaged male specimen from "Manao," Brazil, in the USNM, and apparently not since recorded. The additional specimens, in better condition, show that the 3rd dorsocentral bristle, close before the second, is one-third the length of the second bristle and that the arista bears only very short hairs below in the basal half and 3 to 4 somewhat longer ones in the apical half.—George C. Steyskal, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture, c/o U. S. National Museum, Washington, D. C. 20560.*

A NEW TACHYSPHEX FROM FLORIDA, WITH KEYS TO THE MALES AND FEMALES OF THE FLORIDA SPECIES
(HYMENOPTERA: SPHECIDAE: LARRINAE)

FRANK E. KURCZEWSKI, *Department of Forest Entomology, State University College of Forestry at Syracuse University, Syracuse, New York 13210*

ABSTRACT—*Tachysphex krombeini*, n. sp. is described from Florida. Keys to the males and females of the Florida species are presented. Notes on the ecology and nesting behavior of this new species are given.

This new species of *Tachysphex* from Florida is being described so that a name will be available for subsequent studies on the comparative behavior of the Nearctic species. The species was first collected by Karl V. Krombein during his and Howard E. Evans' 1953 and 1954 collecting trips through Florida. I have examined 18 of these specimens in addition to seven of my own. I am pleased to name the species for Karl V. Krombein, Smithsonian Institution, who first collected it and has contributed much to our knowledge of the behavior and taxonomy of the Hymenoptera.

Tachysphex krombeini, n. sp.

Tachysphex sp. No. 3, Krombein and Evans, 1954. Proc. Ent. Soc. Wash. 56:233 (1 ♀, Arcadia, Fla.; 1 ♀, Orlando, Fla.).—Krombein and Evans, 1955. Proc. Ent. Soc. Wash. 57:231 (2 ♂ ♂, Marco, Fla.; 3 ♀ ♀, 1 ♂, Olga, Fla.; 4 ♀ ♀, 5 ♂ ♂, Arcadia, Fla.; 3 ♀ ♀, 5 ♂ ♂, Orlando, Fla.).

Holotype. ♂; Arcadia, DeSoto County, FLORIDA; March 31, 1954 (K. V. Krombein) [U. S. National Museum, Type No. 70720].

Male. Length 4.0–5.0 (mean, 4.4) mm, forewing 3.0–3.5 (mean, 3.2) mm. Black; apex of underside of scape, labrum, apical one-third to one-half of mandible, apices of tarsi, apex of innerside of hind tibia, last third to half of tegula testaceous; foretarsal pecten and other tarsal and tibial brushes and spines, except mid and hind spurs, golden-brown; apices of first six abdominal terga and sterna faintly coppery-colored; wings with membrane moderately infuscated, veins testaceous; no. of hamuli on margin of hindwing, 8–10 (mean, 9).

Vestiture conspicuous but not dense, silvery and rather appressed on underside of scape, base of mandible, face below median ocellus, back of head, thorax, legs, and sterna and apices of first five abdominal terga; short, erect, prominent setae on antennae.

Clypeus and frons finely and densely punctured, except apical bevel of clypeus polished and with scattered punctures, clypeal lip smooth and broadly rounded, separated from bevel by an impressed line; punctures on vertex more widely separated than those on frons; vertex rather shiny around and behind posterior ocelli; scutum and scutellum not as shiny, with closer punctures, propodeum moderately granulose above, laterally with fine, close oblique rugae, declivity with coarse oblique rugae; first six abdominal terga rather shiny, with relatively sparse, shallow punctures; seventh tergum with larger, more distinct punctures.

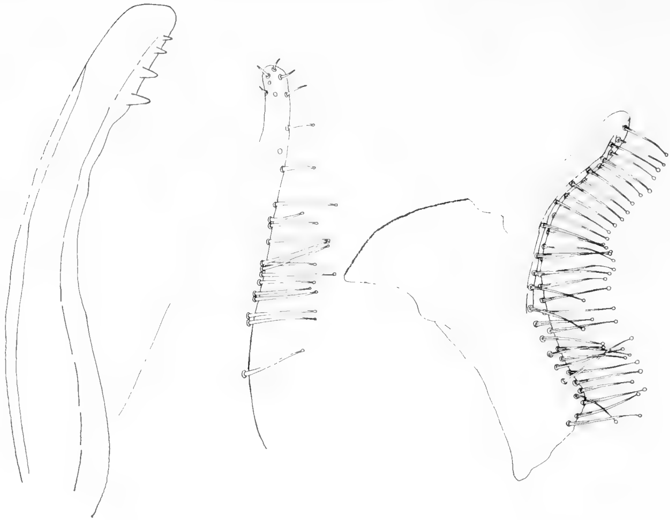

Fig. 1. Aedeagus, gonostyle, and volsella, respectively, of *Tachysphex krombeini*, n. sp. Illustrations are from paratypes, based on ocular grid drawings from dissected and whole mounts. Details were obtained at a magnification of 450×.

Range of ratios (with mean in parentheses) of lengths of first three flagellar segments, head width, least interocular distance (see R. Bohart, 1962), and clypeal breadth as 6–8 (7.1) : 8–10 (8.9) : 8–10 (9.0) : 63–82 (71.2) : 16–18 (17.4) : 38–47 (42.1).

Front tarsus with a definite comb, apical two setae of basal tarsomere about two-fifths its length; number of lateral setae per tarsomere from basal segment: 4–5, 2, 1–2, 1, 0.

Genitalia (fig. 1): Setae of volsella moderately long, stout, capitate, and seemingly bipartite at base, relatively few in number, well-spaced, and arranged in two nearly parallel rows; setae of gonostyle moderately long or shorter toward apex, stout, frequently knobbed, less tapered than those of volsella, fewer in number, and staggered in an indistinct row or two except at apex; serrated crest of volsella with margin evenly arched above, more abrupt posteriorly; aedeagus relatively long with four or five well-spaced teeth, which decrease in size toward apex; apical (fifth) tooth barely distinguishable, basal tooth may be sharply notched.

Allotype. ♀; same data as holotype [USNM].

Female. Length 5.0–6.5 (mean, 5.9) mm, forewing 3.5–4.5 (mean, 4.0) mm. Colored as in male, except apical two-fifths to one-half of mandible, sting and sheath testaceous; apices of first five abdominal terga and sterna faintly coppery colored; wings with membrane apparently slightly more infuscated than in male, veins testaceous; no. of hamuli on margin of hindwing, 9–13 (mean, 11).

Vestiture similar to that of male except sparser and more appressed on abdomen, silvery bands across apices of first four abdominal terga; antennal setae not as stiff and erect.

Punctation of clypeus, frons, vertex, scutum, scutellum, propodeum, and abdominal terga similar to that of male, except clypeal bevel highly polished and more sparsely punctured, lip highly polished, more broadly arched than in male, with a shallow lateral notch; separated from bevel by an impressed line.

Range of ratios (with mean in parentheses) of lengths of first three flagellar segments, head width, least interocular distance, and clypeal breadth as 10–13 (11.0) : 12–15 (13.3) : 13–16 (14.4) : 85–105 (92.4) : 18–21 (18.9) : 50–59 (53.4).

Front tarsus with individual setae about three-fourths as long as basal tarsomere; number of setae per tarsomere from basal segment: 5–6, 3–4, 3, 2, 0.

Pygidium polished apically, otherwise subpolished, with a fine reticulation, sparsely punctured, angled at about 35 degrees, not depressed.

Paratypes. 10♂♂, 13♀♀; Arcadia, DeSoto County, FLA., April 2–3, 1953 (♀), March 31, 1954 (3♂♂, 3♀♀) (K. V. Krombein); same locality, April 6, 1966 (1♂), March 30, 1967 (1♂), March 29, 1968 (1♂), June 27, 1967 (1♀) (Ethology Note No. TX-72), April 6–9, 1971 (3♀♀) (F. E. Kurczewski); Olga, Lee County, FLA., March 29, 1954 (1♀), March 30, 1954 (2♀♀) (K. V. Krombein); Orlando, Orange County, FLA., April 4, 1953 (1♀), April 3, 1954 (1♀, 4♂♂) (K. V. Krombein). All specimens collected "on sand" or "on sand flats." Paratypes have been deposited in the collections of the U. S. National Museum, K. V. Krombein, F. E. Kurczewski, University of California at Davis, Museum of Comparative Zoology, and Cornell University.

Tachysphex krombeini can be readily distinguished from the other Florida species by the combination of small size, all-black color, narrow least interocular distance, foretarsal comb and distinctive genitalia in the male, and clypeus with only a single notch laterally in the female. In Florida it is allied to the recently described *T. boharti* Krombein, which has the abdomen partly or entirely red, is slightly larger, has a wider least interocular distance, a much more polished pygidium, and, according to Krombein (1963), distinctive genitalia.

The following keys will serve to separate the males and females of the Florida species of *Tachysphex*. In many cases I have utilized size and color for the sake of convenience although it is recognized that such characters show considerable infraspecific variation.

Males

1. Vertex with long, erect setae; a distinct convexity behind each posterior ocellus; vertex and thorax highly polished, with well-separated punctures 2
   Vertex with very short setae or none at all; no convexities behind posterior ocelli; vertex and thorax subpolished, opaque, or subopaque with fine, close punctures 3

2. Fortetarsus with a distinct digging comb .... **similis** Rohwer
   Foretarsus without a digging comb .... **apicalis** Fox
3. Large species, body length about 11–12 mm; all-black .... **punctifrons** (Fox)
   Small species, less than 10 mm long; black or red and black 4
4. Foretarsus without a digging comb; apices of femora, tibiae, and tarsi testaceous or yellowish; setae on face golden .... **minimus** (Fox)
   Foretarsus with a distinct digging comb; tarsi at most reddish; setae on face silvery or cinereous 5
5. All-black .... **krombeini**, n. sp.
   Abdomen red and black 6
6. Scutum and scutellum opaque; propodeal declivity granulose; larger species, body length 6–7 mm .... **laevifrons** (Smith)
   Scutum and scutellum shiny; propodeal declivity with oblique rugae; smaller species, body length 5 mm .... **boharti** Krombein

FEMALES

1. Vertex with long, erect setae; a distinct convexity behind each posterior ocellus; vertex and thorax highly polished, with well-separated punctures .. 2
   Vertex with very short setae or none at all; no convexities behind posterior ocelli; vertex and thorax subpolished, opaque, or subopaque with fine, close punctures 3
2. Anterior margin of clypeus with a median lobe; least interocular distance (vertex) more than one-half the interocular distance at the lower edge of the eyes; last abdominal tergite red .... **apicalis** Fox
   Anterior margin of clypeus not produced into a lobe; least interocular distance one-half or less the interocular distance at the lower edge of the eyes; abdomen entirely black .... **similis** Rohwer
3. Anterior edge of clypeus with a median emargination and two lateral teeth .. 4
   Anterior margin of clypeus entire or with only a single notch laterally 5
4. Abdomen black; vestiture silvery or occasionally golden in older specimens .... **minimus** (Fox)
   Abdomen red and black; vestiture golden .... sp. nr. **belfragei** (Cresson)
5. Abdomen black 6
   Abdomen red or red and black 7
6. Large species, body length about 12–13 mm .... **punctifrons** (Fox)
   Small species, body length 5–6 mm .... **krombeini**, n. sp.
7. Abdomen red and black; hind legs black; body covered with short, cinereous setae; larger species, 7.5–9.5 mm long .... **laevifrons** (Smith)
   Abdomen red; hind femora black or reddish; body covered with rather long, silvery setae; smaller species 5.5–7.5 mm long .... **boharti** Krombein

T. krombeini nests in areas of sand with sparse vegetation (see fig. 4, Krombein and Kurczewski, 1963). The inclusive dates of collection of the type series (March 29–June 27) suggest two or more generations per year in Florida. Such multivolinity is common in this genus. Of the six other species of *Tachysphex* which inhabit the sand flats at Arcadia, Florida, only *T. laevifrons* is univoltine. The following notes on the nesting behavior of *T. krombeini* were obtained on June 27, 1967 at Arcadia at an ambient temperature of 31° C.

One wasp (ethology note no. TX-72) constructed her nest in loose sand amidst grasses and decumbent twigs. Her entrance, 3 mm in diameter, was situated beside a grass clump and beneath an overhanging twig. The sand removed from the burrow formed a tumulus, 2.0 cm long, 1.9 cm wide, and 0.9 cm high, in front of the entrance. The nest entrance was left open during the provisioning trips. Beginning at 1330 hours the female was observed to bring five prey to her nest in 65 minutes. She spent 1–31 minutes for individual provisioning trips. Prey were brought to the nest in rather high, rapid flights, the speed of the flights varying inversely with the sizes of the prey. The provisioning wasp held the prey underneath her body with the legs, grasping its antennae with the mandibles. She plunged into the entrance, quickly releasing the prey just inside, and disappeared from sight. She reappeared head first 3–8 seconds later, and, grasping the prey by its antennae with the mandibles, backed into the nest. The fact that each individual was released ventral side up suggests that they were transported to the nest in this position. Small individuals were released farther inside the entrance than larger ones. For example, two small prey were released with only their hind tarsi and last few abdominal sternites visible in the entrance. Larger prey, on the other hand, were placed with the head inside the entrance, the remainder of the body lying exposed on the sand. Eight to sixteen seconds after pulling in the prey the wasp reappeared head first in the entrance and flew away. In no case did she orient to her surroundings or turn toward the entrance. Twice I was able to follow her during her hunting excursions. In both cases she searched for prey near her nest. Hunting activities included flying from plant to plant, running on the stems and leaves, and hovering nearby. In such a manner she was seen to flush tiny prey from the vegetation but was unsuccessful in capturing any of these individuals. At about 1435 hours the provisioning female returned with her last prey, took it inside, and remained in the nest for several minutes. She finally appeared head first, filling the burrow. Coming outside, she raked sand backward with the forelegs which were bent medially; then she backed into the burrow while raking and packed the sand into the tunnel with the bent end of the abdomen. While hammering she held the antennal tips against the walls of the burrow. I collected the wasp before she finished and then excavated her nest.

The burrow, 3 mm in diameter, entered the sand at an angle of about 37° to the horizon, coursed obliquely for 4.8 cm, and terminated in a small oval cell, 2.8 cm beneath the surface. The cell contained seven rather thoroughly paralyzed prey—six nymphal acridids (*Melan-*

oplus sp.) and one nymphal tettigoniid (*Odontoxiphidium apterum* Morse). Five of the acridids, including the one to which the wasp's egg was attached, were positioned ventral side up and head inward. The other acridid and tettigoniid were each placed dorsal side up and head inward. The tettigoniid weighed only 4 mg, the acridids, 5, 5, 6, 6, 6, and 8 mg (female wasp, 6.5 mg), or a total of 40 mg for the cell contents. The wasp's egg was attached by the cephalic end to the soft corium surrounding the base of the largest acridid's left forecoxa and laid transversely behind the front legs. It was slightly curved throughout its length, sausage-shaped, cream in color, elastic, and 1.5 mm long and 0.4 mm wide. It was preserved in 70 percent alcohol for further study.

One female was captured at Arcadia at 1410 hours on April 9, 1971, flying with a paralyzed nymphal *Melanoplus* sp. The wasp weighed 6.5 mg, and the prey, 7 mg.

T. krombeini is the only Florida species which nests in flat sand, leaves the nest entrance open during provisioning trips, transports the prey in flight, makes a single-celled nest, and stores several tiny acridids and tettigoniids mixed in the cell. Its nesting behavior most closely resembles that of *T. sepulcralis* Williams, a species of the Great Plains, except that *T. sepulcralis* stores only acridids. In Florida both *T. boharti* and *T. laevifrons* nest in flat sand, leave the nest entrance open during provisioning trips, and construct a one-celled nest; however, these species store only one or a few larger acridids per cell and often transport the prey on the ground.

Acknowledgments

I am grateful to Karl V. Krombein, Smithsonian Institution, for reading the manuscript critically, and to Ashley B. Gurney, U. S. National Museum, for identifying the prey acridids and tettigoniids. I am also indebted to Richard Archbold and his staff for providing the excellent facilities of the Archbold Biological Station, Lake Placid, Florida. Carey E. Vasey, one of my graduate students, kindly dissected and mounted the male genitalia for study.

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OBSERVATIONS ON THE LARVA OF HYPERA EXIMIA (LeCONTE) (COLEOPTERA: CURCULIONIDAE)

D. M. ANDERSON, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—The recently discovered larva of *Hypera eximia* (LeConte) is compared with the larvae of *H. rumicis* (L.) and *H. compta* Say. Modifications of the existing key to North American *Hypera* larvae are proposed.

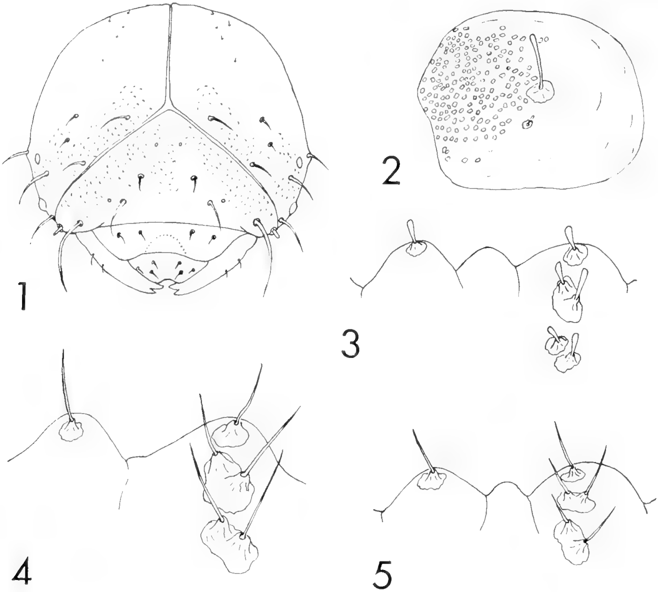
The larvae of most of the native and introduced species of *Hypera* Germar in North America have been better known since the publication of a key to 14 Nearctic and Palearctic species by Anderson (1948) and of the work on central European weevil larvae by Scherf (1964), but the immature stages of *Hypera eximia* (LeConte) have hitherto remained entirely unknown. However, a series of larvae and pupae, associated with adults identified as *Hypera eximius* by R. E. Warner of this Laboratory, were recently collected on dock plants (*Rumex* sp.) by Mr. Benjamin Puttler of the Biological Control Research Laboratory, USDA, Columbia, Missouri. In the paragraphs which follow, the mature larva of *H. eximia* is compared with larvae of 2 other species which are similar to it, and the changes necessary to fit it into the 1948 key by Anderson are indicated. The technical terms used are defined in the paper on a terminology for weevil larvae by Anderson (1947).

All of the specimens mentioned have been placed in the collection of the U. S. National Museum in Washington, D.C.

COMPARATIVE NOTES

The mature larva of *Hypera eximia* agrees in all ways with the generic larval description of *Hypera* (Anderson, 1948), which will not be repeated here. In respect to specific characters, it strongly resembles the larvae of the introduced *H. rumicis* (L.) and the native *H. compta* (Say) in having the abdominal segments distinctly darker above than below the epipleura, the head capsule entirely dark and finely granulate dorsally and laterally (fig. 1), and the abdominal pleura without asperities behind the longest seta (fig. 2). Thus, the larva of *H. eximia* fits into the third group of *Hypera* larvae recognized by Anderson (1948). It can, however, be easily distinguished from the larvae of both *H. rumicis* and *H. compta* by its dorsal body setae, which are much shorter and more distinctly enlarged toward the apex than in those species (compare figs. 3, 4, 5). *H. eximia* can be further distinguished from *H. rumicis* by the surface of the pronotal sclerite, which is covered with blunt asperities in *H. rumicis* but is smooth with

[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.



Figs. 1–3. *Hypera eximia* (Lec.): 1, head, dorsal view; 2, abdominal pleural lobe, showing distribution of asperities; 3, dorsal setae of abdominal segment II. Fig. 4. *Hypera compta* Say, dorsal setae of abdominal segment II. Fig. 5. *Hypera rumicis* (L.), dorsal setae of abdominal segment II.

a shiny central area in *H. eximia.* Dorsal fold III of the abdominal segments is clearly present in *H. eximia* and *H. rumicis* (figs. 3, 5), but is apparently absent in *compta* (fig. 4).

In order to facilitate the identification of the larva of *H. eximia*, I am proposing that the key to *Hypera* larvae by Anderson (1948) be modified to include *H. eximia* through the substitution of the following couplets for couplets 1 and 9. Figure numbers in the substitute couplets refer to figures in the original work by Anderson (loc. cit.).

Couplet 1:

1. Principal dorsal setae cylindrical to club shaped, short (figs. 9, 22–25) *and* abdomen not distinctly darker dorsally than ventrally; head capsule orange anteriorly, brown or mottled posteriorly (often completely orange in *nigrirostris*) 2

Principal dorsal setae cylindrical to attenuate, not enlarged apically, usually elongate (figs. 3–5, 8) *or*, if widened toward apex, as in *eximia*, the abdomen distinctly darker dorsally than ventrally; head capsule brown to nearly black, without a transverse orange band anteriorly 8

Couplet 9:

9. Principal dorsal body setae short, distinctly enlarged apically; pronotal sclerite smooth with a central shiny area; dorsal fold III distinct on first 6 abdominal segments .... **eximia** (LeConte)

Principal dorsal body setae elongate, not enlarged apically; other characters not in same combination as above 9a

9a. Frons with 3 pairs of setae (fig. 15); pronotum nearly uniformly covered with blunt asperities; dorsal fold III distinct on abdominal segments 1–6. Head width: 0.81 to 0.85 mm .... **rumicis** (L.)

Frons with 4 pairs of setae (fig. 14); pronotum with a shiny pigmented sclerite not covered with asperities; dorsal fold III apparently absent on abdominal segments 1–6. Head width: 0.65 mm .... **compta** (Say)

Material Examined

The larval specimens studied were labeled with the following data. Numbers in parenthesis indicate the actual number of larvae (which often were associated with adults and/or pupae) in each series.

Hypera compta: Priest Bridge, Md., May 21, 1939 and June 2, 1940, on *Polygonum*, W. H. Anderson Colr. (48); Havana, Ill., April 30, 1898, on *Polygonum* (6); Clifton Hills, Mo., May 21, 1968, Hostetter & Thewke (84); Canada (no other locality), June 6, 1922, on *Polygonum* (11).

Hypera eximia: Carrollton, Missouri, May 26, 1967, May 9, 1968, Ex *Rumex*, Puttler & Thewke (63).

Hypera rumicis: New Jersey Interstate Park, June 30, 1930, on *Rumex*, J. C. Bridwell (5); New Jersey, May 24, 1957, on Dock, D. W. Jones (7); Ravenkilde, Rebild, Jutland, Denmark, July 14, 1917, on *Rumex*, J. P. Kryger (18); Holmegaard, Denmark, July 9–15, 1939, *Rumex hydrolapathum*, J. P. Kryger (6).

References

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HOST PLANTS OF THREE POLYPHAGOUS AND WIDELY DISTRIBUTED APHIDS IN THE LOS ANGELES STATE AND COUNTY ARBORETUM, ARCADIA, CALIFORNIA[1]

(HOMOPTERA: APHIDIDAE)

MORTIMER D. LEONARD, *Collaborator, Entomology Research Division, Agricultural Research Service, U. S. Department of Agriculture*[2]

and

HARRY G. WALKER, *Entomologist, and* LEONID ENARI, *Plant Taxonomist, Los Angeles State and County Arboretum, 301 North Baldwin Avenue, Arcadia, California 91006*

ABSTRACT—Host plants are listed for *Acyrthosiphon* (*Aulacorthum*) *solani* (Kalt.), *Macrosiphum euphoribae* (Thom.) and *Myzus ornatus* Laing from collections made during 1966 and 1967 in the Los Angeles State and County Arboretum, Arcadia, California.

During 1966 and 1967, aphids were collected from 1,332 different kinds of plants at the Los Angeles State and County Arboretum, Arcadia, California. Among other aphids, three polyphagous and widely distributed species were found. They were: *Acyrthosiphon* (*Aulacorthum*) *solani* (Kaltenbach), *Macrosiphum euphorbiae* (Thomas) and *Myzus ornatus* Laing. For each species a list of the host plants is given, arranged in alphabetical order according to genera, including the date or dates of collection and an indication of the relative abundance of the aphids. In addition, there is an alphabetical listing of the family names of the host plants, plus the number of genera, the number of hosts and the number of collections in which each species was found. *A. solani* is listed from 64 plants, *Macrosiphum euphoribae* from 107, and *Myzus ornatus* from 110.

HOST PLANTS OF **Acyrthosiphon (Aulacorthum) solani** (KALTENBACH) ARRANGED IN ALPHABETICAL ORDER ACCORDING TO GENERA, INCLUDING THE DATE OR DATES OF COLLECTION AND AN INDICATION OF THE RELATIVE ABUNDANCE OF THE APHIDS

Caprifoliaceae
Abelia grandiflora Rehd.
28/IV/67 scarce

Acanthaceae
Acanthus mollis Linn.
28/II/67 scarce

Elaeocarpaceae
Aristotelia maqui L'Herit
28/IV/67 scarce

Loganiaceae
Buddleia 'Royal Purple'
5/IV/67 moderate

[1] This is the third paper in a series on the host plants of aphids at the Los Angeles State and County Arboretum in which Dr. Leonard was responsible for the identification of the aphids, Dr. Walker for their collection, and Dr. Enari for the identification of the host plants.

[2] Mail address: 2480 16th Street, N.W., Washington, D. C. 20009.

Myrtaceae
Callistemon sp.
14/IV/67 scarce
C. pachyphyllus viridis Cheel
14/IV/67 scarce
Leguminosae
Cassia australis Reinw.
12/IV/67 scarce
C. didymobotrya Fresen.
17/IV/67 moderate
Compositae
Chrysanthemum indicum Linn.
15/III/67 moderate
Ranunculaceae
Clematis paniculata Thunb.
4/V/67 scarce
Leguminosae
Clianthus formosus Ford & Vickery
12/IV/67 scarce
Cornaceae
Cornus candidissima Mill.
5/IV/67 moderate
Rosaceae
Cotoneaster amoena E. H. Wilson
28/IV/67 scarce
Compositae
Dahlia sp.
5/VII/67 scarce
Leguminosae
Dalbergia sissoo Roxb.
6/V/67 scarce
Sterculiaceae
Dombeya dregeana Sond.
15/III/67 moderate
D. natalensis Sond.
3/XI/67 scarce
Flacourtiaceae
Dovyalis caffra Warb.
6/IV/67 moderate
Boraginaceae
Ehretia hottentotica Burch.
20/IV/67 moderate
Euphorbiaceae
Euphorbia candelabrum Tremaut
25/IV/67 scarce
Liliaceae
Eustrephus latifolius R. Br.
12/IV/67 scarce
Geitonoplesium cymosum A. Cunn.
12/IV/67 moderate

Proteaceae
Grevillea 'Pink Pygmy'
11/IV/67 moderate
Melianthaceae
Greyia sutherlandii Hook. & Harv.
17/IV/67 scarce
Malvaceae
Hibiscus pedunculatus Linn.
5/IV/67 scarce
Hypericaceae
Hypericum hircinum Linn.
10/III/67 moderate
H. hookerianum Wight & Arn.
20/IV/67 abundant
2/V/67 moderate
H. patulum Thunb.
19/VI/67 moderate
H. polyphyllum Boiss. & Bal.
13/V/67 moderate
H. revolutum Vahl.
10/III/67 moderate
Aquifoliaceae
Ilex burfordii Howell
2/V/67 scarce
I. latifolia Thunb.
1/V/67 scarce
I. rotunda Thunb.
2/V/67 scarce
Geraniaceae
Impatiens sultani Hook.
27/XII/67 scarce
Crassulaceae
Kalanchoe blossfeldiana V. Poelln.
25/IV/67 scarce
Verbenaceae
Lantana kisi A. Rich
17/IV/67 scarce
L. montevidensis Briq.
26/X/67 scarce
Myrtaceae
Leptospermum scoparium 'Grandiflorum Roseum'
12/IV/67 scarce
Melaleuca elliptica Labill
13/IV/67 scarce
M. monticola F. M. Black
14/IV/67 moderate
M. pauciflora Turcz.
17/IV/67 scarce

M. platycalyx Diels.
14/IV/67 scarce
Compositae
Montanoa bipinnatifida C. Koch
10/XI/66
Myrsinaceae
Myrsine africana Linn.
14/III/67 scarce
Hamamelideae
Parrotia persica C. A. Mey.
5/IV/67 moderate
Leguminosae
Phaselous caracalla Linn.
20/IV/67 scarce
Oleaceae
Phillyrea media Linn.
18/III/67 abundant
Pittosporaceae
Pittosporum phillyraeoides DC.
17/III/67 moderate
Labiatae
Prostanthera nivea A. Cunn.
14/IV/67 moderate
Rosaceae
Pyracantha koidzumii Rehder
16/III/67 moderate
Pyrus communis Linn.
24/III/67 abundant
Rubiaceae
Randia rudis E. Mey.
16/IV/67 moderate
Bignoniaceae
Rhigozum obovatum Burch
6/IV/67 moderate
Saxifragaceae
Ribes viburnifolium A. Gray
2/V/67 scarce
Leguminosae
Robinia hispida Linn.
1/VI/67 scarce
Labiatae
Salvia apiana Jepson
24/III/67 abundant
S. microphylla H. B. & K.
14/III/67 abundant
27/III/67 scarce
13/VI/67 scarce
Euphorbiaceae
Sarcococca ruscifolia Stapf.
4/V/67 scarce
Compositae
Senecio petasitis DC.
7/IV/67 moderate
Leguminosae
Sophora moorcroftiana Benth.
6/IV/67 moderate
Apocynaceae
Strophanthus divaricatus Wall.
23/VI/67 moderate
Caprifoliaceae
Viburnum opulus 'Hans'
8/V/67 moderate
Apocynaceae
Vinca major Linn.
6/XI/67 abundant
Leguminosae
Wisteria floribunda DC.
5/IV/67 moderate

AN ALPHABETICAL LIST OF THE FAMILIES OF THE HOST PLANTS OF **Acyrthosiphon (Aulocorthum) solani** (KALTENBACH), INDICATING THE NUMBER OF GENERA, OF SPECIES OR OTHER CLASSIFICATION AND THE NUMBER OF COLLECTIONS MADE DURING 1966 AND 1967.

Family	Genera	Hosts	Collections
Acanthaceae	1	1	1
Apocynaceae	2	2	2
Aquifoliaceae	1	3	3
Bignoniaceae	1	1	1
Boraginaceae	1	1	1
Caprifoliaceae	2	2	2
Compositae	4	4	4
Cornaceae	1	1	1

LIST (CONTINUED)

Family	Genera	Hosts	Collections
Crassulaceae	1	1	1
Elaeocarpaceae	1	1	1
Euphorbiaceae	2	2	2
Flacourtaceae	1	1	1
Geraniaceae	2	2	2
Hamamelideae	1	1	1
Hypericaceae	1	5	6
Labiatae	2	3	5
Leguminosae	7	8	8
Liliaceae	2	2	2
Loganiaceae	1	1	1
Malvaceae	1	1	1
Melianthaceae	1	1	1
Myrsinaceae	1	1	1
Myrtaceae	3	7	7
Oleaceae	1	1	1
Pittosporaceae	1	1	1
Proteaceae	1	1	1
Ranunculaceae	1	1	1
Rosaceae	2	2	2
Rubiaceae	1	1	1
Saxifragaceae	1	1	1
Sterculiaceae	1	2	2
Verbenaceae	1	2	2
Total	50	64	67

HOST PLANTS OF **Macrosiphum euphorbiae** (THOMAS) ARRANGED ALPHABETICALLY ACCORDING TO GENERA INCLUDING THE DATE OR DATES OF COLLECTION AND AN INDICATION OF THE ABUNDANCE OF THE APHIDS.

Caprifoliaceae
Abelia sp.
28/IV/67 scarce
Malvaceae
Abutilon hybridum Voss.
17/V/67 scarce
A. hybridum 'Pink'
13/VII/66 scarce
A. hybridum 'Red'
28/II/67 moderate
15/VI/67 abundant
Compositae
Ageratum mexicanum Sims.
15/III/67
Malvaceae
Alyogyne hakeifolia Alef.
30/VI/67 abundant

Amaranthaceae
Amaranthus retroflexus Linn.
14/VI/67 scarce
Scrophulariaceae
Antirrhinum sp.
14/IV/66
16/V/67 scarce
Chenopodiaceae
Atriplex halimus Linn.
22/II/67 scarce
A. vesicaria Heward
31/III/67 scarce
Rosaceae
Bencomia moquiniana Webb. & Berth.
5/IV/67 moderate
Compositae
Calendula sp.

14/IV/66	moderate
13/V/67	scarce
C. 'Lemon Ball'	
31/X/67	moderate
Myrtaceae	
Callistemon salignus australis Benth.	
13/IV/67	moderate
Bignoniaceae	
Catalpa bignonioides Walt.	
14/IV/66	scarce
C. hybrida 'Japonica'	
13/V/67	scarce
Valerianaceae	
Centranthus ruber 'Alba'	
15/II/67	abundant
Solanaceae	
Cestrum parqui L'Herit.	
21/II/67	abundant
Bombacaceae	
Chorisia speciosa St. Hil.	
12/IV/66	
25/IV/67	scarce
Compositae	
Chrysanthemum frutescens Linn.	
23/VI/67	moderate
Malvaceae	
Cienfuegosia gossypioides Hochr.	
30/III/67	moderate
Cistaceae	
Cistus crispus Linn.	
18/III/67	scarce
Convolvulaceae	
Convolvulus arvensis Linn.	
14/VI/67	moderate
Cornaceae	
Cornus amomum Mill.	
5/IV/67	moderate
Araliaceae	
Cussonia spicata Thunb.	
8/VII/67	moderate
Leguminosae	
Daubentonia tripetii Poit.	
6/VIII/66	
24/V/67	moderate
Rosaceae	
Dendriopoterium menendizii 'Virescens'	
5/IV/67	abundant
Sterculiaceae	
Dombeya rotundifolia Planch.	
6/IV/67	scarce
Chenopodiaceae	
Enchylaena tomentosa R. Br.	
31/III/67	moderate
Myoporaceae	
Eremophila serrulata Druce	
23/I/67	scarce
Compositae	
Eriocephalus africanus Linn.	
27/I/67	scarce
Papaveraceae	
Eschscholzia californica Cham.	
24/III/67	moderate
Myrtaceae	
Eucalyptus brevifolia F. Muell.	
31/III/67	scarce
E. caesia Benth.	
29/VI/67	abundant
E. diversifolia Bonpl.	
30/III/67	scarce
E. fasiculata Deane & Maiden	
6/VII/67	moderate
E. heterophylla Miq.	
31/III/67	moderate
E. megacornuta C. A. Gardner	
24/III/67	moderate
E. preissiana Schau.	
30/I/67	scarce
E. torquata Luehm.	
2/IV/67	scarce
12/IV/67	scarce
E. trachyphloia F. Muell.	
30/VI/67	scarce
E. urnigera Hook	
13/VII/67	abundant
E. viridis latiuscula Blakely	
6/VII/67	scarce
Compositae	
Gaillardia Hybrids	
15/V/67	scarce
Rubiaceae	
Gardenia jasminoides Ellis	
30/VI/67	scarce
Iridaceae	
Geissorhiza inaequalis L. Bolus	
30/IV/67	moderate

Proteaceae
Hakea leucoptera R. Br.
20/I/67 scarce
Leguminosae
Hardenbergia monophylla Benth.
25/III/67 scarce
24/X/67 scarce
Scrophulariaceae
Hebe andersonii Cockayne
15/III/67 moderate
H. perfoliata R. Br.
18/III/66 moderate
27/VI/66 abundant
10/VII/67 moderate
Cistaceae
Helianthemum canum Boiss.
18/III/67 scarce
Hypericaceae
Hypericum sp.
14/VI/67 moderate
H. arnoldianum Rehder
20/IV/67 scarce
H. densiflorum Pursh.
15/II/67 scarce
H. elatum Ait.
18/III/67 abundant
H. hircinum Linn.
23/V/67 scarce
H. revolutum Vahl.
23/V/67 moderate
H. 'Sun Gold'
15/V/67 scarce
Solanaceae
Iochroma cyaneum H. L. Green
28/IV/67 scarce
Iridaceae
Iris sp.
12/IV/66 scarce
15/III/67 abundant
5/IV/67 scarce
I. cypriana Foster & Baker
9/II/67 moderate
I. 'Helen McGregor'
29/XII/66
Bignoniaceae
Jacaranda acutifolia Humb. & Bonpl.
5/VI/67 moderate
Cupressaceae
Juniperus rigida Sieb. & Zucc.
7/II/67 scarce
Compositae
Kleinia repens Haw.
25/IV/67 abundant
Lythraceae
Lagerstroemia 'Walteriana'
16/V/67 scarce
Ficoidaceae
Lampranthus 'Hybrids'
20/IV/67 scarce
Verbenaceae
Lantana camara Linn.
27/III/67 moderate
20/IV/67 scarce
Caprifoliaceae
Lonicera japonica Thunb.
15/II/67 moderate
L. maackii Herd.
2/V/67 scarce
L. nitida E. H. Wilson
2/V/67 scarce
Pittosporaceae
Marianthus lineatus F. Muell.
28/XII/66 abundant
30/VI/67 moderate
Celastraceae
Maytenus boaria Molina
8/II/67 abundant
Berberideae
Nandina domestica Thunb.
3/V/67 moderate
Araliaceae
Nothopanax arboreum Seem.
3/VII/67 scarce
Scrophulariaceae
Penstemon sp.
15/II/67 moderate
Leguminosae
Phaseolus caracalla Linn.
28/VI/67 scarce
Saxifragaceae
Philadelphus grandiflorus Willd.
8/V/67 moderate
P. pekinensis Rupr.
13/V/67 moderate
P. schrenkii Rupr.
13/V/67 scarce
Oleaceae
Phillyrea media Linn.
18/III/67 abundant

Pittosporaceae
Pittosporum viridiflorum Sims.
22/VI/67 scarce
Punicaceae
Punica granatum nana Pers.
27/III/67 moderate
Ranunculaceae
Ranunculus sp.
30/XII/67 moderate
Rosaceae
Rosa sp.
15/VII/66
27/XII/67 abundant
R. spinosissima Linn.
1/VI/67 moderate
Rutaceae
Ruta graveolens Linn.
24/III/67 abundant
Labiatae
Salvia aurea Linn.
22/IV/67 scarce
Leguminosae
Schotia brachypetala Sond.
22/VI/67 scarce
Compositae
Senecio angulatus Linn.
23/VI/67 scarce
S. megaglossus F. Muell.
5/IV/67 scarce
S. microglossus DC.
23/VI/67 scarce
S. petasitis DC.
7/IV/66 scarce
Sonchus oleraceus Linn.
14/VI/67 abundant
Leguminosae
Sophora moorcroftiana Benth.
6/IV/67 moderate
Iridaceae
Sparaxis 'Hybrids'
3/IV/67 moderate
Rosaceae
Spiraea crenata Linn.
1/V/67 moderate
Compositae
Tagetes sp.
10/V/66 scarce
T. 'Cultivar'
20/V/66
Iridaceae
Thereianthus spicatus G. F. Lewis
3/IV/67 scarce
Rhamnaceae
Trevoa trinervia Niers.
8/II/67 abundant
Polygonaceae
Triplaris brasiliana Cham.
5/VI/67 abundant
Araliaceae
Tupidanthus calyptratus Hook
17/III/67 scarce
Verbenaceae
Verbena rigida Spreng.
20/IV/67 abundant
Caprifoliaceae
Viburnum prunifolium Linn.
8/V/67 moderate
V. suspensum Lindl.
5/V/67 scarce
Urticaceae
Zelkova serrata Makino
9/V/67

AN ALPHABETICAL LIST OF THE FAMILIES OF THE HOST PLANTS OF **Macrosiphum euphorbiae** (THOMAS) INDICATING THE NUMBER OF GENERA, OF SPECIES OR OTHER CLASSIFICATION AND OF COLLECTIONS MADE DURING 1966 AND 1967.

Family	Genera	Hosts	Collections
Amaranthaceae	1	1	1
Araliaceae	3	3	3
Berberidae	1	1	1
Bignoniaceae	2	3	3
Bombacaceae	1	1	2
Caprifoliaceae	3	6	6

List (Continued)

Family	Genera	Hosts	Collections
Celastraceae	1	1	1
Chenopodiaceae	2	3	3
Cistaceae	2	2	2
Compositae	9	14	15
Convolvulaceae	1	1	1
Cornaceae	1	1	1
Cupressaceae	1	1	1
Ficoidaceae	1	1	1
Hypericaceae	1	7	8
Iridaceae	4	6	8
Labiatae	1	1	1
Leguminosae	5	5	7
Lythraceae	1	1	1
Malvaceae	3	5	5
Myoporaceae	1	1	1
Myrtaceae	2	12	13
Oleaceae	1	1	1
Papaveraceae	1	1	1
Pittosporaceae	2	2	3
Polygonaceae	1	1	1
Proteaceae	1	1	1
Punicaceae	1	1	1
Ranunculaceae	1	1	1
Rhamnaceae	1	1	1
Rosaceae	4	5	6
Rubiaceae	1	1	1
Rutaceae	1	1	1
Saxifragaceae	1	3	3
Scrophulariaceae	3	4	7
Solanaceae	2	2	2
Sterculiaceae	1	1	1
Urticaceae	1	1	1
Valerianaceae	1	1	1
Verbenaceae	2	2	3
Total	73	107	121

Host Plants of **Myzus ornatus** (Laing) Arranged Alphabetically According to Genera, Including the Date or Dates of Collection and an Indication of the Abundance of the Aphids.

Caprifoliaceae
Abelia grandiflora Rehd.
14/III/67 moderate
28/IV/67 scarce
A. grandiflora 'Prostrata'
6/V/67 scarce

Acanthaceae
Acanthus mollis Linn.
28/II/67 scarce
Compositae
Achillea millefolium Linn.
23/V/67 moderate

Ageratum mexicanum Sims
15/III/67 scarce
Verbenaceae
Aloysia triphylla (L'Her.) Britt.
16/VI/67 moderate
Scrophulariaceae
Antirrhinum sp.
16/V/67 scarce
Araliaceae
Aralia cordata Thunb.
4/V/67 scarce
Compositae
Arctotheca calendula (Linn.) Levyns
3/IV/67 scarce
22/VI/67 scarce
Arctotis acaulis Linn.
27/I/67 moderate
Artemisia douglasiana Bess.
27/III/67 scarce
A. *nutans* Willd.
22/V/67 abundant
Chenopodiaceae
Atriplex breweri S. Wats.
15/VI/67 scarce
A. canescens James
16/VI/67 scarce
Urticaceae
Boehmeria nivea Gaudich
2/V/67 scarce
Myoporaceae
Bontia daphnoides Linn.
28/II/67 scarce
Rutaceae
Boronia megastigma Nees
12/IV/67 moderate
Scrophulariaceae
Bowkeria gerrardiana Harv.
3/IV/67 abundant
Compositae
Calendula officinalis Linn.
13/V/67 scarce
Myrtaceae
Calothamnus validus S. Moore
15/IV/67 scarce
Cannaceae
Canna indica Linn.
13/III/67 scarce
Leguminosae
Cassia didymobotrya Fresen.
17/IV/67 moderate
C. phyllodinea R. Br.
31/III/67 moderate
Compositae
Chrysanthemum indicum Linn.
15/III/67 moderate
C. 'Rambler'
15/V/67 moderate
Cistaceae
Cistus creticus Linn.
18/III/67 scarce
C. salvifolius Linn.
22/II/67 abundant
Onagraceae
Clarkia amoena Nels. & Macbr.
23/VI/67 scarce
Verbenaceae
Clerodendron myricoides G. Don
28/II/67 moderate
17/IV/67 moderate
Boraginaceae
Cordia abyssinica R. Br.
8/VII/67 scarce
Cornaceae
Cornus kousa v. *chinensis* Osburn
3/V/67 scarce
Rosaceae
Cotoneaster sp.
6/V/67 scarce
C. amoena E. H. Wilson
28/IV/67 scarce
C. conspicua Marquand
21/XII/66
2/V/67 moderate
C. microphylla cochleata R. & W.
5/V/67 scarce
Hamamelideae
Davidia involucrata vilmoriniana Wang.
4/V/67 scarce
Saxifragaceae
Deutzia vilmorina Lemoine & Bois.
16/V/67 scarce
Sapindaceae
Dodonaea cuneata Rudge
31/III/67 moderate
Rosaceae
Duchesnea indica Andr.
7/IV/67 abundant

Verbenaceae
Duranta erecta Linn.
21/VI/67 scarce
Boraginaceae
Echium giganteum Linn.
18/III/67 moderate
Myoporaceae
Eremophila serrulata Druce
23/I/67 scarce
Compositae
Erlangea rogersii S. Moore
5/IV/67 abundant
Eucommiaceae
Eucommia ulmoides Oliv.
1/II/67 abundant
Compositae
Eupatorium adenophorum Spreng.
16/III/67 moderate
Euphorbiaceae
Euphorbia mauritanica Linn.
22/IV/67 abundant
Trochodendraceae
Euptelea polyandra Sieb. & Zucc.
9/V/67 scarce
Compositae
Euryops pectinatus Cass.
17/III/67 abundant
Araliaceae
Fatshedera lizei Guillaumin
4/III/68 abundant
Umbelliferae
Ferula communis Linn.
23/V/67 scarce
Onagraceae
Fuchsia microphylla H. B. & K.
16/III/67 scarce
Compositae
Gaillardia Hybrids
15/V/67 scarce
Gamolepis chrysanthemoides DC.
14/III/67 moderate
Rubiaceae
Gardenia jasminoides Ellis
5/V/67 scarce
Compositae
Gazania longiscapa Hybrids
3/IV/67 abundant
Geraniaceae
Geranium robertianum Linn.
3/V/67 scarce
Leguminosae
Hardenbergia violacea Stearn.
25/III/67 scarce
Scrophulariaceae
Hebe andersonii Cockayne
15/III/67 moderate
H. speciosa R. Cunn.
15/III/67 scarce
Dilleniaceae
Hibbertia obcuneata Salisb.
27/II/67 scarce
Hypericaceae
Hypericum chinense Linn.
5/V/67 scarce
H. densiflorum Pursh.
15/V/67 scarce
H. hookerianum Wight & Arn.
2/V/67 moderate
H. polyphyllum Bois. & Bal.
13/V/67 moderate
Acanthaceae
Jacobinia carnea Nichols
28/II/67 scarce
Oleaceae
Jasminum humile Linn.
4/V/67 scarce
Verbenaceae
Lantana sp.
14/XII/66
L. camara Linn.
10/III/67 abundant
20/IV/67 scarce
L. kisi A. Rich.
1/III/67 scarce
18/V/67 scarce
Myrtaceae
Leptospermum 'Red Damask'
12/IV/67 scarce
Hamamelideaee
Liquidambar orientalis Mill.
6/V/67 scarce
Caprifoliaceae
Lonicera nitida E. H. Wilson
2/V/67 scarce
Myrtaceae
Melaleuca hypericifolia Sm.
25/III/67 scarce
Metrosideros excelsa Soland
26/III/67 scarce

Compositae
Montanoa bipinnatifida C. Koch
28/IV/67 scarce
Acanthaceae
Odontonema strictum Kuntze
28/II/67 scarce
Compositae
Olearia viscidula Benth.
26/IV/67 moderate
Geraniaceae
Pelargonium 'Nutmeg'
15/V/67 moderate
Leguminosae
Phaseolus caracalla Linn.
20/IV/67 scarce
Saxifragaceae
Philadelphus pekinensis Rupr.
13/V/67 moderate
Labiatae
Phlomis fruticosa Linn.
18/III/67 scarce
Solanaceae
Physalis alkekengi Linn.
18/III/67 moderate
Pittosporaceae
Pittosporum undulatum Vent
14/III/67 moderate
Labiatae
Plectranthus beharensis
17/IV/67 scarce
Rosaceae
Prunus munsoniana W. F. W. & Hed.
8/V/67 scarce
Raphiolepis indica 'Rosea'
3/V/67 scarce
Rubus palmatus Thunb.
2/V/67 moderate
Rhamnaceae
Sageretia theezans Brongn.
1/V/67 scarce
Labiatae
Salvia apiana Jepson
24/III/67 abundant
S. aurea Linn.
22/IV/67 scarce
S. microphylla H. B. & K.
27/III/67 scarce
S. splendens Ker.-Gawl.
27/III/67 abundant
Malvaceae
Sida schimperiana Hochst.
17/IV/67 moderate
7/VII/67 scarce
Acanthaceae
Strobilanthes lactatus Hook.
1/III/67 moderate
Melastomaceae
Tibouchina sp.
7/II/67 abundant
T. holosericea Baill.
8/II/67 moderate
T. moricandiana Baill.
7/II/67 scarce
T. sellowiana Cogn.
8/II/67 moderate
T. urvilleana Cogn.
7/II/67 moderate
T. viminea Cogn.
7/II/67 scarce
T. weddellii Cogn.
7/II/67 moderate
Verbenaceae
Verbena peruviana Druce
19/VI/67 moderate
Scrophulariaceae
Veronica derwentia Andr.
11/IV/67 scarce
Caprifoliaceae
Viburnum odorotissimum Ker.-Gawl.
5/V/67 abundant
V. plicatum tomentosum Miq.
6/V/67 scarce
V. opulus 'Hans'
8/V/67 moderate
Apocynaceae
Vinca major Linn.
15/III/67 moderate
V. rosea Linn.
10/III/67 abundant
Verbenaceae
Vitex agnus-castus 'Latifolia'
24/V/67 scarce
Caprifoliaceae
Weigela floribunda (S. & Z.) Koch
13/V/67 scarce

An Alphabetical List of the Families of the Host Plants of **Myzus ornatus** Laing Indicating the Number of Genera, of Species or Other Classification and the Number of Collections Made During 1966 and 1970.

Family	Genera	Hosts	Collections
Acanthaceae	4	4	4
Apocynaceae	1	2	2
Araliaceae	2	2	2
Boraginaceae	2	2	2
Cannaceae	1	1	1
Caprifoliaceae	4	7	8
Chenopodiaceae	1	2	2
Cistaceae	1	2	2
Compositae	15	17	18
Cornaceae	1	1	1
Dilleniaceae	1	1	1
Eucommiaceae	1	1	1
Euphorbiaceae	1	1	1
Geraniaceae	2	2	2
Hamamelideae	2	2	2
Hypericaceae	1	4	4
Labiatae	3	6	6
Leguminosae	3	4	4
Malvaceae	1	1	2
Melastomaceae	1	7	7
Myoporaceae	2	2	2
Myrtaceae	4	4	4
Oleaceae	1	1	1
Onagraceae	2	2	2
Pittosporaceae	1	1	1
Rhamnaceae	1	1	1
Rosaceae	5	8	9
Rubiaceae	1	1	1
Rutaceae	1	1	1
Sapindaceae	1	1	1
Saxifragaceae	2	2	2
Scrophulariaceae	4	5	5
Solanaceae	1	1	1
Trochodendraceae	1	1	1
Umbelliferae	1	1	1
Urticaceae	1	1	1
Verbenaceae	6	8	11
Total	83	110	117

HYMENOPTERA ASSOCIATED WITH PIG CARRION

JERRY A. PAYNE, *Department of Entomology and Economic Zoology, Clemson University, Clemson, South Carolina 29631*[1]

and

W. R. M. MASON, *Taxonomy Section, Canada Department of Agriculture, Entomology Research Institute, Ottawa, Ontario*

ABSTRACT—Decomposing pigs (*Sus scrofa* L.) were exposed under various ecological conditions in South Carolina over a period of several years, and a faunistic survey and succession was compiled for the microcommunity of carrion animals that was attracted to them. This paper tabulates the 82 spp. of Hymenoptera collected, and records observations of their habits and possible relationships in the carrion community. Two new species, *Aphaereta* **soronastes**, n. sp. (Braconidae) and *Atractodes* **necrix**, n. sp. (Ichneumonidae) are described.

Carrion, despite the obvious disadvantages, recently has become a popular subject for research. The dead bodies of animals have incited numerous writings; the literature has included studies of problems of agricultural importance, medico-legal importance, and the biology and taxonomy of certain beetles and flies, but there have been few attempts to record and observe the complete fauna of carrion, including the so-called incidental or secondary species.

During the summers of 1962 and 1963, the entire year of 1966, and the spring of 1967, a comparative study of pig carcasses, both exposed to and isolated from arthropods, was undertaken to determine the actual processes and rates of decomposition (Payne, 1965; 1967). Animal succession and decomposition of carrion were studied under different environmental conditions. Baby pigs, *Sus scrofa* Linnaeus, were suspended from trees at various heights, placed in water, buried in the ground, and maintained free from, partially free from, and completely exposed to insects. For brevity, pigs in the last category are indicated here as "open" or "grounded."

A faunal survey was conducted in conjunction with this study (Payne, Mead, and King, 1968; Payne and King, 1969). Special attention was focused on the food habits, relative abundance, succession, and microseral distribution of individual members of the carrion microcommunity. The present paper deals with the hymenopterous species which were associated with the various stages.

METHODS AND MATERIALS

Carcasses were frequently examined for insects; collections were made at various times of the day and night. Excavations beneath the

[1] Present address: U.S. Department of Agriculture, Agricultural Research Service, Entomology Research Division, P.O. Box 87, Byron, Georgia 31008.

carrion were searched thoroughly by using a gardener's tool. Larvae suspected of being parasitized were collected for rearing of the parasites in the laboratory. Some insect-open or grounded carcasses were painted or coated with mevinphos, a phosphate insecticide. This permitted nearly complete collections of insects from all stages of decay, since most arthropods which visited the mevinphos-coated carrion were immobilized or quickly killed.

At the termination of each experiment (60 or more days of observation), carcass remains were collected from their respective cages and thoroughly examined for fauna. The remains of all buried and most other pigs were placed in Berlese funnels for extraction of arthropods.

Results and Discussion

Eighty-two species of Hymenoptera were collected from pig carrion. Table 1 gives the systematic list of all 82 species and the exposure type from which collected. A brief synopsis of these species and their food habits follows.

Braconidae—*Alysia ridibunda* Say was the most common braconid at carrion and was attracted to carrion during the active and advanced decay stages when dipterous larvae were most abundant. These wasps were often found crawling in the cracks and crevices of the carcass and even observed probing in the decaying flesh with their ovipositor. This parasite has been reared from several *Calliphora*, *Lucilia* and *Sarcophaga* species inhabiting carcasses (Roberts, 1935).

Aphaereta soronastes Mason,[2] a parasitic braconid, was reared from *Fannia* pupae from grounded and water carcasses. It was also observed probing for *Phaenicia* maggots concealed under the skin of pig carcasses. Members of the subfamily Microgasterinae which include *Apanteles* and *Microplitis* all seem to be internal parasites of lepidopterous larvae (Muesebeck and Walkley, 1951); *Apanteles carpatus* (Say) was reared from larvae of *Ascedes fuscipuntella* (Haworth) and *A. pallescentella* (Stainton), tineids which occupied these remains (Payne and King, 1969).

Ichneumonidae—Members of the genus *Atractodes* were the most common ichneumonid attracted to carrion, even one new species, *Atractodes necrix* Mason,[2] was collected. Females of *Atractodes* attacked exposed larvae of *Phaenicia*; however, no parasites were recovered from these maggots. They are believed to be parasitic on carrion-inhabiting muscoid Diptera and have been reared from *Hydrotaea dentipes* Fabricius (Myers, 1929).

Xenolytus sp. was reared from tree pig remains; they were suspected of parasitizing tineid larvae occupying these remains. The genera

[2] Description of this new species follows the discussion of food habits.

Table 1. Systematic list of species and the dead pig exposure type from which collected during 1962, 1963, 1966, and 1967.

Species	Exposure*
Order HYMENOPTERA	
Family Braconidae	
Apanteles carpatus (Say)	T
Apanteles spp.**	IO, T
Microplitis sp.	T
Aphaereta pallipes (Say)	IO, W
Aphaereta soronastes Mason	IO, W
Alysia ridibunda Say	IO, T, W
Rogas spp.	IO
Bucculatriplex bucculatricis (Ashmead)	IO
Pauesia sp.**	IO
Family Ichneumonidae	
Alegina sp.	T
Gelis sp.**	IO
Xenolytus sp.	T
Endasys subclavatus (Say)**	IO, T
Atractodes americanus Ashmead	IO
Atractodes necrix Mason	IO
Phaeogenes sp.	IO
Cratichneumon paratus (Say)	IO
Temelucha sp.	IO
Habrocryptoides rufifrons (Walsh)	IO
Ischnus cintipes (Walsh)	IO
Family Eulophidae	
Dicladocerus sp.	B
Tetrastichus sp.	T
Family Pteromalidae	
Spalangia nigra Latreille	T
Spalangia drosophilae Ashmead	T
Pachycrepoideus dubius Ashmead	T
Pachycrepoideus vindaemniae (Rondani)	T
Muscidifurax raptor Girault and Sanders	T
Family Figitidae	
Neralsia sp.	W
Figites sp.	IO, T, W
Family Cynipidae	
Kleidotoma sp.	B
Ganaspis sp.	T, B
Pseudeucoila sp.	IO, T, W

* IO—Insect-open, or grounded, T—Tree, W—Water, B—Buried.
** For record only. No evidence of attraction to carrion community.

Table 1. (Continued)

Species	Exposure*
Ceroptres sp.**	W
Neuroterus sp.**	IO, T
Andricus flavohirtus Beutenmueller**	IO, T, W
Callirhytis futilis (Osten Sacken)**	IO, T, W
Family Evaniidae	
Hyptia harpyoides Bradley	IO
Family Pelecinidae	
Pelecinus polyturator (Drury)	IO
Family Proctotrupidae	
Cryptoserphus abruptus (Say)	IO
Codrus sp.	IO
Family Diapriidae	
Aneurhynchus sp.	IO
Psilus sp.	IO
Trichopria sp. (poss. *haematobiae* Ashmead)	T, B
Family Mutillidae	
Pseudomethoca simillima (Smith)	IO
Family Formicidae	
Amblyopone pallipes (Haldeman)	IO
Euponera sp.	B
Proceratium silaceum Roger	IO
Ponera coarctata pennsylvanica Buckley	IO, W, B
Stenamma meridionale Smith	IO
Stenamma diecki Emery	IO
Aphaenogaster fulva Roger	B
Aphaenogaster lamellidens Mayr	IO
Aphaenogaster rudis Emery	IO
Aphaenogaster texana (Emery)	IO, B
Pheidole bicarinata vinelandica (Forel)	IO
Crematogaster cerasi (Fitch)	IO
Monomorium minimum (Buckley)	IO
Myrmecina americana Emery	IO, B
Leptothorax curvispinosus Mayr	IO, W
Leptothorax schaumi Roger	W
Smithistruma sp.	IO
Dorymyrmex sp.	IO
Camponotus americanus Mayr	IO, W
Camponotus ferrugineus (Fabricius)	IO
Camponotus nearticus Emery	IO
Camponotus pennsylvanicus (DeGeer)	IO, T, W
Camponotus subbarbatus Emery	B
Paratrechina parvula (Mayr)	IO, W

Table 1. (Continued).

Species	Exposure*
Prenolepis imparis (Say)	IO, T, B
Formica sp.	IO, B
Family Vespidae	
Vespula maculifrons (Buysson)	IO, T, W
Vespula maculata (Linnaeus)	IO, T, W
Family Pompilidae	
Auplopus nigrellus (Banks)	IO
Aporus niger (Cresson)	IO, W
Psorthaspis mariae (Cresson)	IO
Family Sphecidae	
Trypoxylon carinatus Say	IO
Family Halictidae	
Halictus sp.	IO, T, W
Lasioglossum sp.	IO, W
Family Apidae	
Xylocopa virginica (Linnaeus)	IO, T
Bombus grisecollis (DeGeer)	T
Bombus impatiens Cresson	IO, T, W
Apis mellifera Linnaeus	IO, T, W

Phaeogenes, *Temeluca*, and *Ischnus* were represented at carrion. Their normal hosts are Lepidoptera larvae; however, no observations on these parasites were made.

Eulophidae—*Tetrastichus* was collected from tree pig remains. Members of the subfamily Tetrastichinae develop as internal parasites of the eggs, larvae, or pupae of other insects (Clausen, 1940). Host records for this genus even include tineid larvae, the normal inhabitants of tree pig remains. Two specimens of *Dicladocerus* were recovered from buried pigs. No information is available on possible hosts but phorid or sphaerocerid larvae appear likely since they occupied this buried pig (Payne, King, and Beinhart, 1968).

Pteromalidae—Five species were collected from tree pigs. *Spalangia drosophilae* Ashmead was reared from puparia of *Drosophila* sp. occupying tree carrion; however, it was not recovered from *Drosophila* on carrion in other exposures. Hosts of *Spalangia nigra* Latreille were not determined in this study. *Pachycrepoideus dubius* Ashmead is a pupal parasite of various Diptera (Nostvik, 1954). *Phaenicia caeruleiviridis* (Macquart) and *Piophila* spp. were the dominant hosts on tree carrion. It is somewhat surprising that *Pachycrepoideus* were not recovered from carrion in the other exposures. *Muscidifurax raptor* Girault and Sanders, a common parasite of blow flies, was only captured once during this study.

Cynipidae—Seven species of cynipids were collected from pig carrion; four of these were gall producers on oaks and their attraction to carrion cannot be explained. *Pseudeucoila* sp. was reared from puparia of *Conioscinella hinkleyi* (Malloch), a chloropid inhabiting tree pig remains. *Kleidotoma* sp. and *Ganaspis* sp. were taken from buried carrion; however their hosts are unknown. James (1928) has reared *Kleidotoma* from *Lucilia, Musca* and *Hydrotaea,* all common carrion maggots.

Figitidae—Two genera, *Figites* and *Neralsia* were reared from calliphorid and sarcophagid puparia. These small parasites were attracted to carrion during the early stages of decomposition when *Phaenicia* and *Sarcophaga* larvae were the prevalent species. Exposed larvae were normally parasitized; however, *Figites* would even enter the carcass in search of prey. *Neralsia* were only observed parasitizing exposed larvae of water carrion.

Evaniidae—The evaniids are all thought to be parasitic in the egg capsules of cockroaches. Townes (1951) reported that our common native species of *Hyptia* were presumed to be parasites of *Parcoblatta. Hyptia harpyoides* Bradley was observed flying about dried pig carcasses under which *Parcoblatta* spp. were usually found.

Pelecinidae—Only two specimens of *Pelecinus polyturator* (Drury) were recorded during the entire study. They were crawling about the moist carrion as if in search of food or host. It is assumed that *Pelecinus* parasitizes the larvae of soil-inhabiting Scarabaeidae (Muesebeck and Walkley, 1951).

Proctotrupidae—*Cryptoserphus abruptus* (Say) and *Codrus* sp. were collected from insect-open carrion in active and advanced decay. No observation on habits was noted. Clausen (1940) reported that a number of species of this family are parasites of the larvae of various Coleoptera and Diptera.

Diapriidae—The genera *Aneurhynchus* and *Psilus* were represented at insect-open carrion and *Trichopria* at tree and buried carrion. These small black insects are believed to be internal parasites of the immature stages of Diptera (Clausen, 1940). *Trichopria* and *Aneurhynchus* have been reared from carrion Diptera by Graham-Smith (1919) and Roberts (1935). No observations on parasitization were made in this study. These small wasps were seldom recovered probably due to their small size.

Mutillidae—One species, *Pseudomethoca simillima* (Smith), was observed as a rather frequent visitor to the carrion. Mutillids are generally accepted as being predaceous or parasitic on other Hymenoptera, Coleoptera, and Diptera.

Formicidae—Ants fed actively during all stages of carrion decomposition. They were observed carrying off maggots and eggs of other insects in large quantities, and feeding on the carrion soups and scraps. Ants were the principal and only observed omnivores for buried pigs. Fuller (1934) believed that ants could not be considered regular carrion inhabitants of any influence since they were found on only a few carcasses near nests. The authors, however, hold the opposite opinion, since ants were found on all carcasses. *Camponotus americanus* Mayr and *Prenolepis imparis* (Say) were the numerically dominant ant species at the carrion; they were most active in early morning, late afternoon, and into the night. Ants of several different species remained even after the maggots had left, feeding on bits of carrion scraps and dead insects.

Vespidae—*Vespula maculifrons* (Buysson) and *Vespula maculata* (Linnaeus) were collected from inspect-open, tree, and water carcasses. They were observed feeding on dipterous eggs, larvae, and even adults. They also fed on the carcass especially when it was fresh or nearly so; however, their role as predator was more important. Bromley (1931) made an extensive study of hornet habits. He reported that yellow jackets fed on all sorts of organic matter and were also predaceous. Graham-Smith (1916) reported that blow flies, green-bottle flies, and other flies attracted to carrion were often captured by the common species of wasps. Davis (1919) observed *Vespula maculata* feeding on a dead house sparrow and a water snake. Vespids and ants were opportunists and fed upon what was available in quantity and thus their position as scavenger, predator, or omnivore changed with stage of decay.

Pompilidae—Three species, *Auplopus nigrellus* (Banks), *Aporus niger* (Cresson), and *Psorthaspis mariae* (Cresson) visited the carcasses. Members of this family provision their nests with spiders. The pompilids observed here could have been searching for spiders. Carcasses in the dried condition harbored over 70 different spider species (Payne, 1967).

Sphecidae—One species, *Trypoxylon carinatus* (Say) was collected. Members of this genus also provisioned their nests with spiders (Krombein, 1951). The carrion may have established a concentration of spiders due to the presence of the many insects.

Halictidae—Halictids normally feed on pollen and nectar of flowers; however, *Lasioglossum* sp. was collected from insect-open and water pig carrion, apparently feeding on the fluids present. Six species of *Augochlora* and *Halictus* were collected from dog carcasses in Tennessee (Reed, 1958).

Apidae—*Apis mellifera* Linnaeus, *Bombus grisecollis* (DeGeer), *Bombus impatiens* Cresson, and *Xylocopa virginica* (Linnaeus), were attracted to the carrion only while fluids were present. They were observed sucking up the foul-smelling juices. Some of the odors of putrefaction may have served to orient the bees to the carrion media.

Descriptions of New Species[3]

Aphaereta soronastes, n. sp.

This is distinguishable from other *Aphaereta* by the short ovipositor; long, deep, crenulate notauli; anteromedian scutellar sulcus and rugose propodeum with large apophyses.

DESCRIPTION. Holotype: female, length 2.5 mm. Second flagellar joint 1.2 times as long as first; flagellum 21-jointed; cheek strongly flared out at outer margin of mandible socket.

Mesonotum polished; notauli deep, crenulate and extending 0.8 of distance to posterior margin; a small oval median fovea just in front of prescutellar fovea; the latter almost as large as scutellum; scutellum rectangular, about 1.5 times as wide as long and bearing a shallow median anterior sulcus. Mesopleural furrow broad and strongly rugose. Propodeum rugose, with large lateral apophyses and a strong median longitudinal carina; costulae vaguely indicated among the rugae.

Ovipositor sheath about half as long as hind tibia.

Color black, the following parts suffused with ferrugineous: clypeus, mandibles, upper quarter of face, basal flagellar joints, prothorax, notauli, scutellum and adjacent areas, metanotum, tergite I, tergite II medially. The following parts yellowish: scape, pedicel, labium, maxilla, tegula and wing bases, all legs and coxae. Wings hyaline, veins and stigma brown.

Paratypes: females, flagellum with 21–24 joints, scutellum sometimes about as wide as long, clypeus often brown, tergite II sometimes black. Males: flagellum with 18–23 joints, notauli black, tergite II usually completely suffused with ferrugineous, propodeal apophyses often inconspicuous.

TYPES. Holotype; ♀, Clemson, South Carolina, 11 August 1966, collected by Jerry A. Payne, reared from *Fannia* puparium found in pig carrion. Canad. Nat. Coll. No. 11201. Paratypes; 4♂♂, 6♀♀, same data but dates between 28 June and 27 October (CNC and U.S. Natl. Mus.).

Atractodes necrix n. sp.

This species is similar in size and general appearance to *A. americanus* Ashmead, which is also found about carrion in eastern North America. However, *A. necrix* flies in spring and summer, has hairy eyes and apical flagellar joints over 50% longer than wide. *A. americanus* flies in autumn, has glabrous eyes and apical flagellar joints about as long as wide.

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[3] The description of the following two species are written by the junior author.

DESCRIPTION. Holotype: female, length 6.5 mm. Flagellum 19-jointed, first joint 3 times as long as wide, subterminal joints about 1.6 times as long as wide and the same width as joint one. Eyes hairy. In dorsal aspect width of head : length of head = 1.75; width across eyes : width across temples = 1.07; width across eyes : width of frons = 2.0; length of eye : length of temple = 1.3. In facial aspect width of face : length of face (from apex of clypeus to lower margin of antennal sockets) = 1.25; eyes divergent below; clypeus shining and coarsely punctate, the punctures separated by about half their widths.

Mesonotum and mesopleuron shining and moderately sparsely but finely punctate. Combined petiolarea and areola transversely rugose peripherally, weakly granular centrally; greatest width of area (at junction of apical transverse carina) almost twice width at base or apex; length : greatest width = 2.0 ±.

Tergite I about 2½ times as long as its apical width; the latter about equal to greatest width of petiolarea. Abdomen comparatively short and wide for the genus depth (at tergite II or III) about 1½ times width; length (excluding tergite I) : length of tergite I = 3.0; length (excluding tergite I) : width at junction of tergites II and III = 4.5. Lateral crease on tergite II less than 0.1 times length of tergite. Tergites II and III with only a few short scattered hairs, but none near lateral margins; tergites IV–IX with a submarginal row of long sparse hairs; sternites II–VI with sparse scattered long hairs. Ovipositor sheaths together subhemispherical and densely set with hairs that are about as long as the sheaths; length of sheath : height = 1.0; height of sheath : height of cercus = 2.0.

Color black; the following parts reddish yellow: scape, pedicel, mouthparts, apical half of clypeus, upper hind corner of pronotum, tegula, wing base, all legs and coxae. Flagellum, veins and hind tarsi brown. Abdomen behind tergite I red, but heavily infuscated above behind tergite IV. Wing membranes weakly infumated.

Paratypes: females, flagellum with 18–19 joints, anterior end of combined areola and petiolarea sometimes narrowed to less than one-third greatest width of area.

TYPES. Holotype: ♀, Clemson, South Carolina, 28 July 1966, collected by Jerry A. Payne from pig carrion. Canad. Nat. Coll. No. 11202. Paratypes; 5♀♀, same locality and collector but dates 4–29 April and taken on various kinds of carrion, pig, dog and chicken (CNC and U.S. Natl. Mus.).

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PLATYBASICORNIS RAMOSI, A NEW NEOTROPICAL GENUS AND SPECIES
(Hemiptera: Miridae: Hyaliodini)

J. Maldonado-Capriles, *Department of Biology, University of Puerto Rico, Mayaguez, Puerto Rico 00708*

ABSTRACT—A new Hyaliodini mirid genus and species, **Platybasicornis ramosi**, is described from Venezuela. This species is characterized by its long foliaceous first antennal segment, pitted pronotum, reddish coloration, and relatively narrow body.

Herein I describe a new genus and species of the tribe Hyaliodini from Venezuela. This species can be easily identified by its reddish coloration, foliaceous first antennal segment, and moderately elongate body besides the hyaline condition typical of the tribe to which it belongs.

I am grateful to Mrs. G. M. Black, British Museum (Natural History), for comparing our specimens with the types of *Pseudocarnus lineolatus* Distant and *P. magnus* Distant and to Dr. Per Inge Persson, Naturhistoriska Riksmuseum, Stockholm, for the loan of the types of *P. dilatatus* Stål and *P. fraudans* Stål.

The types are deposited in the U. S. National Museum at Washington, D.C. and paratypes in Dr. J. C. M. Carvalho's and my collection. In the measurements that follow 10 micrometer units correspond to 0.38 mm. Support for this study was made possible by National Science Foundation grant GB-7382.

Platybasicornis, n. gen.

Type-species: *Platybasicornis ramosi* new species.

Deraeocorinae, Hyaliodini. First antennal segment flattened laterally, foliaceous, long oval, longer than pronotum; last three segments cylindrical, slender; second slightly longer than head and pronotum combined, slightly thicker than last two; last two segments together slightly longer than first, the third longer than the fourth; all segments covered with abundant fine moderately long pilosity. Head rounded, slightly produced between antennal bases; medianly sulcate; with a short neck, neck with a transverse carina. Eyes large, not produced laterally, occupying most of the lateral sides of head, separated from collar by about one-half length of eye; interocular space wider than width of eye (fig. 4); vertex smooth. Beak slender, reaching between fore and mid legs. Legs slender; claws spined near base. Pronotum with lateral margins slightly concave; about $1\frac{1}{2}$ times as wide as long; tapering anteriorly; posterior margin above scutellum straight; collar smooth, long and well defined, twice as long as thickness of second antennal segment at base; calli well defined but not prominent, smooth; lateral margin not keeled, rounded; disc clearly and sparsely pitted. Vertex, legs, pronotum, and forewings with relatively abundant fine moderately long pilosity. Mesoscutum short, about $\frac{1}{10}$ length of scutellum; scutellum as long as wide, smooth, very

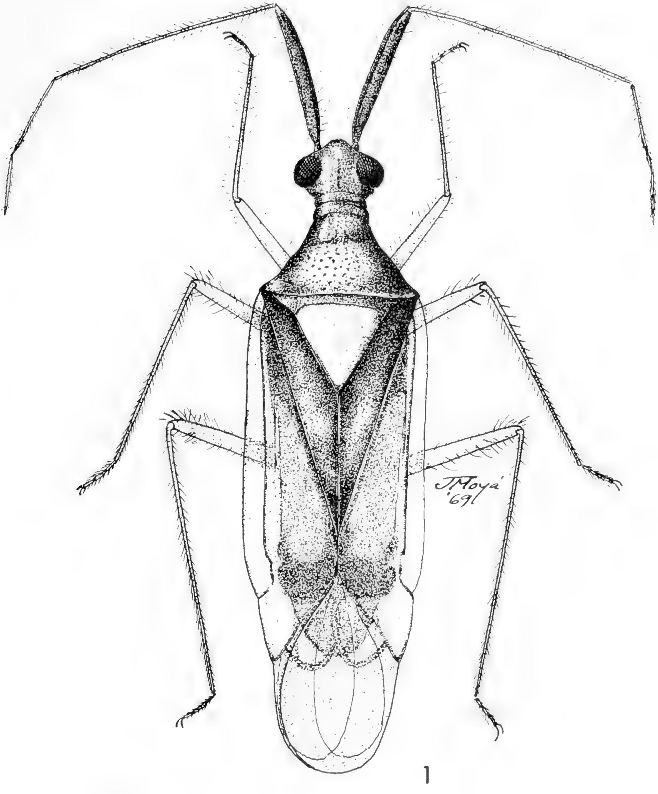
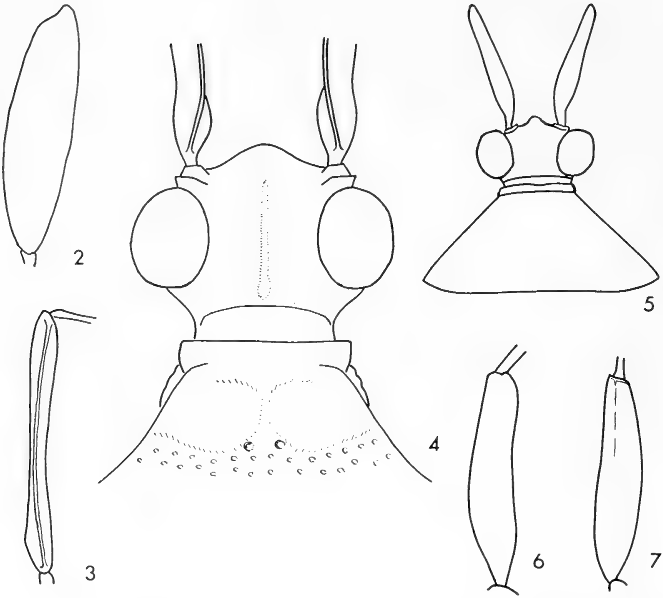


Fig. 1. *Platybasicornis ramosi*, n. gen., n. sp., ♀, dorsal view.

slightly convex. Forewing hyaline; embolium flat, depressed, costal margin straight, parallel-sided except basally, and with a row of fine punctures along emboliocorial suture; a row of fine punctures along corio-claval suture; cuneus slightly over 1½ times as long as wide; membrane with two cells. Straw-colored and ornamented with reddish or reddish-brown.

Platybasicornis ramosi, n. sp.

Female: straw-colored, ornamented with reddish and reddish-brown. Head reddish-yellow; eyes deep red; first antennal segment polished, red, last three



Figs. 2–4. *Platybasicornis ramosi*, n. gen., n. sp., ♀: 2, first antennal segment, lateral view; 3, same, dorsal view; 4, head and anterior part of thorax. Fig. 5. *Pseudocarnus magnus* Distant, ♀, head and thorax, dorsal view. Figs. 6–7. *P. dilatatus* Stål, ♀, first antennal segment: 6, dorsal view; 7, lateral view.

straw-colored; beak straw-colored, red at apex. Pronotum laterally and along lateral margins reddish-brown; disc and area between calli brownish-yellow. Thorax ventrally and legs yellowish. Scutellum shiny ivory-yellow. Forewing: clavus shiny reddish-brown; corium shiny reddish-brown near basal angle and in an irregular area near apical margin, other areas yellowish-hyaline; embolium hyaline, with a pale straw-colored tinge; cuneus colored as embolium, inner margin narrowly red; membrane with a pale fuscous tinge, veins slightly darker. Abdomen ventrally reddish-brown. Recently molted specimens are mostly reddish ventrally.

Head, including neck, ¾ as long as wide (15 : 20); width of eye 6, length 8; interocular space 8; distance from caudal margin of eye to collar 4. Antennal segments: 27, 47, 18, 12; first segment foliaceous in lateral aspect, 8 units wide at midlength and 2–3 units thick. Beak reaching almost to base of middle coxae. Pronotum about 1½ times as wide as long (37 : 23), clearly tapering to apex; margins and pitting as for genus. Width across forewings 44. Overall length 4.6–4.8 mm.

Male: the only male at hand has the general coloration of the female but slightly more brownish than reddish. Head of about same shape and size; interocular space slightly narrower (7 vs 8); pronotum about same shape and size (36 : 23). Beak slightly shorter, reaching to middle of mesosternum. Scutellum about as long as wide (17 : 18). Overall length 4.5 mm. The genitalia were lost during dissection.

Holotype—male, from El Limón, Aragua, Venezuela, July 4, 1968; J. Maldonado Capriles collector, on the leaves of *Pachyra insignis* or "Castañón"; in the U.S.N.M., Cat. No. 71502. Allotype, female, same data, in the U.S.N.M. Paratypes: three females in my collection and one teneral male in Dr. Carvalho's collection; all with same data as types. One female in Carvalho's collection, from Costa Rica, by Reventazón River, 1927.

Platybasicornis is not particularly close to any of the genera in the Hyaliodini. Because of its reddish coloration it has some resemblance to the species of *Pseudocarnus* but these are wider, not as slender as *Platybasicornis.* This new genus can be accommodated in Carvalho's key to the genera of the world, on page 24, by slightly modifying the second part of couplet 2 and adding a new couplet as follows:

2. First and second antennal segments very wide, laminate or foliaceous (fig. 58) (Central and South America) .... **Auchus** Distant
   First antennal segment cylindrical, incrassate or foliaceous and second cylindrical .... 2a.

2a. First antennal segment foliaceous; pronotum $1\frac{1}{2}$ times as wide as long, abruptly tapering anteriorly; disc of clavus and corium not pitted; reddish elongate species .... **Platybasicornis**, n. gen.
   First antennal segment cylindrical or incrassate or if foliaceous then pronotum nearly twice as wide as long, not so tapered, and clavus and corium distinctly or very finely pitted 3

Modified this way, the second part of the new couplet will carry *Pseudocarnus lineolatus* that has the first antennal segment foliaceous, "as in your species" writes Mrs. G. M. Black. The other three species in *Pseudocarnus* have the first antennal segment cylindrical, as in figs. 6 and 7 from *P. dilatatus* Stål. All the species of *Pseudocarnus* have the pronotum about or slightly over twice as wide as long and lateral margins straight or slightly convex as in fig. 5 from *P. magnus* Distant. The clavus and corium is distinctly punctured in *P. dilatatus* and very finely so in *P. fraudans.*

Etymology: the generic name describes the foliaceous first antennal segment. I take great pleasure in dedicating the species to Dr. J. A. Ramos, my first professor of entomology and a long time friend and source of stimulus.

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LOCALIZATION, BEHAVIOR, AND SPACING OF UNPAIRED MALES OF THE DAMSELFLY, ARGIA PLANA CALVERT[1]

(ODONATA: COENAGRIONIDAE)

GEORGE H. BICK[2] and JUANDA C. BICK, *Saint Mary's College, Notre Dame, Indiana 46556*

ABSTRACT—Localization, behavior, and spacing of *Argia plana* Calvert were studied at a small creek in southern Oklahoma, and were compared with data on *Argia apicalis* (Say), studied earlier at another habitat. Localization was determined by recording the particular 1 m sector occupied by individually marked unpaired males on different days as well as on different hours of the same day, spacing by recording the number of all males in each sector, and behavior by tape recording all activity of individually marked males for 30 minute intervals. Day-to-day (14%) and even hour-to-hour (10%) localization at the same 1 m sector was very low. The most frequent (13/male/30 min.) aggressive event was nonsexual flight, with neither contact nor flight maneuvers, toward conspecific males (56%) or pairs (23%). *A. plana* and *A. apicalis* won 79% and 87% respectively of their aggressive encounters, defended areas, and met other criteria for territorial species, but both are considered intermediate among the Zygoptera in degree of territoriality. Their territorial behavior places the successful males at advantageous positions for seizing females as they fly to the aquatic habitat. *A. apicalis*, spaced at 2 m intervals, is judged more successful than *plana* (1 m), because it maintained a larger area with fewer aggressive events and thus less expenditure of energy.

During the summer of 1964 at Cowan Creek in southern Oklahoma, studies of 143 individually marked *Argia plana* Calvert males furnished data for our papers on demography (1968) and reproduction (1971) and for the present work on localization, behavior, and spacing. Counting all individuals along a 144 m length of this 1–2 m wide creek provided demographic data but did not accurately show spacing because most males were located among a dense growth of *Nasturtium officinale* at one part of the study area. Hence localization and spacing were determined in the area of greatest density, a 10 m stretch subdivided with permanent stakes into 1 m sectors. Behavior was studied by tape recording all activities of individually marked unpaired males for 30 minute periods, using essentially the same terminology as in our earlier studies of *Enallagma civile* (Hagen) (1963), *Argia apicalis* (Say) (1965), and *Lestes unguiculatus* Hagen (1965).

We thank our friend and student, Mr. Steve Montgomery, for his enthusiastic participation and particularly for his many hours of constant observation.

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[1] Immediate publication secured by full payment of page charges.—Editor.

[2] Visiting Professor, University of Oklahoma Biological Station.

Table 1. Daily and hourly localization of marked *Argia plana* males at each 1 m sector of a 10 m area during a 20-day period. Repeat visits were not necessarily successive.

	Daily	Hourly
No. of ♂s at least once in 10 m area	23	32
No. of ♂s repeating in 10 m area	14	13
No. of ♂s repeating in same 1 m sector	6	8
Possible repeat visits in 10 m area	88	117
Repeat visits in 10 m area	32	25
Localization in 10 m area	36%	21%
Repeat visits in 1 m sector	12	12
Localization in 1 m sector	14%	10%

Localization

Most individually marked males did not occur persistently at any particular site either from day-to-day or from hour-to-hour during the same day. Localization was the exception rather than the rule.

Daily localization was studied near noon on each of 20 days (Table 1) by recording the particular 1 m sector where each marked male was found. One exceptional male was at the same 1 m sector on four successive days, at another one on the following day, absent for one day, and then present at the original sector for three successive days. However, most males did not return to the staked area on successive or even on non-successive days even though they were recovered elsewhere along the 144 m stretch of creek. Males repeated somewhere in the 10 m area at any time during the 20 days on only 36% of their days at water and returned to a particular 1 m sector on only 14%.

Hourly localization (Table 1) was determined by recording the marked males in each 1 m sector for seven successive hours on each of two days and also at 1300 and 1400 hours on 20 days. Although each of two exceptional males remained for three successive hours at his 1 m sector, hourly localization was even less than daily. Males remained within the 10 m area on but 21% of their possible hours and within the same 1 m sector on only 10%. In general, males moved about considerably at the aquatic habitat during the course of a particular day and even in the short space of one hour.

Behavior

The frequencies of all activities of 15 individually marked males during 30 minute intervals are summarized in Table 2. Physical contact or clashes did not occur. Flight toward and wing warning, performed only when intruders approached, were definitely aggressive and in no

Table 2. Summary of twenty 30 minute activity records of 15 different unpaired *Argia plana* males at water, June 9–July 2.

	Number of events		Av. per individual	
Flight toward	260		13.0	
Wing warning	15		.7	
Total		275		13.7
Flight no reason	330		16.5	
Wing clapping	323		16.1	
Grooming, feeding, comfort movements	144		7.2	
Reaction to non-odonates	65		3.2	

way sexual. The encounter was recorded as won if the intruder flew off, shared if he perched within 0.5 m of the occupant, and lost if the defender left his perch to the intruder. During flight toward, the male flew, without circling, toward an intruder who was usually a conspecific male. A wing warning individual lifted and spread each of the four wings "in a manner suggestive of the ruffled feathers of a cock before a clash" (Bick and Bick, 1963). Displays, essentially similar to these wing warnings which we record for unpaired males of *civile*, *apicalis* and *unguiculatus* as well as for *plana*, have been noted in perched individuals of one or both sexes of many other species, and Pajunen (1963) summarizes the occurrences of this threat display in the Zygoptera. He states that, along with the wing spreading, a simultaneous upward and forward bending of the abdomen occurs. Our observations of the above species differ in that the abdomen of a wing warning male was never bent upward and forward even though it was sometimes slightly elevated.

Flight no reason was a short straight flight out over water with an immediate return usually to the same perch. Such a sortie was not an advance to any other odonate, was not for feeding, and was not a response to any stimulus which we could detect, hence our designation of flight no reason. However, we consider that these flights functioned in *plana* as in *apicalis*, i.e., as short patrols, important in maintaining an area free of intruders.

With a very quick movement a wing clapping male slightly separated right and left wings and then brought them together, usually one to seven times. Throughout a clap, the meso- and metathoracic wings on each side remained close together, whereas all four wings spread and stayed apart until the end of a wing warning. Wing clapping, in the absence of females, which we observed in *Calopteryx maculata* (Beauvois) and filmed in *C. aequabilis* Say and which Robert (1958) describes for *C. virgo* Linnaeus, appears to be essentially a more elaborate version of wing clapping in *apicalis* and *plana.* Because movements which we consider basically similar to wing clapping are progressively more pronounced proceeding from *unguiculatus* and *Archilestes grandis* (Rambur) having very little defense of territory, to *apicalis* and *plana*, intermediate in territorial activity, to *maculata* with obvious defense of territory, we think that clapping most likely functions as a territorial display. However, in as much as it usually occurred after flight and sometimes in the absence of nearby odonates, the possibility of a mere comfort movement cannot be ruled out.

Grooming, feeding, and comfort movements are grouped in Table 2. Feeding flights at the aquatic reproductive site were very infrequent, averaging only 0.4 per male per 30 minute, and the prey, when recognized, was always a chironomid. Because feeding was also very infrequent in *civile* and *apicalis*, it could hardly be a primary function of the unpaired male's behavior at the aquatic habitat. The only kind of comfort movement, which occurred on horizontal perches, was a "push-up"-like raising and lowering of the entire body, all of which remained in the same plane. Grooming included eye cleaning, leg cleaning, abdominal cleaning, and "abdominal bobbing." A bobbing male swung his entire abdomen dorsally, sometimes to an almost vertical position, in a movement differing from the wing cleaning which Moore (1960) figures for *Pyrrhosoma nymphula* (Sulzer). Bobbing also differed from the activity which we often observed in *maculata* and *Hetaerina americana* (Fabricius) wherein only the last three abdominal segments were dorsally elevated. In 1963 we stated that the frequent bobbing in *civile* was a territorial declaration. After having seen it away from water in males of many additional species, we now hypothesize that bobbing functions primarily in grooming the wings. Regardless of function, the action could hardly be significant to *plana* because it was so rare.

At times a *plana* male ignored or shuffled slightly aside as a small wasp or ant arrived at or crawled on the odonate's perch. This is recorded in Table 2 simply as reaction to non-odonates.

Argia plana males averaged 13.7 aggressive actions per 30 minute interval, nearly all of which were flights toward intruders (Table 2). The number of these actions per male ranged from 0 to 38. This variation was not the result of a high or low degree of individual aggressiveness; male A performed 38 activities on one day, four on another when population size was similar. Nor was the number of a male's aggressive actions directly related to total density at water on any one day; male J performed 22, male E only nine on the same day. Instead, as in *apicalis*, the number of aggressive events for any one male depended primarily on the location of his perch in relation to

Table 3. A comparison of number of males at water, spacing, and salient features of behavior in *Argia apicalis* and *Argia plana*.

	A. apicalis at Looney Pond*	*A. plana* at Cowan Creek
Aggressive activity		
Flight toward (av./♂/30 minute)	5.2	13.0
Wing warning (av./♂/30 minute)	0.8	0.7
Won (%)	87	79
Shared (%)	10	19
Lost (%)	3	2
Toward conspecific males (%)	26	56
Toward conspecific pairs (%)	23	23
Flight no reason (av./♂/30 minute)	12.1	16.5
Length of shoreline (m)	151	144
Av. no. unpaired ♂s at water (June 9–July 2)	38	34
Size of territory (mode in m)	2	1

* Modified from Bick and Bick, 1965.

many small configurations of the shore and the resulting variation in exposure to conspecific traffic.

Table 3 compares salient features of behavior, number of males at water, and territory size of *plana* with that of *apicalis*. As expected, the frequency of interspecific interactions was related directly to the population sizes of the other species present. At the creek, where the *plana* count was high and that of all other Zygoptera low, the majority (56%) of the 275 *plana* interactions were with conspecific males. Quite differently, at a pond which *apicalis* shared with a large *civile* population, only 26% of the *apicalis* interactions were with conspecific males.

Twenty-three per cent of all interactions of *plana* males were with conspecific pairs. When such a pair approached, the male usually flew toward them, but contact was never made. Possibly the occupant, recognizing the tandem situation, flew less intensely. Or perhaps he first flew strongly, then recognized the tandem condition and returned to his perch without further threat. In either event, half of the males' flights toward pairs resulted in sharing the perch with them, whereas 85% of the flights toward intruding males were won.

Among all 275 interactions with intruders, the occupant male scarcely ever (2%) lost encounters, even the few with the much larger *americana* and *Argia moesta* (Hagen) males. *A. plana* won 79% of all interactions, *apicalis*, 87% (Table 3). The chances of a male losing his perch are greater when flying toward an intruder or patrolling an area than when wing warning from a perch. Males of both species seldom lost their perches, i.e., as occupants they apparently had an advantage, even though they seldom wing warned (Table 3) from their perches, but instead momentarily vacated them during flights toward and flights no reason.

Spacing

Spacing was studied by recording the number of males in each 1 m sector on 13 days near noon. Sometimes (45 instances) a 1 m sector was unoccupied, but most often (64) one male was present, less often (20) two males, and only once were three males present. Although unpaired males sometimes gave a superficial impression of crowding, they usually were spaced rather regularly. At a particular moment after some disturbance, there were momentary flights, but very quickly thereafter the flying about ceased and the rather regular spacing was resumed. The modal distance between *plana* males was 1 m, the mean, 1.2 m. This spacing is comparable with Zahner's (1960) average territory size (1.9 m) for *virgo* and with Pajunen's (1966) data (10 males/10 m) for low densities of the same species.

Although a *plana* male showed slight localization, a relatively unimportant point in determining whether or not a species is territorial (Kormondy, 1961; Johnson, 1964), he successfully defended a 1 m length of shoreline which by Noble's (1939) traditional definition would be considered a territory. Moreover, *plana* males met all criteria for territoriality (spacing, fighting for territory, male superiority within his territory, signals) discussed by Kormondy (1961) even though wing warning signals were rare. St. Quentin (1964) points out that territoriality in Zygoptera varies from passive occupancy to complex flight maneuvers. We consider that *apicalis* and *plana* are in an intermediate position because their occupancy was not passive yet was without complex flight maneuvers.

Although the average number of males at water was similar for both species, an *apicalis* male defended twice as much shoreline as *plana* yet performed only half as many aggressive actions (Table 3). Because in both species, flight toward was the primary means of warding off intruders, an *apicalis* male maintained a larger area probably as a result of the intensity, rather than the number or kind of action against intruders.

The primary function of territorial activity of *apicalis* and *plana* males is to provide the more successful ones with positions at water where their possibilities for seizing females flying to the aquatic habitat are greater. The amount of energy expended in securing and holding territory should be considered significant when comparing the success of populations or species. We judge *apicalis* more successful than *plana* because the former not only maintained a larger area but also did this with the expenditure of less energy, i.e., the use of fewer aggressive activities.

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A NEW NAME FOR A SUBGENERIC HOMONYM IN EPHEMERELLA
(EPHEMEROPTERA: EPHEMERELLIDAE)

Edmunds proposed the subgeneric name *Attenuatella* for those species of *Ephemerella* formerly referred to as the *annenuata*-group, with the type-species *attenuata* McDonnough. Dr. Georges Demoulin (in letter) kindly has called my attention to the fact that Stehli has used this name to designate a genus of Permian brachiopods. The name had not yet appeared in Zoological Record when the manuscript was submitted, and because of my narrow interests I had not read the paper on fossil brachiopods.

Therefore, I propose *Attenella*, new name for *Attenuatella* Edmunds (1959, Ann. Ent. Soc. Amer. 52:546) not *Attenuatella* Stehli (1954. Bull. Amer. Mus. Nat. Hist. 105:343. Brachiopoda: Spiriferidae). The name *Attenella* is formed by an arbitrary combination of letters.—GEORGE F. EDMUNDS, JR., *Department of Biology, University of Utah, Salt Lake City, Utah 84112.*

TWO NEW SPECIES OF NORTH AMERICAN NEOLASIOPTERA FROM BACCHARIS

(Diptera: Cecidomyiidae—Compositae)

Raymond J. Gagné, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—Two new North American species of *Neolasioptera* reared from 2 different kinds of galls on *Baccharis halimifolia L.* are described: *N.* **lathami**, n. sp. from globular, soft, apical galls, and *N.* **baccharicola**, n. sp. from hard, cylindrical, stem galls. These gall midges are potential candidates for introduction to Australia as possible biological controls of *Baccharis*.

Recently Brian W. Willson of the Alan Fletcher Research Station, Queensland Department of Lands, Australia, sent to me for determination some specimens of a new species of Cecidomyiidae, described here as *Neolasioptera lathami*, n. sp. which he reared in Florida while collecting parasites of *Baccharis* for potential introduction to Australia as biological control agents. This species forms soft, more or less globular galls, ¼ to 1 inch in diameter, on the upper stems of *Baccharis halimifolia* L. and which in some cases stunt plant growth. There were already several series of the same species from other States in the U.S. National Museum, some of which had been collected in 1960 by F. D. Bennett of The Commonwealth Institute of Biological Control, West Indian Station, Trinidad, for the same purpose as Willson, and, also, a series of another very different species from Virginia, described here as *Neolasioptera baccharicola*, n. sp. which is responsible for a hard, woody, cylindrical gall at the base of *B. halimifolia* stems.

I have compared both new species to each other and to the other 12 Nearctic species of *Neolasioptera* that have been reared from stems of Compositae. These are: *albitarsis* (Felt), *ambrosiae* Felt, *erigerontis* (Felt), *eupatorii* (Felt), *helianthi* (Felt), *perfoliata* (Felt), *ramuscula* (Beutenmüller), *rudbeckiae* (Felt), *tertia* (Cockerell), *trimera* (Felt), *vernoniae* (Beutenmüller), and *weldi* (Felt). These species are better known as a group than the remaining *Neolasioptera* species in that both sexes are known for 10 of the 12 species and the larvae are known for 8 species. None of the species listed above is from *Baccharis*, but *albitarsis* and *ramuscula* are from *Aster* and *erigerontis* is from *Erigeron*; both *Aster* and *Erigeron* belong to the same tribe as *Baccharis*, the Astereae. There are 3 Argentine species of *Neolasioptera* that were reared from *Baccharis* spp. These are *cordobensis* Kieffer and Jörgensen from *Baccharis coridifolia* D.C., *interrupta* K. and J. from *B. juncea* (Lehm.) Desf., and *ornaticornis* K. and J. from *B.*

[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

salicifolia Pers. They are possibly closely related to *N. lathami*, n. sp. but more material must be reared from *Baccharis* in Argentina to be sure. The original descriptions (Kieffer & Jörgensen, 1910) are very sketchy and the type series cannot be located and are probably lost.

Neolasioptera lathami, n. sp.
(Figs. 1–6)

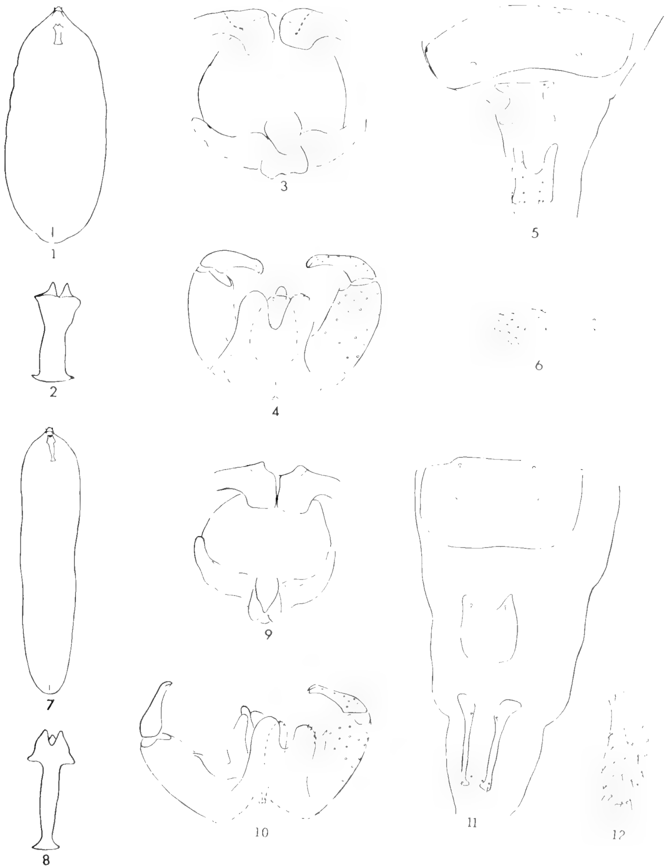
Adult. Wing length, 1.07–1.37 mm. Antenna: 11–12 flagellomeres in male, 13–17 in female. Palpus 3–4 segmented. Anepimeral setae, 10–24: anepisternal scales, 15–35. Wing: length R_5 (from arculus) to length remainder of wing as 62 : 58 (avg. 10 specimens); costa dark scaled except for white scales at junction of C and R_5. Legs covered with dark scales, unbanded. Male abdomen: tergum VI rectangular, very wide; tergum VII rectangular with several setae and scales present caudolaterally; tergum VIII unsclerotized; sternum X slightly wider than lobes of tergum X; genitalia as in fig. 4. Female abdomen (fig. 5): tergum VI 3 times as wide as long, rectangular, with double row of caudal setae and covered with scales; tergum VII about as wide as long, scalloped laterally, with 3–4 caudal rows of setae and the caudal ⅔ covered with scales; tergum VIII divided cephalad for about ½ its length, more strongly sclerotized laterally than mesally; setulae of distal ½ of ovipositor each with many short, straight prongs; dorsal lamella (fig. 6) short, bulbous; ventral lamella about .40 length dorsal lamella.

Pupa. Head as in fig. 3. Frontoclypeal setae absent.

Larva (fig. 1). Sternal spatula bidentate (fig. 2). Anal segment with 3 pair of papillae, subequal in length, ca. .010–.013 mm in length; dorsal and pleural papillae of abdominal segment VIII ca. .018 mm in length; cuticle covered with small, pointed verrucae, though those on pleurae may sometimes be rounded and larger than elsewhere.

Material examined. Holotype, male, reared from globular stem gall on *Baccharis halimifolia*, Yemassee, S.C., V-1960, F. D. Bennett, U.S. National Museum Type No. 70949. Paratypes (all reared from same kind of gall as holotype and from same host species and deposited in the U.S.N.M. except as noted): Orient, N.Y., VII-10-1967, R. Latham, 2 larvae, 3 pupae; Yemassee, S.C., V-1960, F. D. Bennett, 4♂, larva, 3 pupal exuviae; Charleston, S.C., VIII-10-1953, V. J. Reid, ♀, 4 larvae; Brunswick, Ga., V-1962, F. D. Bennett, 2♂, 7♀ (♂, ♀ in British Mus. (N.H.)); Lake Placid, Fla., along Hwy 70, VIII-12-1969, B. W. Willson, 8♂, 3♀ (2♂, 2♀, in Alan Fletcher Res. Sta., Queensland, Aust.); Dade Co., Fla., emerged IV-11-1969, #69-96A, C. E. Stegmaier, ♀; Haines City, Fla., V-1960, F. D. Bennett, 3♂; Bay St. Louis, Miss., I-26-1944, 5 larvae.

Remarks. *N. lathami* differs quite strongly from *N. baccharicola*, as can be seen from comparing the accompanying illustrations of the 2 species. The larva of *lathami* differs from the other Nearctic *Neolasioptera* considered here by the bidentate spatula and the short, broad body. The others have a tridentate or quadridentate spatula and long



Figs. 1–6. *Neolasioptera lathami*, n. sp.: 1, outline of larva (ventral); 2, spatula; 3, pupal head (ventral); 4, male genitalia (dorsal); 5, female abdominal terga VI–VIII; 6, lamellae of ovipositor (dorsal). Figs. 7–12. *N. baccharicola*, n. sp.: 7, outline of larva (ventral); 8, spatula; 9, pupal head (ventral); 10, male genitalia (dorsal); 11, female abdominal terga VI–VIII; 12, lamellae of ovipositor (dorsal).

spindle shaped bodies. However, larvae of the 3 Argentine species of *Neolasioptera* from *Baccharis* have bidentate spatulas.

The female of *lathami* has an incompletely divided tergum VIII and resembles only *rudbeckiae* in this respect; *N. weldi* and *N. trimera* have an undivided tergum VIII and all the others have it distinctly divided to form 2 elongate tergites. Otherwise, the female is easily separable from *rudbeckiae* by the number of flagellomeres: 13–17 in *lathami* and 21 in the latter, known from the female holotype only.

This species is named in honor of Mr. Roy Latham, now in his 90th year, a veteran farmer and amateur naturalist from Orient Point, New York.

Neolasioptera baccharicola, n. sp.
(Figs. 7–12)

Adult. Wing length, 1.36–1.63 mm. Antenna: 14–15 flagellomeres in male, 20–21 in female. Palpus 4 segmented. Anepimeral setae, 16–29, anepisternal scales, 45–75. Wing: length R_5 (from arculus) to length remainder of wing as 63:82 (avg. 4 specimens); costa dark scaled except for white scales at junction C and R_5. Legs covered with dark scales, probably unbanded. Male abdomen: terga VI–VII rectangular, covered entirely with scales and each with complete row of caudal setae; tergum VIII unsclerotized; sternum X narrower than lobes of tergum X; genitalia as in fig. 10. Female abdomen (fig. 11): tergum VI about 2 times as wide as long, with 3 more or less complete rows of setae caudally, and covered with scales; tergum VII slightly longer than wide, scalloped cephalad, with several rows of setae caudally, and caudal half covered with scales; tergum VIII completely divided to form 2 elongate sclerites; setulae of distal half of ovipositor each with many short, straight prongs; dorsal lamella (fig. 12) long, rounded distally; ventral lamella about .33 length dorsal lamella.

Pupa. Head as in fig. 9. Frontoclypeal setae absent.

Larva (fig. 7): Sternal spatula tridentate (fig. 8). Anal segment with 3 pair of papillae, the outer pair about .026 mm in length, about twice the length of the 2 inner pair; dorsal and pleural papillae of abdominal segment VIII about .030 long; cuticle covered with rounded verrucae.

Material examined. Holotype, male, reared from hard, cylindrical stem gall on *Baccharis halimifolia*, Virginia Beach, Va., V-1960, F. D. Bennett, U.S. National Museum Type No. 70950. Paratypes (same data as holotype): 3♂, 3♀, 4 pupal exuviae, 10 larvae (♂, ♀, in British Mus. (N.H.), remainder in U.S.N.M.).

Remarks. *N. baccharicola* is more closely related than *N. lathami* to the other species of *Neolasioptera* considered here. Of the 8 other species for which the larval stage is known, the following 6 resemble *N. baccharicola* in the tridentate spatula with a strong lateral development anteriorly: *albitarsis, ambrosiae, eupatorii, perfoliata, ramuscula,* and *weldi.* The remainder have either a quadridentate spatula (*erigerontis*) or a parallel-sided, tridentate spatula lacking the strong lateral extensions (*vernoniae*). Of the 6 with a spatula similar to that of *bac-*

charicola, ambrosiae, eupatorii, and *perfoliata* resemble that species in possessing 3 pair of terminal papillae instead of 4, but, unlike *baccharicola,* in which the outer pair is about 2 times the length of the 2 inner pair, the papillae are all subequal in length.

The female of *baccharicola* has a fully divided tergum VIII, as do most of the other composite inhabiting *Neolasioptera,* but the width of the 2 tergites at about midlength is about 1/15 that of the total length. Only *ambrosiae* and *erigerontis* approach that narrowness, all the others being more than 1/8 wide as long. Females of *baccharicola* can readily be separated from those 2 species by the number of flagellomeres: 20–21 in *baccharicola* and 16–17 in either *ambrosiae* or *erigerontis.*

Reference

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SPILOCHROA GEMINATA SABROSKY A SYNONYM OF S. POLITA (MALLOCH)

(Diptera: Trixoscelididae)

Spilochroa polita (Malloch, 1931, Proc. U. S. Natl. Mus. 78 [15]:30, *Diastata*) was described from female specimens. The holotype is labeled "N. Mexico / airplane / P. Glick." *S. geminata* Sabrosky (1961, Ent. News 72:233) was described from Arizona and Sonora, Mexico, largely upon differences in the maculation of the wing and with the statement that "no males of *polita* are available for comparisons of the male terminalia."

Material referable to either *polita* or *geminata* has been received several times from traps used in fruit fly surveys in the southwestern States, especially Arizona. This material is so variable in wing markings that I have been suspicious of the distinctness of *S. geminata.* Fortunately these flies have a fairly complex female postabdomen. The abdomen of the holotype of *S. polita* was therefore macerated. The sclerotization of the 7th segment consists in a complete ring, rather short dorsally and ventrally, but expanded laterally to twice the medial length and furnished with a series of rather strong setae around almost the entire posterior margin. The 8th sternum consists of 3 sclerites: a median, transversely lenticular piece flanked on each side by a narrowly triangular piece turned apicomesad and furnished with 2 rather strong and long apical setae. The 9th sternum is triangular with bulging sides and is furnished with a pair of well separated apical and a closely-set, somewhat heavier pair of subbasal, apically directed setae.

Females of the type series of *S. geminata* as well as those received from fruit-fly traps in Arizona show postabdomens with the same characters as those of *S. polita.* I am therefore, with Sabrosky's concurrence, considering that the 2 species are synonymous.—George C. Steyskal, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture, c/o U. S. National Museum, Washington, D. C. 20560.*

THE GNATHOSOMA OF CHEYLETUS CACAHUAMILPENSIS BAKER
(ACARINA: CHEYLETIDAE)

FRANCIS M. SUMMERS and ROBERT L. WITT, *Department of Entomology, University of California, Davis, California 95616*

ABSTRACT—The gnathosoma of *Cheyletus cacahuamilpensis* Baker emphasizes the adductor and flexor functions of the movable segments of its thickset pedipalps. The right and left basal segments of the chelicerae are completely fused together to form a stylophore, and this in turn is integral with the fused coxal segments of the pedipalps. The piercing thrust of the axial mouthparts is ascribable only to protractile movements of one or both cheliceral stylets. The skeletal parts, major muscles and other soft organs of the gnathosoma of females are described and illustrated from stained serial sections.

The axial mouthparts of cheyletids are peculiar because portions of the first two postoral appendages—chelicerae and pedipalps—fuse together to form a rigid beak. A study of the anatomy of the gnathosoma made by T. E. Hughes (1958) showed that the fusion of right and left chelicerae includes the whole of these appendages except for the movable digits or stylets. His transverse sections of the gnathosoma of *Cheyletus eruditus* (Schr.) revealed that the cheliceral stylophore and the underlying parts of the pedipalps are also ankylosed, or not movably articulated, at least to the level of the pivotal sclerites (hereafter called the *fulcra*) of the stylets.

We believe that the surface skeleton which covers the capitulum between the arms of the peritremes is the dorsalmost wall of the joined chelicerae rather than a tectum or overlying fold of integument united with high basal angles of the pedipalp coxae (Snodgrass, 1948). Peritremes are carried on the shafts of separate chelicerae in the Cryptognathidae (Summers and Chaudhri, 1965) and are inlaid into the dorsal cuticle of the chelicerae when right and left members coalesce to form a stylophore in the Caligonellidae (Summers and Schlinger, 1955). Extensions of the internal tracheae curve upward and ascend to the dorsal surface of the stylophore through its median septum (Grandjean, 1946; T. E. Hughes, 1958). The vertical extensions of the tracheae are continuous with the arms of the peritremes. Although peritremes may emerge in various locations along the median septum of the stylophore, the origin of peritremes close behind the fulcra of the stylets in the caligonellid *Coptocheles* very nearly duplicates the capitular organization of the cheyletids.

Summers and Price (1970) referred to the posterodorsal part of the stylophore bordered by the peritremes as the tegmen. That part of the stylophore which lies in front of the peritremes and which ensheaths and supports the stylets was called the protegmen. The conformation of the protegmen sometimes is distinctive for cheyletid genera or species.

The rostrum is a fleshy, spoon-shaped forward projection of the basis capituli and is thought to have been derived from paired endites of pedipalpal coxae (T. E. Hughes, 1959). This projection of the basis is coextensive with the retracted cheliceral stylets and, in most cheyletids, appears to project from beneath the anterior lobe or lobes of the stylophore. The front end of the stylophore seems to be drawn to a pointed apical process which may represent fixed cheliceral digits. The apical process merges with the upper face of the rostrum or is pressed into its median gutter. When cheyletids are dorsoventrally flattened onto slides, the nature of the union or articulation between protegmen and rostrum cannot be discerned. The intent of this study was to seek additional information about the skeletal elements of the gnathosoma of *Cheyletus* females and to describe some of its internal anatomy from sectioned material. Although four species of *Cheyletus* are being reared in the authors' laboratory, the species *C. cacahuamilpensis* Baker was chosen for this study because its gnathosomal skeleton is somewhat thicker and possibly more apt to show articulations than the other, more transparent species.

Techniques

The organization of the skeleton muscles and foregut is best revealed in microtome sections cut in each of the principal body planes. The chief handicap thus far has been rather poor fixation; we have not been able to preserve the soft tissues well enough to comprehend the histology of the mite even though its gross anatomy is reasonably revealed in the stained preparations. Fixatives tried were: aqueous Bouin's, alcoholic Bouin's, Gilson's, Zenker's, FAA, Carnoy's, Carnoy-Lebrun, and Flemming's chromoaceto-osmic acid (strong formula); one or more of these has been tried under reduced pressure, hot vs. cold, and mechanically aspirated into ruptured specimens. The most useful preparations were obtained with Carnoy-Lebrun's at room temperature. Sections were stained with Delafield's haemotoxylin and eosin.

Skeleton

In the anteriormost cross sections which we have obtained (fig. 1), the food canal appears to be closed above and party occluded by a sclerotic bar which Hughes has interpreted to be labrum. The food canal flattens near the stylet fulcra and communicates with the lumen of the pharyngeal pump, above the plunger. A thin-walled, tubular oesophagus (figs. 7, 12) proceeds rearward from the floor of the pump.

Parasagittal and sequential cross sections show that the union of chelicerae and coxal parts of the pedipalps is complete. The fulcra of the stylets are anchored within the fleshy part of the protegmen. Their shafts lie beside the food tube, in a pair of enclosed channels. Membranous sheaths which invest the stylet shafts immediately distal to the fulcra (fig. 6) are continuous with the walls of these channels (fig. 2). There are no identifiable fixed digits; the forward extensions of the protegmen merge with the rostrum, but the mergence is a true union, not a slip fit or apposition, as supposed by Summers and Price (1970). According to Hughes (1959) the rostrum or pedipalpal part of the beak of *Cheyletus eruditus* projects slightly beyond the extremity of the stylophore and is an open trough within which the tips of the retracted stylets lie side by side. In *C. cacahuamilpensis*, we have not been able to determine how much of the rostrum is uncovered.

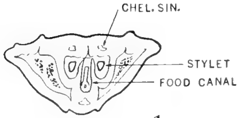
The line of fusion between stylophore and pedipalpal coxae is marked by a horizontal septum and external sutures at the sides of the tegmen (fig. 10). There is a vestige of a vertical septum between the chelicerae where the two body tracheae converge and ascend to the dorsal surface (fig. 8). Vertical and horizontal septa are continuous at this location. Behind this point, the horizontal septum divides into a pair of plate-like apodemes (figs. 5, 10). Their mesal edges do not appear to be interconnected, and the haemocoelic sinuses of the stylophore and pedipalps are continuous. The recognition of cheliceral and pedipalpal components in the narrowing beak, anterior to the pharyngeal pump, is uncertain. We think that the pedipalpal extensions (i.e., endites) form the sidewalls of the stylet channels and the upfolded horizontal septa separate the latter from the haemocoelic sinuses of the pedipalps (fig. 2).

Tracheae and Ducts

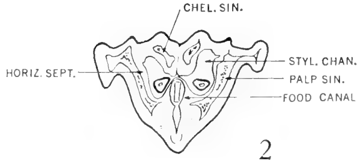
Two principal tracheal trunks connect with the peritremes via two juxtaposed vertical trunks in the median cheliceral septum. The chambered organization of the external peritremes also prevails in the vertical trunks (fig. 8) and in the roots of the principal tracheae as far back as the first lateral branching (fig. 5). The roots of the tracheae are embedded in the margins of the two horizontal septa. Each tracheal trunk sends a branch forward into the cheliceral sinus. Behind this

→

Fig. 1: Cross section near tip of beak. The tiny paired sinuses (chel. sin.) in the skeleton which covers the stylet channels are extensions of the general haemocoele of the stylophore. Fig. 2: Section 10 microns behind the first cut. The wedge-shaped slot below the food canal is continuous with the wide lumen of the pharyngeal pump. Fig. 3: Frontal section through the stylophore which shows several fibers of the stylet protractor muscles and their insertions on the fulcra. Fig. 4: Horizontal section through pharyngeal pump showing apodemes of the pharyngeal dilator muscles. Fig. 5: Dorsal aspect of axial part of gnathosoma illustrated from a cleared whole mount (Hoyer's). Plate-like apodemes of the divided horizontal septum are illustrated as textured sheets.


CHEL. SIN.
STYLET
FOOD CANAL

1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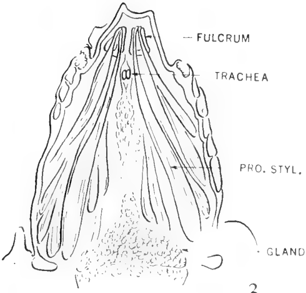
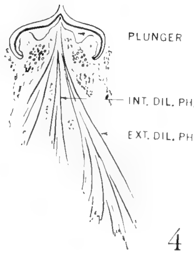
HORIZ. SEPT.
STYL. CHAN.
PALP SIN.
FOOD CANAL

2


FULCRUM
TRACHEA
PRO. STYL.
GLAND

3


PLUNGER
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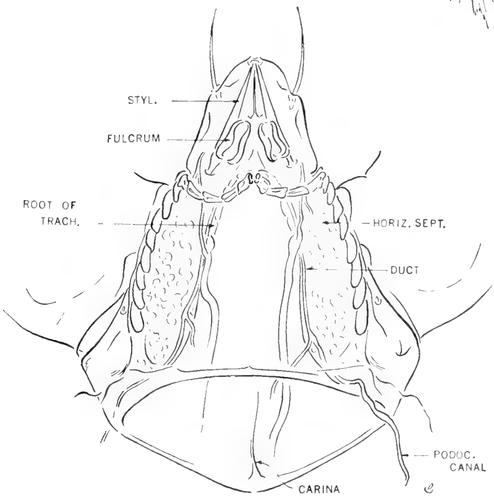
STYL.
FULCRUM
ROOT OF
TRACH.
HORIZ. SEPT.
DUCT
PODOC.
CANAL
CARINA

5

furcation the trachea separates from the septa and follows a sinuous course rearward.

The significance of chambers in the peritremes is not obvious; presumably the segmentation does not have to do with pulsatile or telescoping motions since both external and internal chambered parts are embedded in rigid skeleton. Available evidence indicates that the peritremes of this species are possibly open gutters, not covered by a thin cuticular membrane as reported for *C. eruditus* by Hughes (1958) and having minute stigmata at several points (Newstead and Duval, 1918). Our best prepared sections show the peritremes to be open grooves (fig. 8) containing darkly pigmented trabecular folds on the internal walls. Also a specimen was lyophilized, shadowed with gold and examined under a scanning microscope at 20,000 diameters. A membranous closure could not be demonstrated. Of course, this evidence does not preclude a possibility that ordinary histological preservatives and freeze-drying create distortional forces which may draw apart the thin outer lips of the peritremes, thus ripping any outer cuticular membrane. We are greatly indebted to Mssrs. Robert Schuster and Marvin Kinsey, of this department, for their services in this special microscopy.

A tubular gland consisting of about three tightly appressed convolutions lies below the caeca of the ventriculus and above the muscles of coxae I–III on each side. This pair of glands corresponds in position to the tubular silk glands identified in *Tetranychus* by Blauvelt (1945). The epithelium of each gland transforms into a slender ductule in the vicinity of coxa I; this is the podocephalic canal (Grandjean, 1938) which, in *Cheyletus*, is fairly difficult to see in whole mounts. Each ductule traces anteriorly, over the musculature of the pedipalp and onto the horizontal apodemes beneath the stylophore. Each ductule receives a prominent median branch then passes forward between the stylets (fig. 7) and probably enters the pharyngeal food channel a short distance in front of the pump mechanism.

An extensive gland-like mass lies above the compound nerve ganglion and has several pairs of lobules projecting into the gnathosoma. Its histology is poorly understood and its function is unknown. We think that this mass has a pair of sleeve-like, collapsible ducts which come together above and behind the pharyngeal pump. There is, however, no certainty that the sleeve-like tubes actually connect with the foregut. Another unresolved detail is the origin of the mesal ductules which join with the podocephalic canal where the latter enters the gnathosoma.

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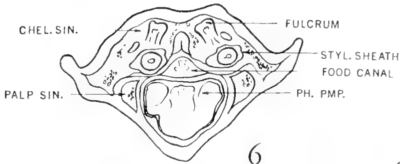
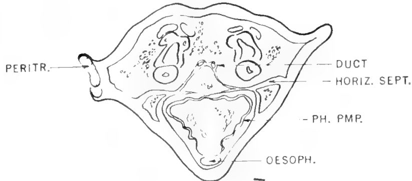
Figs. 6–10: Series of cross sections of different specimens to show relations of septa, stylets, peritremes, pharyngeal pump and musculature of the mouthparts.


CHEL. SIN.
FULCRUM
STYL. SHEATH
FOOD CANAL
PALP SIN.
PH. PMP.

6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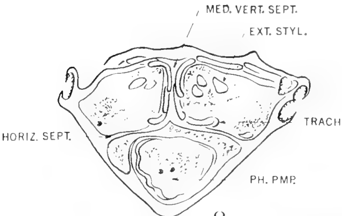
PH. PMP.
OESOPH.

7


MED. VERT. SEPT.
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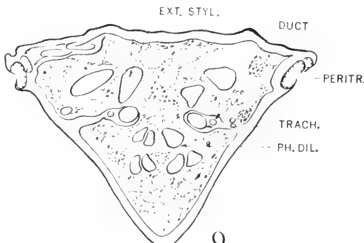
PH. PMP.

8


EXT. STYL.
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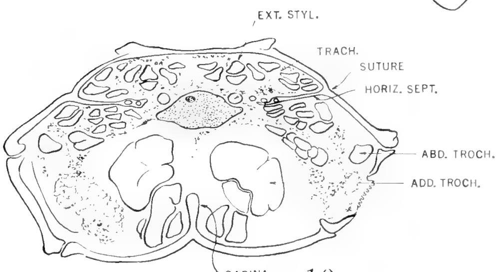
9


EXT. STYL.
TRACH.
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HORIZ. SEPT.
ABD. TROCH.
ADD. TROCH.
CARINA

10

Musculature

The structures here referred to as "muscle fibers" are thought to be single, large fibers in the histological sense. The fibers are not organized into a compact body or belly in some of the musculature. Other structures called "muscles" or "slips" may be single, large fibers, branched fibers or aggregates of these.

Levator-Retractors of the Gnathosoma (lev. gn.). Two or three pairs of large muscle fibers originate near the posterior margin of the propodosomal plate and insert on the sides of the posterodorsal rim of the stylophore (fig. 12). These fibers flank the anterior cornua of the midgut. Their origins are revealed as several pairs of cancellate areas on the propodosomal plate near its dorsal midline.

Depressor-Retractors of the Gnathosoma. Two pairs of moderately robust muscle fibers originate near the mid-region of the propodosomal plate and pass downward and forward to insert on the posteroventral rim of the basis capituli. These fibers pass close beside the lateral faces of the levator fibers.

Protractors of the gnathosoma were not identified. Turgor due to body compression may apply the counterforce.

Protractors of the Stylets (pro. styl.). A cluster of fibers (fig. 3) originate on a broad area of the posterior one-third of the stylophore. The cancellate marks where the fibers attach to the surface skeleton make up the characteristic ornamentation of the tegmen. The fibers of one side overlie the horizontal septum of the corresponding side but none of them appear to attach to it. Retractors of the stylets—if any—were not demonstrated. The protractors are labeled ext. styl. in figs. 8–10.

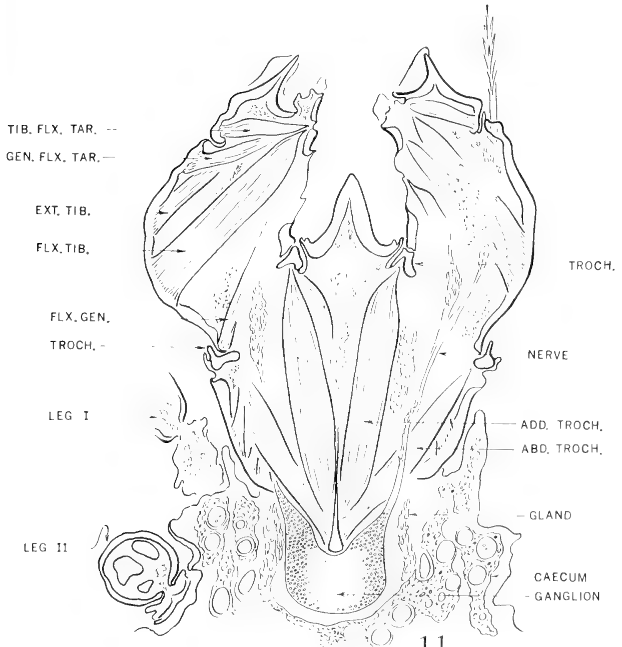
Dilators of the Pharyngeal Pump. Two sets of muscle fibers operate the suctorial apparatus.

External dilators (ext. dil. ph.) comprise a pair of fiber bundles. The fibers in these bundles originate on the inferior and lateral surface of each wing of the horizontal septum. Five or more fibers per side attach one behind another to the septa quite far behind the pharyngeal pump (fig. 12). The anterior ends of these fibers fasten somewhat fanwise to an elongate apodeme. The apodemes of each side join almost at the point of insertion in the concavity of the piston-like pharyngeal wall (fig. 4).

Internal dilators (int. dil. ph.) are similarly constituted. A bundle

→

Fig. 11: Frontal section of basis capitulum cut through keel of rostrum and deep-lying nerve ganglion. This section shows the insertions of heavy muscles on the palp trochanter. Fig. 12: Parasagittal section selected to best reveal the arrangement of external dilator muscles of the pharyngeal pump. Lobes of gland-like mass (not labeled in fig. 12) occupy interstices between muscles and anterior limb of midgut (filled with crystalline matter).


TIB. FLX. TAR.
GEN. FLX. TAR.
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TROCH.
LEG I
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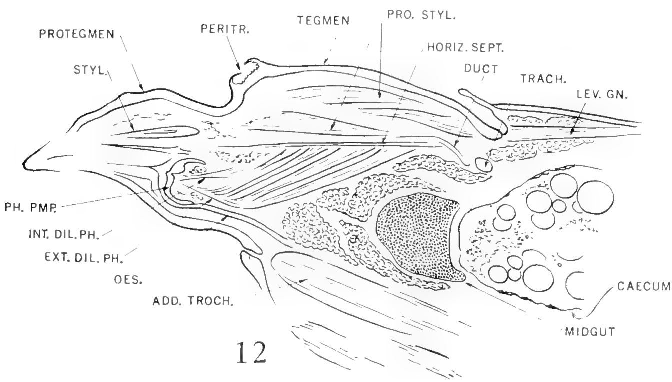
NERVE
ADD. TROCH.
ABD. TROCH.
GLAND
CAECUM
GANGLION

11


PROTEGMEN
STYL.
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TEGMEN
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HORIZ. SEPT.
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TRACH.
LEV. GN.
PH. PMP.
INT. DIL. PH.
EXT. DIL. PH.
OES.
ADD. TROCH.
CAECUM
MIDGUT

12

of five to eight fibers is implanted on the inferior surface of each wing of the horizontal septum. The fibers on the opposite sides of the midline lie somewhat mesad and dorsad of the external dilator fibers. Those of each side converge and tie to a single median apodeme. This median apodeme and the Y-shaped apodemes of the external dilators seem to have a common insertion at the center of the pump plunger (fig. 4).

Cross sections cut close to the posterior end of the gnathosoma show numerous fibers of both pairs of dilator muscles (fig. 10). However, sections cut farther forward show few fibers (fig. 9). The reduction may occur because some of the fibers anastomose or attach to thin apodemes not readily discernible in cross sections.

The ventral seam of the basis capituli is the suture of the median vertical septum (carina) on which arise the mite's most robust muscles. The median septum incompletely partitions the basis (fig. 10). It is confluent with the thickened hindmost rim of the gnathosoma and continues forward to the rostral base.

Adductor of the Palp Trochanter (add. troch.). This muscle has a long, robust body. Its principal component arises on the median septum near the posterior, ventral lip of the gnathosomal skeleton (fig. 11). It has at least five other slips which originate at equally space intervals along the full length of the carina. Each slip angles upward and forward and then merges into the body of the whole. The muscle narrows abruptly to a short apodeme which inserts on the mesal rim of the palp trochanter. Although it inserts on the trochanter, the principal action of this muscle appears to be adduction of the entire pedipalp.

Abductor of the Palp Trochanter (abd. troch.). The single slip of this muscle arises on or near the posterior base of the carina. It passes laterad to insert on the inner rim of the trochanter, approximately in the same horizontal plane as its antagonist. Its function can be deduced from the illustration (fig. 11).

Adductors of the Palp Femur. The ventralmost muscles in the basis capituli are adductors of the palp femora. The two muscles of each side arise on ventrolateral cheek of the basis capituli and appear to have only one point of insertion, on the mesal rim of the femur, somewhat beneath the adductor of the trochanter. The larger, lateral slip originates on the bulged cheek of the basis. Another, somewhat smaller slip originates some distance behind the first. There may be a very slender third slip which originates on the carina and which lies parallel with the belly of the trochanter adductor. This femoral muscle and the overlying adductor of the trochanter are probably synergists. We have not identified a corresponding antagonist.

Flexor of the Genu (flx. gen.). A slender, tapered muscle which anchors in the outer, proximal end of the femur (fig. 11). This portion of the femur telescopes into the palp trochanter when the appendage abducts. The muscle passes diagonally through the cavity of the femur to insert on a thread-like apodeme on the mesal side of the short, annular genu. Its action tucks the inner flange of the genu into the femur.

Flexor of the Tibia (flx. tib.). One stout head originates on the posterolateral face of the femur (fig. 11). Its myofibrils (or tonofibrils) are splayed out to create the largest of the cancellate areas noticeable on the elbowed part of the femur. A second, smaller head arises in the ventrolateral area of the femur. Both slips pass anteriorly across the femur and insert on the tibia below the tibiotarsal articulation. The two slips are believed to insert on the same apodeme.

Extensor of the Tibia (ext. tib.). This extensor comprises a single slip which arises in the lateral skeleton of the femur, somewhat distal to the larger tibial flexor (fig. 11). The insertion is in the outer base of the tibia. Its body lies below the tarsal flexors.

Genual Flexor of the Tarsus (gen. flx. tar.). Since the genu is scarcely more than a short sclerotic ring, this muscle lies almost in a transverse plane, passing from the outer face of the genua to the mesal rim of the tarsus (fig. 11).

Tibial Flexor of the Tarsus (tib. flx. tar.). A short slip of muscle which traverses the tibial segment. Separate insertions for this muscle and the genual flexor of the tarsus are not distinguishable.

The gnathosomal musculature of *Cheyletus* greatly exaggerates the adductor-flexor motions of the pedipalps. We have succeeded in identifying only two small muscles to counteract the pincer movements.

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RECORDS OF APHIDS COLLECTED IN NEWFOUNDLAND (HOMOPTERA: APHIDIDAE)

MORTIMER D. LEONARD, *2480 16th Street, Washington, D. C. 20009*

ABSTRACT—Records are given for 17 species of aphids collected on about 20 plants in Newfoundland, Canada by Dr. Charles P. Alexander.

In the Spring of 1961 between 11 June and 23 July, Dr. Charles P. Alexander of Amherst, Massachusetts made 36 collections of aphids in Newfoundland, Canada. These collections represented 17 species specifically determined and two only to genus on about 20 plants. The material was all sent in alcohol to Dr. M. E. MacGillivray, Research Station, Canada Department of Agriculture, Fredericton, New Brunswick, who kindly made the slides and determinations. Representative slides are in the Cornell University Collection. Dr. MacGillivray commented that all of these species collected in Newfoundland have been collected in the Maratime Provinces. It is felt that these records should be made available to others.

Acyrthosiphon pisum (Harris). Junction Pond 16.VII on *Trifolium repens.*

Amphorophora ampullata Buckton (=*A. laingi* Mason). Malignant Cove and Junction Pond 14.VII on *Prenanthes alba.*

Aphis corniella Hille Ris Lambers. Aspen Brook 17.VII (det with query), Chapel Arm 2.VII on *Cornus amomum*, South Brook 14.VI on *C. stolonifera* (det with query).

Aphis farinosa Gmelin. Aspen Brook Camp 18.VII on *Salix* sp.

Boernerina variabilis Richards. Colinet 25.VI on *Alnus rugosa.*

Catamergus purpurascens (Oestlund) formerly in *Kakimia.* Embree 16.VI on *Thalictrum polygonum* (M. E. Smith coll.).

Cinara abieticola (Cholodkovsky). Bonne Bay 12.VI on *Picea mariana*, Chapel Arm 2.VII on *Abies balsamea* and The Cataracts 25.VI.

Cinara braggi Gillette. Bonne Bay 11.VI and Aspen Brook Camp 18.VII on *Picea rubra.*

Cinara canatra Hottes & Bradley. Birch Lake 13.VI on *Picea mariana.*

Cinara laricifex (Fitch) originally in *Lachnus.* Buchans 19.VI on *Larix laricina.*

Dactynotus sp. (only immatures). Cochrane Point 30.VI on *Solidago hispida.*

Euceraphis sp. Gander 17.VI on *Alnus rugosa* and Indian River 23.VII on *Alnus incana.*

Euceraphis gillettei Davidson. Gander 17.VI on *Betula alba papyrifera* and *Myrica gale.*

Euceraphis punctipennis Zetterstedt (formerly det as *E. betulae*). Chapel Arm 2.VI on *Betula alba pendulifera* and Junction Pond 11.VII on *B. a. papyrifera.*

Macrosiphoniella millefolii (DeGeer). Buchans 17.VI on *Achillea millefolium.*

Macrosiphum near *tenuitarsis* Gillette & Palmer. Brigus Junction 1.VII and 19.VII Buchans on *Aster novae-belgii.*

Mindarus abietinus Koch. Chapel Arm 2.VII on *Pyrus americana* (? accidental) and on *Betula alba pendulifera.*

Neonasonovia nabali (Oestlund). (new comb. MacGillivray). Aspen Brook Camp 18.VII on *Prenanthes ?alba.*

Pterocallis alnifoliae (Fitch) formerly in *Myzocallis.* Lethbridge 3.VII on *Alnus rugosa* (CPA coll.) and MMA coll. on *Abies balsamea.*

TAXONOMIC NOTES ON TWO RACEMICOLOUS GALL-MAKERS ON SOLIDAGO SPP.

(Diptera: Cecidomyiidae—Compositae)

Osten Sacken (1862, Smith. Misc. Coll. 6(1[=pub. 141]): 196) described *Cecidomyia racemicola* from galls and larvae found among the racemes of an unidentified *Solidago* from Washington, D. C. The galls are green, ca. 2.5 mm in diameter, and rounded except for the tapered apex. Later, Felt (1907, New Species of Cecidomyiidae, Albany, N. Y., p. 24, & N. Y. State Mus. Bull. 110:120) described another species, *Rhopalomyia racemicola,* from adults reared from the same kind of gall on *Solidago canadensis* from Asheville, N. C. Beutenmüller (1907, Amer. Mus. Nat. Hist. Bull. 23:393, pl. 17, figs. 14–15) illustrated the gall and larval spatula of *Cecidomyia racemicola* from N. Y. and N. C., and pointed out that Osten Sacken's and Felt's species were probably synonymous. Thereafter, the 2 species were treated as synonyms in the genus *Rhopalomyia.*

Recently, Dr. Rodney Dodge showed me some typical *racemicolous* galls from *Solidago stricta* found near his residence in Bradenton, Florida. Orange-red larvae were crawling on the inside of the vial containing the galls, almost all of which had a tiny round hole in the side. This was uncommon behavior for a *Rhopalomyia* because the generally whitish larvae usually pupate within the galls. Upon closer inspecition, the Florida larvae proved to belong to *Schizomyia.* They agreed with Beutenmüller's (ibid) description and with his observation that the larvae left the galls to pupate. In Osten Sacken's type galls, presently on loan to the U. S. National Museum from the Museum of Comparative Zoology in Cambridge, Mass. were some dried larvae which also proved to be *Schizomyia.* Thus there are 2 species associated with the same type of gall: *Cecidomyia racemicola* Osten Sacken, here transferred to *Schizomyia* (n. comb.) and known from larvae only, and *Rhopalomyia racemicola* Felt, known from adults only. I am designating as lectotype of *S. racemicola* (O.S.) a larva found protruding from one of the type galls. It will be deposited in the MCZ.—Raymond J. Gagné, *Systematic Entomolgy Laboratory, Agricultural Research Service, U. S. Department of Agriculture, c/o U. S. National Museum, Washington, D. C. 20560.*

CERATOCULICOIDES, A NEW GENUS RELATED TO CERATOPOGON MEIGEN

(DIPTERA: CERATOPOGONIDAE)

WILLIS W. WIRTH, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

and

NIPHAN CHANTHAWANICH RATANAWORABHAN, *Migratory Animal Pathological Survey, Applied Scientific Research Corporation, Bangkok, Thailand*

ABSTRACT—**Ceratoculicoides**, n. gen. is proposed for *Helea longipennis* Wirth, type-species, from northern and eastern North America, *Helea virginianus* Wirth from eastern U.S.A., **blantoni**, n. sp. from Maryland and Virginia, and *Ceratopogon gracilipes* Remm from Estonia.

A small group of *Ceratopogon* species are set apart from others in the genus by a number of very distinct characters. Wirth (1952) commented on these in his description of *Helea longipennis* Wirth and later Wirth (1965) and Remm (1967) assigned the three known species to the subgenus *Nilohelea* Kieffer, using the interpretation of the latter suggested by Macfie (1940).

An examination of the original description of *Nilohelea* Kieffer (1921) and the type species *Nilohelea albipennis* Kieffer from the Sudan, indicates that *Nilohelea* should more properly be included in the synonymy of the subgenus *Isohelea* Kieffer. Kieffer's figure of the male genitalia of *N. albipennis* shows a characteristically sickle-shaped and distally narrowed dististyle quite unlike any found in the species reviewed here, but strikingly similar to that described for *Ceratopogon (Isohelea) sahariensis* Clastrier (1961) from Mouydir, Algeria, in the Central Sahara.

We therefore take this opportunity to propose a new genus for the three known species erroneously assigned to *Nilohelea*, and to describe a new North American species.

Ceratoculicoides, n. gen.

Type-species: *Helea longipennis* Wirth.

Diagnosis.—Moderate size species with female claws small and *Culicoides*-like on hind leg; first radial cell obsolete, second small; vein M2 interrupted at base.

Eyes hairy or bare, well separated by an angular space in female (fig. 1e). Female antenna (fig. 1a) with five distal segments moderately elongate, shaped much as in *Culicoides*, distal sensory pit present on third segment; antennal ratio about 1.1 to 1.25. Male antennal segments 3–13 fused, 13–15 elongate with short verticils (fig. 1g). Female palpus (fig. 1b) short, third segment with moderately

[1] Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

deep pit. Female mandible (fig. 1f) slender distally with large teeth. Wing (fig. 1d) narrower than in *Ceratopogon*, usually somewhat infuscated along veins; costa short, 0.50–0.55 of wing length in American species, 0.69 in *gracilipes* Remm. Legs (fig. 1h) moderately slender, without conspicuous bristles; tarsal ratio about 2.2; fourth tarsomere slender; claws of female (fig. 1j) long and subequal to slightly unequal on fore and mid legs, small and equal, similar to the male claws on hind leg (except in *gracilipes* which has large claws only on fore leg). Female genital opening provided on each side with a narrow, mesally forked sclerotization (fig. 1n); two large and one rudimentary spermathecae (fig. 1m) present (only one large spermatheca in *gracilipes*), with characteristic long oblique necks. Male genitalia (fig. 1L) with ninth sternum rather broad, with small caudomedian excavation; ninth tergum moderately long and tapering with well-developed, digitiform apicolateral processes. Basistyle moderately stout, dististyle slender and nearly straight. Aedeagus with characteristic shape, with low basal arch and short anterolateral basal arms; broad main portion usually with slightly cleft apex and bearing small, dorsally bent, apicolateral teeth. Parameres (fig. 1k) separate, each arising from a slender anterolateral apodeme similar to that of *Alluaudomyia*; main portion a straight, tapering rod with simple tip usually somewhat bent posterolaterally.

This genus combines some of the characters of *Isohelea* and *Brachypogon* Kieffer, while at the same time presenting some aspects similar to the genus *Culicoides* Latreille. With *Isohelea* it shares the short costa, interrupted vein M2, distinct apicolateral processes of the male ninth tergum, and separate male parameres. With *Brachypogon* it has the reduced radial cells, with the reduction not so complete as in that genus. The small claws on the hind (and sometimes mid) tarsi of the female are unique in the tribe Ceratopogonini, but are reminiscent of the claws of the genus *Culicoides*. The antennae are more suggestive of *Culicoides* than of *Ceratopogon* except for the restriction of the sensory tufts to the third segment. This genus is also quite distinctive in the shape of the sclerotization on each side of the female genital opening, and in the general structure of the male genitalia.

Key to the Species of **Ceratoculicoides**

1. Female claws long only on fore leg; one spermatheca present; male aedeagus with distinct caudomedian cleft and caudolateral teeth; male parameres slender on distal half .... **gracilipes** (Remm)
   Female claws long on fore and mid legs; two spermathecae present; male genitalia various 2
2. Legs yellow; small species, wing 0.90–1.10 mm long; male aedeagus slightly cleft distad with distinct caudolateral teeth, parameres stout with apices laterally bent .... **virginianus** (Wirth)
   Legs brownish; larger species, wing 1.15–1.25 mm long; male genitalia various 3
3. Female spermathecae larger, 0.082 and 0.075 mm in diameter; male aedeagus with simple rounded tip, parameres slender on distal half .... **longipennis** (Wirth)

Female spermathecae smaller, 0.046 and 0.040 mm in diameter; male aedeagus with truncate tip bearing sharp caudolateral teeth; parameres stout with abruptly pointed tip .... **blantoni**, n. sp.

Ceratoculicoides longipennis (Wirth), n. comb.
(Fig. 1)

Helea longipennis Wirth, 1952:201 (female; ? subgenus; California).
Ceratopogon (*Nilohelea*) *longipennis* (Wirth): Wirth, 1965:133 (combination).

Female.—Length of wing 1.25 mm.

Head: Brown, including antennae and palpi. Eyes with numerous, moderately prominent interfacetal hairs. Antenna (fig. 1a) with proximal segments not as short and stout as in *virginianus*, lengths of flagellomeres in proportion of 23-19-18-20-20-22-22-23-31-35-37-40-43; antennal ratio 1.12. Palpal segments (fig. 1b) with lengths in proportion of 15-25-30-15-23; third segment short, length/breadth ratio 1.66, with a small deep sensory pit.

Thorax: Subshining brownish black; legs brown, knee joints and tarsi paler. Claws (fig. 1j) nearly as long as fifth tarsomere on fore and mid legs, small and equal, same size as male claws, on hind leg. Hind basitarsus 2.1 as long as second tarsomere. Wing (fig. 1d) darker than in *virginianus*, with more macrotrichia at wing margin distally; costa extending to 0.53 of wing length. Halter pale.

Abdomen: Dark brown. Spermathecae (fig. 1m) ovoid with long oblique necks, with pronounced hyaline perforations; measuring 0.082 + 0.032 (neck) by 0.075 mm and 0.075 + 0.023 by 0.060 mm.

Male.—Similar to the female with the usual sexual differences; legs and wings darker in color, wings practically without marginal macrotrichia; antennal plumes brown; antennal segments 13–15 with lengths in proportion of 62-52-68. Genitalia (fig. 1L): Aedeagus with main body slightly longer than broad, basal arch extending to a fourth of total height; distal margin evenly rounded, without trace of median notch or sublateral teeth. Parameres (fig. 1k) each stout at base, evenly tapered to slender pointed tip, the latter slightly bent ventrad.

Distribution.—Washington, California, and from Quebec to Florida.

Type.—Holotype female, Stony Brook, Sequoia National Park, Tulare Co., California, 13 July 1947, W. W. Wirth, "attempting to bite" (Type no. 59944, USNM).

Specimens Examined.—CALIFORNIA: Laguna Beach, 28 March 1935, A. L. Melander, 1 female; Mill Valley, Marin Co., 10 May 1958, H. B. Leech, 1 female; Redding, 14 May 1948, W. W. Wirth, stream margin, 1 female (paratype); Stony Brook, Sequoia National Park, etc. (holotype female). FLORIDA: Torreya State Park, Liberty Co., 27 April 1958, F. S. Blanton, light trap, 1 male; 20 May 1966, H. V. Weems, light trap, 2 males; 22 April 1967, W. W. Wirth, light trap, 1 male. MARYLAND: Forest Glen, Montgomery Co., 5 June 1967, W. W. Wirth, light trap, 4 males, 1 female. NEW YORK: Allegany State Park, 3 June 1963, W. W. Wirth, mossy woods and stream margin, 5 males, 9 females. OREGON: North Plains, Washington Co., 19 May 1963, K. Goeden, along stream, 1 male; Wetmore Campground, Baker

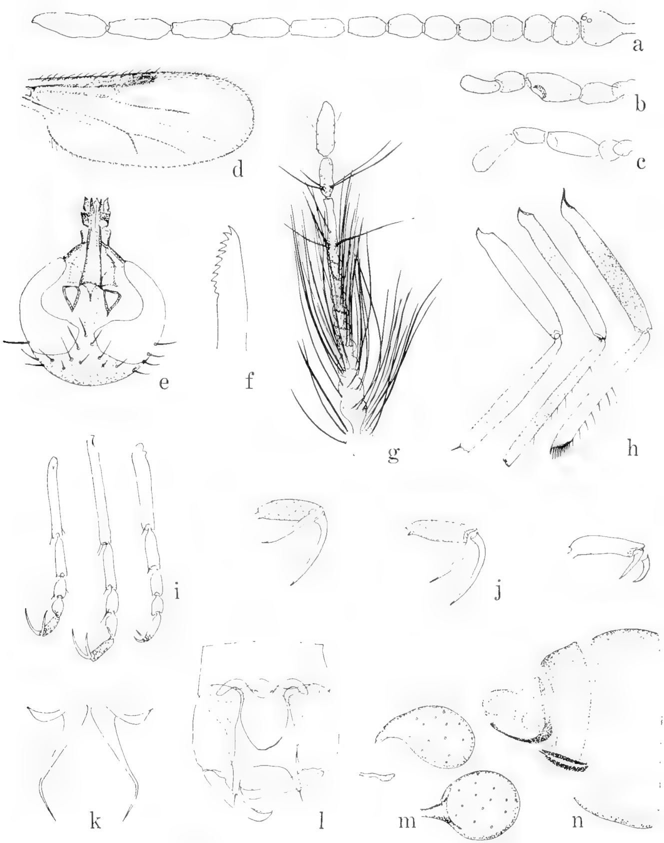

Fig. 1. *Ceratoculicoides longipennis* (Wirth): a, female antenna; b, female palpus; c, male palpus; d, female wing; e, female head; f, female mandible; g, male antenna; h, female legs, left to right, fore, mid, and hind; i, female tarsi, fore, mid, and hind; j, female claws, fore, mid, and hind; k, male parameres; l, male genitalia, parameres removed; m, female spermathecae; n, female genital sclerotization.

Co., 9 mi w Unity, 2 July 1965, malaise trap, 1 female. QUEBEC: Meach Lake, 6 June 1960, W. W. Wirth, 1 female. VIRGINIA: Falls Church, May 1958, W. W. Wirth, light trap, 2 males, 14 females. WASHINGTON: Adna, 10 July 1917, A. L. Melander, 1 female.

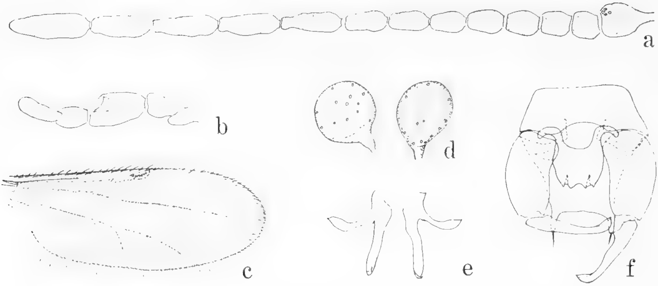

Fig. 2. *Ceratoculicoides blantoni*, n. sp.: a, female antenna; b, female palpus; c, female wing; d, female spermathecae; e, male parameres; f, male genitalia, parameres removed.

Discussion.—This species is distinguished from *virginianus* (Wirth) by its larger size and brownish legs, and from *blantoni*, n. sp. by its larger spermathecae, distally slender male parameres, and male aedeagus without sublateral teeth on the distal margin.

Ceratoculicoides blantoni, n. sp.
(Fig. 2)

Female.—Length of wing 1.15 mm. A dark brown species, nearly indistinguishable from *C. longipennis*. Antennal ratio 1.07; costal ratio 0.50. Spermathecae (fig. 2d) much smaller, measuring 0.064 + 0.014 by 0.046 mm and 0.051 + 0.011 by 0.040 mm, hyaline perforations absent.

Male.—Lengths of antennal segments 13–15 in proportion of 65-55-55. Genitalia (fig. 2f): As in *C. virginianus*, but the aedeagus with main body slightly broader than long, the distal margin without mesal notch but with prominent, dorsally projecting teeth. Parameres (fig. 2e) stout distally as in *virginianus*, but the tips more abruptly narrowed with the points not bent laterad.

Distribution.—Maryland, Virginia.

Types.—Holotype male, allotype female, Snow Hill, Worcester Co., Maryland, 19 May 1968, W. H. Anderson, light trap (Type no. 70650, USNM). Paratypes, 8 males, 4 females, Falls Church, Virginia, May 1958, W. W. Wirth, light trap.

Discussion.—We are pleased to name this species for Professor F. S. Blanton of the University of Florida in recognition of his long and dedicated work on American Ceratopogonidae. Pinned specimens of *C. blantoni* cannot be distinguished from those of *C. longipennis*, but in slide mounts the smaller female spermathecae and the shapes of the male aedeagus and parameres will afford an easy separation.

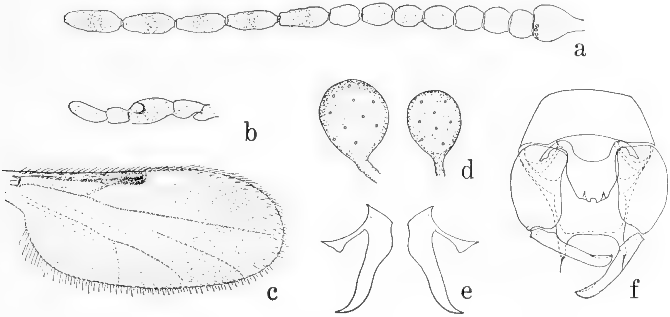

Fig. 3. *Ceratoculicoides virginianus* (Wirth): a, female antenna; b, female palpus; c, female wing; d, female spermathecae; e, male parameres; f, male genitalia, parameres removed.

Ceratoculicoides virginianus (Wirth), n. comb.
(Fig. 3)

Helea (*Isohelea*) *virginianus* Wirth, 1951:318 (male, female; Virginia, Maryland; fig. male genitalia).

Ceratopogon (*Nilohelea*) *virginianus* (Wirth): Wirth, 1965:133 (combination).

Female.—Length of wing 0.90–1.10 mm.

Head brown, antennae and palpi pale brown. Eyes practically bare, only a few very fine interfacetal hairs present. Antenna (fig. 3a) with proximal flagellomeres broader than long, gradually becoming longer and more slender, the distal five distinctly elongated; lengths in proportion of 12-13-14-15-17-18-19-19-30-30-30-32-35; antennal ratio 1.25. Palpal segments (fig. 3b) with lengths in proportion of 15-15-25-14-22; third segment short, length to breadth ratio 1.66; with a small deep sensory pit.

Thorax subshining brownish black, mesonotum with sparse, long, light brown hairs; coxae brown, remainder of legs yellow. Claws subequal, nearly as long as fifth tarsomere on fore and mid legs, small and equal, the size of male claws, on hind leg; hind basitarsus 2.2 as long as second tarsomere. Wing (fig. 3c) smoky grayish brown, the veins slightly infuscated; costa extending to 0.50 of wing length; macrotrichia absent except for a few along wing margin between tips of veins R5 and M2. Halter pale.

Abdomen: Deep brownish black. Spermathecae (fig. 3d) unequal in size, measuring 0.070 + 0.017 (neck) by 0.058 mm and 0.052 + 0.016 by 0.046 mm; ovoid, with long, slender, sclerotized neck arising obliquely.

Male.—Similar to the female with the usual sexual differences; antennal plumes yellowish brown; antennal segments 3–13 fused, lengths of 13–15 in proportion of 80-65-48. Genitalia (fig. 3f): Aedeagus with main body as broad as long, basal arch high, extending to a fourth of total length; apex broad, more or less truncate with a small distomesal notch, each distolateral lobe with two sharp, anterodorsally bent teeth. Parameres (fig. 3e) each short and stout, especially at base, with bluntly pointed tip somewhat bent ventrolaterally.

Distribution.—Eastern U.S.A. from New York to Florida and Texas.

Type.—Holotype male (pinned), Mount Solon, Virginia, 11 July 1950, W. W. Wirth (Type no. 60972, USNM).

Specimens Examined.—FLORIDA: Gainesville, Alachua Co., 20 April 1967, W. W. Wirth, light trap, 1 male; Torreya State Park, Liberty Co., April 1957, F. S. Blanton, light trap, 1 male, 3 females; 20 May 1966, H. V. Weems, light trap, 3 males, 3 females; 22 April 1967, W. W. Wirth, light trap, 2 males; Welaka, Putnam Co., 9 April 1964, H. A. Denmark, light trap, 1 male. MARYLAND: Forest Glen, Montgomery Co., 22 June 1967, W. W. Wirth, light trap, 1 male. NEW JERSEY: New Brunswick, 12 July 1958, W. W. Wirth, lake margin, 1 female. NEW YORK: Colton, Raquette River, S. Lawrence Co., 24 June 1963, W. W. Wirth, 1 female; Stoddard Hollow, Cattaraugus Co., 10 August 1961, J. L. Laffoon, 1 female. NORTH CAROLINA: Highlands, Macon Co., 17 July 1958, J. L. Laffoon, 1 male, 1 female. TEXAS: Kerrville, 2 June 1953, L. J. Bottimer, light trap, 2 females. VIRGINIA: Falls Church, 8 June 1952, W. W. Wirth, stream margin, 1 male, 1 female; Falls Church, Holmes Run, 24 June 1960, W. W. Wirth, light trap, 1 male, 1 female; Mount Solon, data as above, 1 male (holotype). WEST VIRGINIA: Lost River State Park, 23 May 1954, W. W. Wirth, 2 males, 1 female.

Discussion.—This species is readily distinguished from the other American species by its smaller size and yellowish legs. In the latter it resembles the Palaearctic *C. gracilipes* (Remm).

Ceratoculicoides gracilipes (Remm), n. comb.

Ceratopogon (*Nilohelea*) *gracilipes* Remm, 1967:28 (male, female; Caucasus; fig. eye separation, palpus, claws, genital sclerotization, spermatheca, male genitalia).

Female.—Length of wing 1.25–1.30 mm. Eyes separated. Mandible with strong teeth; proboscis short, a third of width of head. Antennal segments 3–6 spherical, 7–10 oval; antennal ratio 1.2. Wings slightly smoky, anterior veins darkened; costal ratio 0.69; numerous macrotrichia along wing margin between veins R5 and M1. Claws of fore leg large, of middle and hind leg small as in male. Spermatheca single.

Male.—Length of wing 1.03–1.10 mm. Head and thorax black, mesonotum shining, with slight grayish brown pruinosity and fine, pale, sparse hairs; legs except coxae light yellow; halteres cream-colored; wing milky, anterior veins darkened. Eyes pubescent. Antennal plume with yellowish reflection. A single radial cell, a little oblong, partially fused with radial vein; proximal half of vein M2 absent; macrotrichia absent. Genitalia with aedeagus longer than broad, with a median cleft distally, each distolateral lobe bearing two or three distinct chitinous points; parameres slender distally, with distal point distinctly bent back.

Distribution.—Kharagoule, Bruzenskaya SSR, in the Caucasus.

Discussion.—We are indebted to Dr. Lloyd V. Knutson for a translation of the original description from which the above description is modified. *C. gracilipes* resembles *C. virginianus* in its yellow legs, but is a much larger species, about the same size as *C. blantoni* and *C. longipennis.* On two points *C. gracilipes* differs strikingly from the American species: the large claws are present only on the fore leg of the female, those of the mid and hind legs being small as in the male, and there is only a single spermatheca.

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A NEW PEDIOBIUS PARASITIC ON A THRIPS
(Hymenoptera: Eulophidae)

B. D. Burks, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—A new species of eulophid chalcidoid, *Pediobius* **thysanopterus**, is described. This is an internal parasite of the larvae of *Gynaikothrips ficorum* (Marchal), a thrips living in leaf-rolls on fig. The parasite is known from Israel and Egypt.

Very few chalcidoid parasites of thrips have been recorded. The eulophids, a species of *Tetrastichus* Haliday, a few species of *Ceranisus* Walker (=*Thripoctenus* Crawford and probably =*Epomphale* Girault), three species of *Thripoctenoides* Erdös, one species of *Thripobius* Ferrière, and two species of *Goetheana* Girault (=*Dasyscapus* Gahan), with three species of the trichogrammatid *Megaphragma* Timberlake, are all the chalcidoid parasites of thrips listed in the available indices (Thompson, 1951; Peck, 1963; cumulative host-parasite index main-

[1] Mail address: c/o U. S. National Museum, Washington, D.C. 20560.

tained by the U. S. Department of Agriculture). There are other records of chalcidoid parasites of thrips in the literature, but most of them require re-examination. For instance, the record of the mymarid *Camptoptera pulla* Girault from *Hercothrips* (Girault, 1916). This need not be taken seriously, since the *Camptoptera* was obtained from leaves containing both whiteflies and thrips, and there is no direct evidence that the parasite came from either of them.

It was with the greatest interest that I recently received specimens of a *Pediobius* that is parasitic on thrips from J. C. Hall, Division of Biological Control, University of California, Riverside. This had been reared as an internal parasite of the larva of *Gynaikothrips ficorum* (Marchal), the material originally coming from Rehovot, Israel. A search through the literature turned up one previously overlooked record of another *Pediobius* from a thrips. Risbec (1958) recorded his species *P. dipterae* as a parasite of the larva of thrips in leaf galls on *Psiadia* in Madagascar. *P. dipterae* was originally described (Risbec, 1951) from Senegal as a parasite of dipterous and lepidopterous leafminers. It may be that the species Risbec had from leafminers in Senegal and from thrips in Madagascar are not the same. Certainly the figures he gives in the two papers do not look as though they had been made from the same species. If Risbec's thrips parasite is actually a different species from *dipterae*, 1951, it is an undescribed species. However, the *Gynaikothrips* parasite is obviously different from the description of *P. dipterae* Risbec, 1951, and from the figures given for *P. dipterae* Risbec, 1958.

This parasite of *Gynaikothrips* could not be identified by the keys in any of the revisional papers on *Pediobius* that are currently available. These are Waterston, 1915 (African and Persian species), Ferrière, 1933 (South Asiatic species), Masi, 1940 (African species), Risbec, 1958 (African species), Bouček, 1965 (European species), and Burks, 1966 (North American species). Consequently a description of it has been prepared. The host thrips is originally from the Indian Region, in the opinion of Priesner (1964). This parasite has, thus, been studied in comparison with the Oriental species of *Pediobius*. Its closest relative seems to be *P. detrimentosus* (Gahan), which was described from Coimbatore, India, and which has been found to be widely distributed in the Oriental region.

Pediobius thysanopterus, n. sp.

This species agrees with *detrimentosus* (Gahan) in having the median area of the scutellum smooth with the lateral areas longitudinally striate, in having the posterior notaular depressions sculptured, and in having the vertex smooth. They differ in that *thysanopterus* is much smaller, less than 1 mm long, while *detrimentosus* is slightly more than 1.5 mm long; *detrimentosus* has the occipital ridge sharp, while this species has it poorly defined; and in *detrimentosus* the first gastral tergum occupies ½ the gaster, while it occupies all of it in this species.

Female.—Length, 0.8–0.9 mm. Dorsum of head and thorax shining, jet black; frons, face and genae, thoracic pleura, antennal scapes, legs except tarsi, and gaster dark metallic blue; antennal flagellum and propodeum dark metallic green; basal three segments of each tarsus pale yellow; wings hyaline, veins yellow, darkened at base of marginal vein and on stigmal vein.

Width of head equal to maximum width of thorax; vertex broadly rounded, surface smooth and shining, parascrobal areas below transverse frontal groove very faintly reticulated, almost smooth; face and genae smooth; occipital margin subangulate, distinct carina absent; occiput shagreened; malar groove absent, eyes with sparse, short hairs; width of malar space ½ as great as height of compound eye; dorsal width of an eye ⅕ width of interocular space at anterior ocellus; antenna with 3 funicular and 2 club segments, apex of club pointed; relative proportionate lengths of parts of antenna—scape, 90; pedicel, 40; first funicular segment, 30; second, 25; third, 25; club, 60; ocellocular line 1½ times as long as lateral ocellus.

Pronotum with 4 dorsal bristles; mesopraescutum and scutum, including posterior notaular depressions, with scaly sculpture, but this sculpture weak; axillae with faint, irregularly lineolate sculpture; scutellum smooth and shining in median half anteriorly, longitudinal striations present in lateral areas, these converging on posterior third of scutellum and becoming alveolate. Forewing with marginal vein 10 times as long as stigmal, postmarginal and stigmal veins equal in length.

Propodeum smooth, shining; median carinae not quite meeting at base, diverging posteriorly to enclose minute, subspherical neck at apex; propodeal spiracles round, minute, separated from anterior margin of propodeum by a space slightly greater than diameter of a spiracle. Petiole borne at almost a vertical angle to longitudinal axis of gaster; surface of petiole heavily sculptured; petiole stout, as wide as long. Gaster as long as thorax, basal tergum occupying entire dorsal surface of gaster, only minute tip of ovipositor sheath protruding at apex; posterior margin of basal tergum straight on dorsum; dorsal surface of basal tergum smooth and shining, unsculptured.

Male.—Unknown.

Type locality.—Rehovot, Israel [specimens reared in laboratory at Riverside, California].

Type.—U.S.N.M. catalog no. 70850.

Described from 20 female specimens. Holotype and 13 paratypes, reared Sept. 2, 1969, in laboratory at Riverside, California, from material imported from Rehovot, Israel, from larvae of *Gynaikothrips ficorum* (Marchal), Yair Ben-Dov; 6 paratypes, Giza, Egypt, Sept. 20, 1955, reared from *Gynaikothrips ficorum*, A. Nagi. Four paratypes are deposited in the Department of Entomology collection, University of California, Riverside, 2 paratypes in the British Museum (Natural History) collection, London, and the other types are in the U. S. National Museum.

I am greatly indebted to Mr. Hall for sending me this interesting species for description.

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CORRECTIONS TO MOSQUITO CATALOG SUPPLEMENTS III AND IV

Inasmuch as the last Mosquito Catalog Supplement to appear under my authorship is now published it seems well to make note of a few errors that have been brought to my attention. I am indebted to Botha de Meillon and J. P. Duret for pointing out some that I did not discover myself. The first number is the journal page, the number in parentheses the page of the original catalog.

Supplement III. Proc. Ent. Soc. Wash., Vol. 69, 1967.

215 (241). Raise 241 to stand before **annulirostris**.
217 (260). Raise 260 to stand before **sitiens**.
(276). *portesi*—Change "Cenevet" to "Senevet."
218 (281). Change "*bisculatus*" to "*bisulcatus*."
223 (327). BNI—Change "Barnhard" to "Bernhard."

Supplement IV. Proc. Ent. Soc. Wash., Vol. 72, 1970.

150 (187). Change "**seato**" to "**seatoi**." Also index, p. 171.
162 (269). Change "**cristovai**" to "**cristovaoi**." Also index, p. 170.
163 (272). **kerri**—Insert "Rio Preto" before "Joao Goulard."
(273). **nicaroensis**—Change "INM" to "A."

ALAN STONE, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture, c/o U. S. National Museum, Washington, D. C. 20560.*

A NEW GENUS AND NEW SPECIES OF BEE FLIES
(DIPTERA: BOMBYLIIDAE)

FRANK M. HULL, *Department of Biology, University of Mississippi, University, Mississippi 38677*

ABSTRACT—This paper describes a new genus, **Euprepina**, from South America. The type of the genus is **nuda**, new species; also described are the additional new species **shannoni, bicincta, truxalia, knutsoni** and **maracajula** also from South America.

Among recent material that has come to hand, belonging to the family Bombyliidae, I find an interesting new genus from South America, described below.

Euprepina, n. gen.

Densely pilose flies with the abdomen a little more than usually elongate and with a slender proboscis and slender, small labellum. Related to *Sparnopolius* Loew which they resemble in the bare, black and shining, prominent and extended oragenal cup. They differ from that genus in the position of the anterior crossvein which is placed at or beyond the outer third of the discal cell; in *Sparnopolius* Loew this crossvein lies at the basal third or always before the middle of the cell. Also in *Euprepina* there is a dense, long tuft of pile in front of the halter but this space is bare in *Sparnopolius* Loew, which appears to be a Nearctic genus.

Euprepina is found from Rio de Janeiro, Brazil, southward to Uruguay. There are several species, and while these species may possibly be described under some older name, I have not identified them with such, and it seems important to describe them now so that their generic status may be recognized in pending studies.

Length: 10 to 13 mm, excluding proboscis; wing 8 to 10 mm.

Type-species: *Euprepina nuda*, n. sp.

Euprepina nuda, n. sp.

Head: slightly triangular in appearance because of flattened eyes of male, flat front in female, and more especially the triangularly produced and obliquely truncate, or plane oragenal cup. Sides of oragenal cup convex above, sharp and polished like glass, without pile but with pollen on a short area beneath the antenna which is separated from oragenal cup by a crease. Occiput rather thick inwardly, considerably produced in profile, but of flat *Bombylius*-type with small central foramen. Pile of occiput dense and shaggy dorsally, extending only a short distance above eye. Hair rather blunt, shorter along middle, becoming long and fine ventrally. Posterior margin of eye not quite plane, very shallowly concave, upper facets strongly enlarged in males. Front reduced to a minute triangle in front of antennae in male, slightly raised on upper half and vertex in female, a shallow transverse depression in front of antennae.

Antennae attached at upper fifth of head and rather large, elongate and slender. First segment slightly longer than second, bearing numerous, rather long, coarse bristles and bristly hairs on all sides, longer laterally and below. Second segment, slightly widened apically has shorter but similar bristles on all sides. Third segment slender, spindle-shaped, base knobbed, outer half attenuate, with two small microsegments and bristle at tip.

Thorax: longer than wide, rather convex; head slightly drooping. Mesonotum opaque black with dense, brown pollen and dense, fine, erect pile of no great length. Notopleuron with four slender bristles, postalar callosity with many long, fine, slender bristly hairs. Scutellum clothed like mesonotum with fine, long hairs on margin. Pleuron densely pilose including propleuron, whole of mesopleuron and metapleuron; pteropleuron and anterior hypopleuron bare.

Legs: all legs slender. All femora with fine fringe of very slender, long hairs ventrally. Bristles absent, although in some species hairs on hind femur slightly thicker. Femora also covered with flat-appressed, long slender scales or scaliform pile.

Wings: long and slender, subhyaline, tinged with pale brown anteriorly and basally. Two submarginal cells, first posterior cell very slightly narrowed. Anal cell widely open, anterior crossvein entering discal cell near outer fourth, hence first basal cell much longer than second.

Abdomen: elongate, distinctly narrowed, tapered and compressed posteriorly. More than 1½ times as long as mesonotum, scutellum excepted. Seventh tergite and corresponding sternite form a long cone in female, about as long as wide and obtuse apically. Color black, opaque in females with dark to light brown pollen and with appressed, glittering, somewhat flattened hair over middle and some erect, moderately long, loose, scattered, yellow hairs basally, changing to fine, erect, black hairs along posterior margins of apical tergites. Curled over side margins of first four or five tergites with long, conspicuous, dense, erect, yellow or sometimes reddish or whitish pile in female.

Male abdomen similar in form but different in pile. In some species male has first two tergites opaque white across middle and opaque across middle of fifth tergite. Some have only fifth tergite pale. Pile of male dense, fine and erect and tending to form bands across middle on posterior margins of tergites. Sixth and seventh tergites of male with dense, expanded conspicuous tuft of hair; curled over lateral margins with very dense hairs. Male terminalia asymmetrical and recessed.

Male abdomen opaque black, with fine, erect, brownish-yellow pile, except entire fifth tergite which is opaque grayish-white, with whitish pile.

Holotype: a male, allotype, a female, and one male and one female paratype, from Nova Teutonia, Brazil (Fritz Plaumann), in Hull collection.

Euprepina shannoni, n. sp.

This species differs from *Euprepina nuda*, n. sp. in the distinctly much shorter, less slender proboscis, the more dense and more brownish pile of the abdomen, the less narrowed discal cell, and the somewhat larger size.

Holotype: a male, and 9 paratype males, from Rio de Janeiro, alt. 2000 ft. March 1941, R. C. Shannon. Also one paratype male from

Rocha, Uruguay. Holotype in U.S. National Museum. Paratypes in U.S. National Museum and Hull collection. Named in honor of an early friend and enthusiastic dipterist.

Euprepina bicincta, n. sp.

This species is distinct in the presence of a second, opaque grayish band lying over the greater part of the second tergite. The sides and posterior border of this tergite are opaque brownish black; the gray band notched in the middle. Anterior border of wing tinted with brown as far as the end of the auxiliary cell. End of marginal cell similar to *nuda*, n. sp. and anal cell also opened widely, but discal cell much more blunt and widened apically. Length of proboscis similar to *shannoni*, new species.

Holotype: a male, allotype a female, a paratype of each sex; from Nova Teutonia, Brazil. In the Hull collection.

Euprepina truxalia, n. sp.

Much like *shannoni*, n. sp. but with the marginal cell much widened, and anal cell open but much narrowed. Fore margin of wing tinted brown. Second abdominal tergite black but with a conspicuous band of rather dense, erect, contrastingly pale, whitish pile. Proboscis longer and slender, much as in *nuda*, n. sp.

Holotype: a male. 24 kil. E. of Formosa, Go., Brazil. F. S. Truxal, May 28, 1956. Type in Los Angeles County Museum. Species named for Dr. Truxal.

Euprepina knutsoni, n. sp.

Very different from other species. The fifth tergite similar to *nuda*, n. sp. but the second has a very narrow distinct cross band, opaque gray, just before the hind border; it is notched in the middle. The brownish abdominal pile is distinctly sparse. The anal cell is narrowly open and the wing faintly tinted with reddish villi. Apex of marginal cell as in *nuda*, n. sp.; but apex of discal cell wider. Proboscis comparatively long and slender.

Holotype: a male, from Copinota, Bolivia. 1918. Type in the U.S. National Museum. Named for Dr. Lloyd Knutson.

Euprepina maracajula, n. sp.

Similar to *nuda*, n. sp. and like it with virtually hyaline wings. End of marginal cell similar. Abdomen similar. The pile of the abdomen is fine, scanty and pale, quite unlike *shannoni*, n. sp. There are fewer spines on the sides of the hind tibia, the anal cell is much narrowed, the abdominal pile is quite pale yellow for the most part, but reddish across tergite three, and the proboscis is shorter than in *nuda* and more like *shannoni*.

Holotype: Maracaju, Matto Grosso, May 1937. R. C. Shannon. Also two paratype males. Holotype in U.S. National Museum.

ABOUT IDIOCERINAE LEAFHOPPERS: V. BALCANOCERUS, A NEW GENUS FOR CHUNROCERUS BALCANICUS ZAKHVATKIN, 1946
(HOMOPTERA: CICADELLIDAE)

J. MALDONADO-CAPRILES, *Department of Biology, University of Puerto Rico, Mayagüez, Puerto Rico 00708*

ABSTRACT—Zakhvatkin established the genus *Chunrocerus* with *Idiocerus niveosparsus* Lethierry as the type. As this species belongs in *Idioscopus*, *Chunrocerus* is therefore a synonym of *Idioscopus*. **Balcanocerus** is proposed as a new genus to include *balcanicus*, the only other species included in *Chunrocerus*, as this species properly belongs in a genus distinct from the others in the subfamily.

I am grateful to Dr. C. W. Sabrosky, from the Systematic Entomology Laboratory, U.S. Department of Agriculture, Washington, D.C., for his assistance in elucidating this nomenclatural problem.

Zakhvatkin (1946b: 155)[1] described the genus *Chunrocerus* to include *Idiocerus niveosparsus* Lethierry, as he correctly considered that this species does not belong in *Idiocerus*, and called it the type of his new genus on page 156. At the same time, on page 155, he included *Idiocerus balcanicus* Horváth in his new genus. Baker (1915c: 338) described the genus *Idioscopus* with *Idiocerus clypealis* Lethierry as the type of the genus. In this same paper he included *Idiocerus niveosparsus* in *Chunra*. *Idiocerus clypealis* Lethierry and *I. niveosparsus* Lethierry are congeneric and both belong in *Idioscopus* as demonstrated by me (Maldonado-Capriles, 1964). Therefore, *Chunrocerus* is a synonym of *Idioscopus*. A new genus *Balcanocerus*, is proposed to include *Chunrocerus balcanicus* (Horváth) as this species represents a genus distinct from the above. Zakhvatkin's description and illustrations, on pages 155 and 156, clearly distinguish between *Chunrocerus* and *Idiocerus*. Herein I illustrate the aedeagi of *Balcanocerus balcanicus*, new combination, and *Idioscopus clypealis*. The aedeagus of the latter is quite similar to that of *Idioscopus niveosparsus*. Other details of the male genitalia of *B. balcanicus* are also illustrated. These drawings were kindly furnished by Mr. F. Heller, from Staatliches Museum fur Naturkunde, Stuttgart, Germany. His drawings are from Horváth's type and this from Vranja, Servia, Horváth collector, 1902.

Balcanocerus, n. gen.

Type-species: *Idiocerus balcanicus* Horváth.

Relatively wide across head in relation to its body length ($58/20 = 2.6$); length of head, thorax, and scutellum slightly over ⅓ of body length. Face and vertex

[1] Complete references to literature prior to 1956 will be found in Metcalf's Bibliography of the Cicadelloidea, 1964, Fasicle IV of the General Catalogue of the Homoptera. References to cited literature appearing after 1955 are given under "References" at the end of this article.

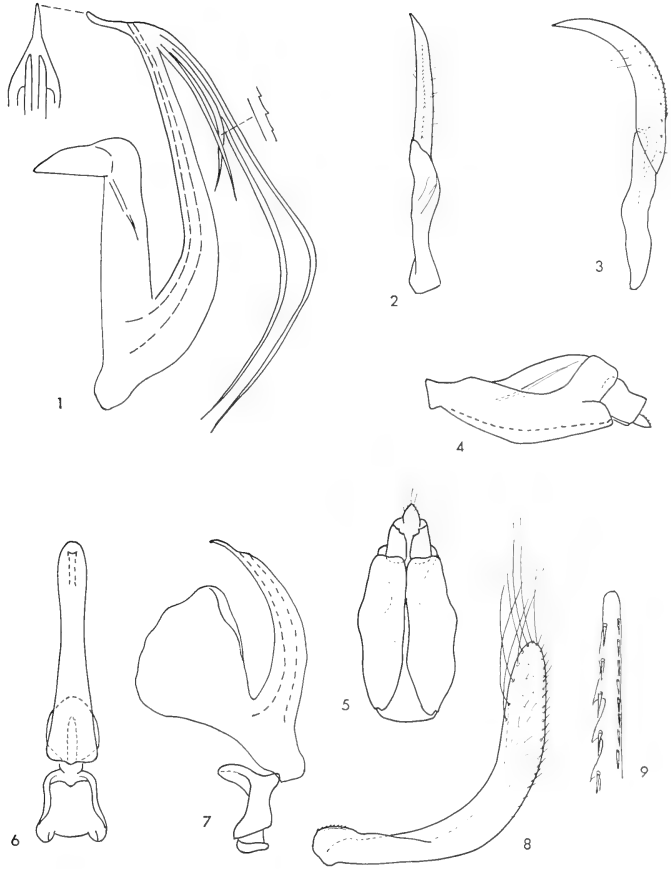

Fig. 1. *Idioscopus clypealis* (Lethierry), male aedeagus, lateral. Figs. 2–9. *Balcanocerus balcanicus* (Horváth), male holotype: 2, style, dorsal; 3, style, lateral; 4, genital capsule, lateral; 5, genital capsule, ventral; 6, aedeagus and connective, caudal; 7, aedeagus and connective, lateral; 8, valve, lateral; 9, outer edges of hind tibia.

shagreen. Distance between ocelli about 1½ times more than distance from ocellus to eye. Upper extremities of clypeus well defined, reaching ocelli of corresponding side. Pronotum 3 to 5 times longer than vertex. Scutellum shorter than pronotum and vertex together, but feebly raised basally or practically flat. Four apical and three anteapical cells. First apical cross-vein of forewing close to bifurcation of R resulting in: 1) first subapical cell very small, smaller than all others; 2) this small cell is narrower at base than apically; 3) the first apical cell consequently is longer than the other apicals. Fore-wing, across mid-length of clavus and adjacent half of corium, with peculiar snow-white callose ornamentation. Clavus with fine punctures along both sides of discal veins and along inner side of marginal veins; corium with fine punctuations along both sides of veins R, M, and Cu, and inner of C. Fore and mid legs glabrous. Hind leg: femur with two apical spurs; tibia oval-flattened in cross-section, slightly curved; upper outer margin with eight or nine spines closely appressed to shaft of tibia, upper inner margin with many short spines appressed to shaft of tibia; lower outer margin with first two spines appressed or semierect, last four raised above level of shaft by a sharply produced base (fig. 9); lower margin with fine appressed spines; both inner margins quite close to each other.

Male genitalia: pygofer longer than deep (figs. 4 and 5), with inner margins straight and meeting along mesal line. Valve spatulate; with long setae on margin of inner apical fourth; clearly angled at about midlength (fig. 8). Aedeagus with well developed basal projection; tubular, curved cephalad, flattened dorsoventrally near apex; gonopore opening subapically; without filaments. Style with anterior end flattened laterally; posterior end tapering, sharp, upcurved, with a few fine long setae on upper margin well before apex, and with lower margin serrate.

Female genitalia: similar to *Idioscopus*. Ovipositor smooth, longer than valves, narrow, straight. Seventh sternum of *B. balcanicus* produced medianly.

Balcanocerus can be separated from *Idiocerus* and *Idioscopus* as follows:

	Balcanocerus	*Idiocerus*	*Idioscopus*
Anteapical cells	three	usually three	usually two
Vertex	shagreen	usually wrinkled	usually wrinkled
Spines of outer margins of metatibia	appressed	erect or semierect	erect or semierect
Clavus	finely punctured	without punctures	without punctures
Pygofer	longer than deep	deeper than long	deeper than long
Pygofer	with unsclerotized longitudinal area	without such area	with such area
Apodeme of aedeagus	flattened	widened apically	flattened
Style with	few anteapical hairs	usually strong apical setae	microsetae
Callose whitish ornamentation of forewing	present	absent	absent
Aedeagus	without filaments or processes	usually with apical spine-like process	2–4 apical filaments

A bibliographical summary of the mentioned changes follows.

Balcanocerus, n. gen.

Chunrocerus Zakhvatkin, 1946b:155, in part.
Type-species: *Idiocerus balcanicus* Horváth, 1930a.

Balcanocerus balcanicus (Horváth), n. comb.

Idiocerus balcanicus Horváth, 1930a:24.
Chunrocerus balcanicus (Horváth): Zakhvatkin, 1946b:154.

Idioscopus Baker 1915c:338.

Idiocerus Lewis, 1834a:47. Synonym in part.
Chunrocerus Zakhvatkin, 1946b:155. New synonym, in part.

Idioscopus clypealis (Lethierry)

Idiocerus clypealis Lethierry, 1889c:5.
Idioscopus clypealis (Lethierry): Baker, 1915c:338.

Idioscopus niveosparsus (Lethierry)

Idiocerus niveosparsus Lethierry, 1889c:252.
Chunra niveosparsa (Lethierry): Baker, 1915c:318.
Chunrocerus niveosparsus (Lethierry): Zakhvatkin, 1946c:155.
Idioscopus niveosparsus (Lethierry): Maldonado-Capriles, 1964.

REFERENCE

Maldonado-Capriles, J. 1964. Studies on Idiocerinae leafhoppers: II. The Indian and Philippine species of *Idiocerus* and the genus *Idioscopus*. Proc. Ent. Soc. Wash. 66(2):89–100.

THE GENUS ZADIPRION ROHWER
(HYMENOPTERA: DIPRIONIDAE)

DAVID R. SMITH, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—Keys and descriptions are given for adults and larvae of the three species of *Zadiprion. Neodiprion grandis* Rohwer is synonymized with *Z. townsendi* (Cockerell). Two species of *Zadiprion* are known from the United States and one species from Mexico. The host plants are various pines.

Zadiprion Rohwer

Neodiprion subgenus *Zadiprion* Rohwer, 1918, p. 83; Middleton, 1931, p. 166.
Zadiprion: Ross, 1937, p. 57; Ross, 1951, p. 19.
Type-species: *Diprion grandis* Rohwer. Original designation.

Zadiprion may be separated from other genera of Diprionidae by the following combination of characters: supraclypeal area not tuber-

[1] Mail address: c/o U.S. National Museum, Washington, D. C. 20560.

culate; antenna with more than 20 segments; vein 2A and 3A of forewing complete, not fused to 1A and anal crossvein usually present, but sometimes absent; in female, pulvillus of hindbasitarsus about as long as basitarsus (fig. 9); in male, antennal segments bipectinate except for apical 4 or 5 segments which are moniliform and undivided.

I have not found adequate characters to separate the larvae of *Zadiprion* species from the larvae of other genera of Diprionidae.

This small genus is found in Mexico and southwestern United States, extending as far north and east as the Black Hills of South Dakota (fig. 1). Three species are included, all of which feed on pines in the larval stage, and each of which has been destructive to forest stands at various times.

Key to Species

Adults

1. Female 2
   Male 4
2. Head and body entirely yellow; first annulus of lancet inverted U-shaped, second to ninth annuli subparallel (fig. 2) .... **Z. rohweri** (Middleton)
   Head and thorax mostly reddish-brown, abdomen black and yellow; first annulus of lancet straight, third annulus parallel or divergent 3
3. Markings of head and mesonotum yellow; first annulus of lancet with about 10 teeth, third and fourth annuli divergent (fig. 4) .... **Z. townsendi** (Cockerell)
   Head entirely reddish-brown, markings on mesonotum black; first annulus of lancet with only 2 large teeth, annuli 3 to 10 subparallel (fig. 3) .... **Z. vallicola** (Rohwer)
4. Abdomen, except for hypandrium, black .... **Z. rohweri** (Middleton)
   Abdomen with lateral margins partly white and with considerable white on sternites 5
5. Clypeus, supraclypeal area, basal plates, and mesopleural spot yellowish .... **Z. townsendi** (Cockerell)
   All above parts black .... **Z. vallicola** (Rohwer)

Larvae

1. Body ornamentation consisting of small setalike tubercles, none of which are arranged in clusters (fig. 13); thoracic legs dark brown to black; on pinyon pines .... **Z. rohweri** (Middleton)
   Body ornamentation consisting of small conical tubercles, some of which are arranged in clusters (figs. 14, 15); thoracic legs amber to orange 2
2. Body color dark brown to black with tubercles, prolegs, and lateral, longitudinal line pale; U.S., on ponderosa pine .... **Z. townsendi** (Cockerell)
   Body pale colored with small brown spot on each side of each spiracle and with very light brownish lateral, longitudinal stripe; Mexico, on various pines .... **Z. vallicola** (Rohwer)

Zadiprion rohweri (Middleton)

Neodiprion (*Zadiprion*) *rohweri* Middleton, 1931, p. 166.
Zadiprion rohweri: Ross, 1951, p. 19; Burks, 1967, p. 14.

Female.—Average length, 10.3 mm. Antenna, head, legs, and body yellowish; only apex of mandibles and apical 3 or 4 antennal segments blackish. Wings uniformly, very lightly, yellowish hyaline.

Head, thorax, and abdomen shining, not densely punctate nor dulled with fine surface sculpture. Lancet with 9 annuli; first annulus inverted U-shaped, second to ninth annuli subparallel (fig. 2).

Male.—Average length, 7.9 mm. First and second segments and main stalk of antenna yellowish, filaments black. Head black with maxillary and labial palpi, labrum, clypeus, and supraclypeal area white to yellowish; spot on each para-antennal field and each upper inner orbit yellowish to brownish. Thorax black with posterior margin of pronotum, tegulae, and epipleurites whitish. Legs yellowish; each trochanter, base of each coxa, and inner surface of each femur blackish. Abdomen black; hypandrium whitish; basal plates sometimes brownish. Genitalia as in figs. 5 and 6.

Larva.—Final feeding stage, 30 to 40 mm. Head dark amber to orange with eyespots and tips of mandibles black. Body whitish (preserved specimens) with following dark brown: sclerites of thoracic legs; spot on each side of mesothorax and metathorax; small spot below each abdominal spiracle; large spot at center of each side of each abdominal segment, partially covering third and fourth annulets. Body ornamentation consisting of small setalike tubercles.

Hairs moderately abundant on head. Antenna 3-segmented, first two segments flat, not complete, third segment erect and peglike. Clypeus with 4 setae; labrum with 4 setae, front margin emarginated, slightly asymmetrical; epipharynx with about 8 stout spines on each side (fig. 11). Right mandible with 3 dorsal and 2 ventral teeth; left mandible with 4 dorsal and 2 ventral teeth; each mandible with 1 seta on outer basal angle (fig. 12). Maxillary palpus 4-segmented, 1 seta on second segment, 1 seta on palpifer; lacinia with 8 stout spines, 2 spines on inner edge largest (fig. 10). Labial palpus 3-segmented; second segment with 1 seta.

Thoracic legs 5-segmented; tarsal claws present; hairs abundant on segments of legs. Each annulet of each thoracic segment with tubercles except for posterior annulet of each segment.

Abdominal segments 1 to 9 each 6-annulate; fifth annulet sometimes not distinct, appearing fused to fourth annulet. Annulets 1, 2, and 4 with tubercles; 9 to 12 tubercles on each side of annulet 1 and 6 to 10 tubercles on each side of annulets 2 and 4; postspiracular lobe, subspiracular lobe, and surpedal lobe each with 7 to 14 tubercles. Tenth tergum with tubercles scattered over surface and row on outer edge; suranal and subanal areas with setae and tubercles. Prolegs on abdominal segments 2 to 8 and 10; anal proleg divided.

Type.—U.S.N.M. type no. 43467, ♀, from Swartout Valley, San Bernardino, Calif., 5-29-30, Hopk. 17915a, *Pinus monophylla*, H. E. Burke, collector.

Distribution.—CALIFORNIA: Swartout Valley, San Bernardino, bred, *Pinus monophylla*, H. E. Burke; 3 mi. SSW Valyermo, Los Angeles Co., 2000′, reared, larvae on *Pinus monophylla*, N. McFarland;

Fig. 1. Distribution of *Zadiprion* species: circles, *rowheri* (Middleton); triangles, *townsendi* (Cockerell); rectangles, *vallicola* (Rohwer).

Wrightwood, Oct. 31, 1953, *Pinus monophylla*, Pierce, Albrecht. COLORADO: Mesa Verde Nat. Pk., 6-12-29, pinyon pine, H. E. Burke. NEVADA: Clark Co., Mountain Springs Summit, many records on *Pinus monophylla* from May 23 to August 2, 1961, August 6, 1959, from 4500′ to 5000′ elevation, collected by R. C. Bechtel, F. D. Parker, and

D. F. Zoller; Clark Co., Kyle Canyon, 4800′–6500′, August 2, 1961, *Pinus monophylla*, R. C. Bechtel, F. D. Parker; Clark Co., Lee Canyon, 4800′–6500′, August 5, 1961, *Pinus monophylla*, R. C. Bechtel, F. D. Parker; Douglas Co., 6 mi. SE Gardnerville, August 21, 1961, August 24, 1962, *Pinus monophylla*, R. C. Bechtel, F. D. Parker; Douglas Co., 5 mi. SE Centerville, August 21, 1961, *Pinus monophylla*, C. W. Baker; Lyon Co., 3 mi. SW Dayton, August 17, 1961, *Pinus monophylla*, R. C. Bechtel; Lyon Co., Wellington, 10 mi. SE, August 22, 1961, *Pinus monophylla*, R. C. Bechtel, F. D. Parker; Ormsby Co., Brunswick Canyon, 5000′, August 17, 1961, *Pinus monophylla*, R. C. Bechtel; Washoe Co., Washoe Lake, east side, 5100′, August 17, 1961, *Pinus monophylla*, R. C. Bechtel; Washoe Co., Geiger Grade, 4800′–6200′, August 17, 1961, *Pinus monophylla*, R. C. Bechtel, F. D. Parker; Pinyon Ridge, Toiyabe N.F.,[2] July 11, 1962, pinyon pine, R. I. Washburn, F. W. Honing. NEW MEXICO: Placitas, August 29, 1961, *Pinus edulis*, C. L. Massey. UTAH: Panguitch, VIII-26-1962, pinyon pine, M. M. Furniss.

Hosts.—Larvae feed on pinyon pines, *Pinus monophylla* Torr. and Frém. and *P. edulis* Engelm.

Discussion.—The yellow color of the female and the black abdomen of the male will distinguish the adults of this species. The lancet of the female is also distinctive, with the first annulus in the form of an inverted "U".

The larvae are distinguished from those of other *Zadiprion* species by the pale coloration and small setalike tubercles. I have noticed some variation in color in the larvae. Some specimens have only a subspiracular dark brown spot which, in other specimens, may form almost a continuous longitudinal line; other specimens have the supraspiracular brown spot more developed than the subspiracular spot. Another diprionid, *Neodiprion edulicolus* Ross, also feeds on pinyon pine and the larva may be confused with that of *rohweri*. However, in the specimens of *edulicolus* that I have seen, the head capsule is usually black, the body lacks dark brown markings or may have a light longitudinal dorsal stripe, each lacinia has only 6 spines, and there are only 6 spines on each side of the epipharynx.

There is no literature on the biology of *rohweri*.

Zadiprion townsendi (Cockerell)

Lophyrus townsendi Cockerell, 1898, p. 457.
Neodiprion (*Zadiprion*) *townsendi*: Rohwer, 1918, p. 83.
Zadiprion townsendi: Ross, 1951, p. 19.
"Bull pine sawfly," Swenk, 1911, p. 1.
Diprion grandis Rohwer, 1912, p. 208. **New synonymy.**

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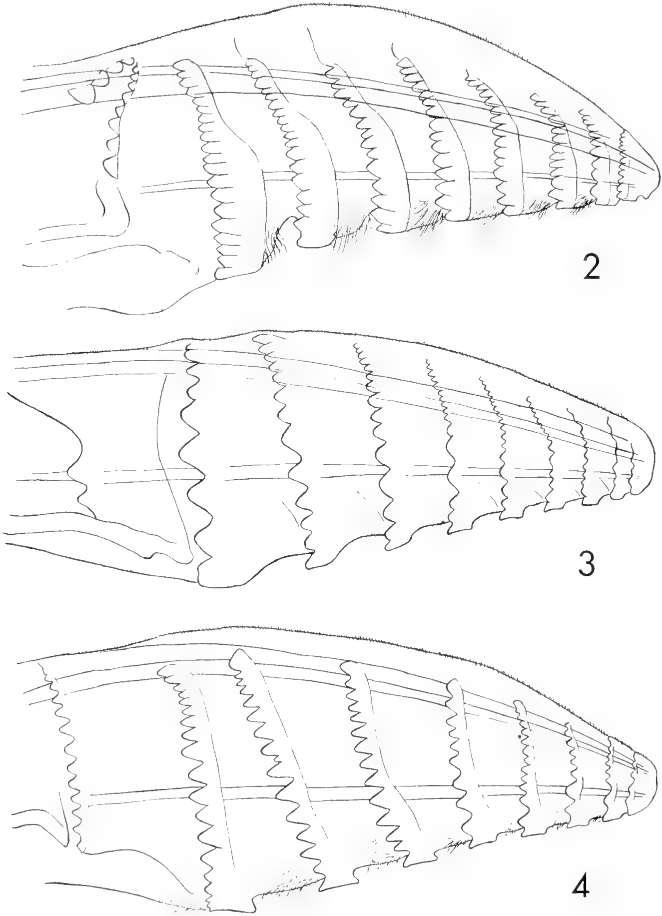
[2] This may be Pine Nut Range in Ormsby, Lyon, or Douglas Counties (Correspondence, R. C. Bechtel, Nevada Department of Agriculture).



Figs. 2–4. Lancets of *Zadiprion* species: 2, *rohweri* (Middleton); 3, *vallicola* (Rohwer); 4, *townsendi* (Cockerell).

Neodiprion (Zadiprion) grandis: Rohwer, 1918, p. 83.
Zadiprion grandis: Ross, 1951, p. 19.

Female.—Average length, 10.5 mm. Antenna reddish-brown, apical 3 or 4 segments blackish. Background color of head yellow with anterior margin of clypeus, frons, ocellar area, and broad stripe between each lateral ocellus and upper inner orbits reddish-brown. Thorax reddish-brown with epipleurites, mesoscutellum, lateral margins of mesoprescutum, and central spot on mesopleuron white to yellowish. Legs reddish-brown. Background color of abdomen yellow with second to fourth tergites mostly black and posterior margin of each remaining abdominal segment black; apical segment reddish-brown. Wings uniformly, lightly, yellowish hyaline.

Texture of head and body dull, mostly with fine punctures and fine surface sculpture. Lancet with 9 annuli; first annulus straight with about 10 teeth, third and fourth annuli divergent, second and fifth to ninth annuli subparallel (fig. 4).

Male.—Average length, 9.5 mm. Antenna dark reddish-brown with apical 4 or 5 segments black. Head black with maxillary and labial palpi, labrum, clypeus, supraclypeal area, para-antennal fields, and outer orbits yellowish. Thorax black; epipleurites, tegula, and small spot located posterocentrally on mesopleuron yellowish to reddish-brown. Legs yellow with each coxa, trochanter, and femur except for extreme apex blackish. Abdomen black; basal plates, posterior half to two-thirds of lateral margin of each tergite, and anterior two-thirds of each sternite yellow; apical half of hypandrium yellow. Harpe and parapenis similar to that of *rohweri* (fig. 5); harpe slightly longer and narrower. Penis valve as in fig. 7.

Larva.—Final feeding stage, 30 to 40 mm. Head amber to orange with large irregular eyespot and tips of mandibles black. Thoracic legs amber to orange. Body mostly dark brown to black mottled with white (preserved specimens), white areas as follows: tubercles and areas consisting of clumps of tubercles; lateral, supraspiracular, longitudinal line; prolegs. Body ornamentation consisting of short, conical tubercles.

Most structural features as for *rohweri*. Short setae and longer hairs abundant on head and sclerites of thoracic legs. Epipharynx with 8 to 10 spines on each side. Lacinia usually with 7 spines, size of inner two spines as for lacinia of *rohweri*.

Abdominal segments 1 to 9 with 6 annulets, indistinct third and fifth annulets, each sometimes fused with anterior and posterior margin of fourth annulet, respectively. Tubercles present on first, second, and fourth annulets; first annulet with 8 to 10 tubercles; second annulet with 10 to 12 tubercles; fourth annulet with 13 to 16 tubercles of which 10 to 12 are situated in a cluster near center of annulet. Postspiracular lobe with about 7 tubercles in cluster; subspiracular lobe with cluster of about 10 tubercles; surpedal lobe with about 13 tubercles, most of which are arranged in a row (fig. 14). Tenth tergum with scattered tubercles.

Types.—*L. townsendi* is U.S.N.M. type no. 4332, ♀, labeled "S. Fk. Eagle Cr., abt. 8000′, White Mts., NM, coll. Townsend," "found dead under pine tree, Aug. 17." *D. grandis* Rohwer is U.S.N.M. type no. 14758, ♀, labeled "Crawford, Nb., bred spem., 23-VII-1910," "M. H. Swenk, collector."

Distribution.—ARIZONA: Santa Rita Mts., July 24, W. J. Chamberlin; Flagstaff, reared, June 28, 1916, July 20, 1916, *Pinus ponderosa*, D. F. Kerstain; North Rim, Grand Canyon, 12-7-65, *Pinus ponderosa*, D. A. Pierce. COLORADO: Palmer, Pk., VII-24-16, VII-8-16, *Pinus scopulorum*, G. Hofer. NEBRASKA: Crawford, bred, VII-23-1910, 7-9-10, June 30, 1910, M. H. Swenk; Hat Creek, August. NEW MEXICO: Vallecitos, reared, June 30, 1924, *Pinus ponderosa*, W. J. Perry; Magdalena, 1-13-61, *Pinus ponderosa*, A. M. Rives; Sandia Park, 12-19-69, on ponderosa pine, C. J. Germain. SOUTH DAKOTA: Black Hills near Custer (recorded by Swenk, 1911).

Host.—*Pinus ponderosa* Laws.

Discussion.—*Z. townsendi* and *Z. grandis* had been considered as distinct species by previous authors. Rohwer (1918) separated them by the depth of the emargination of the last sternite of the female, and Middleton (1931) separated them by the deneness of the punctures of the mesoscutellum. However, the similarity of the genitalia, larvae, host plant, and variation of the characters used by Rohwer and Middleton leaves little doubt that these species are synonymous.

The yellow and brown coloration and the straight first annulus with about 10 teeth of the female, and the yellow lateral spots on the abdomen and yellowish clypeus and basal plates of the male will separate this species from *rohweri* and *vallicola*. The larvae are distinguished by the predominately dark coloration, amber colored thoracic legs, and the numerous, conical tubercles some of which are in clusters.

Swenk (1911) studied the biology of this species in northwestern Nebraska and called it the "bull pine sawfly." A year later, Rohwer (1912) described it as *grandis*.

Zadiprion vallicola (Rohwer)

Neodiprion (*Zadiprion*) *vallicola* Rohwer, 1918, p. 84; Hernández, 1930, p. 1; Middleton, 1931, p. 165; Olmedo, 1932, p. 168; Mendiolea, 1942, p. 28.
Zadiprion sp., Lara and Ortiz, 1969, p. 14.

Female.—Average length, 10.2 mm. Antenna reddish-brown with apical 3 or 4 segments blackish. Head reddish-brown; ocellar area sometimes blackish. Thorax reddish-brown; spot on mesopleuron, central and posterior portion of mesoprescutum, at least anterior half of mesoscutellum, and sometimes metanotum black. Legs reddish-brown. Abdomen with basal plates and apical segment reddish-brown, other segments whitish with tergites 2 to 5 mostly black, remaining segments with black only on posterior margin. Wings uniformly, lightly, yellowish hyaline.

→

Figs. 5, 6, 9–13. *Zadiprion rohweri* (Middleton): 5, harpe and parapenis; 6, penis valve; 9, female hindtarsus; 10, larval maxilla; 11, larval epipharynx; 12, larval mandibles, ventral view; 13, larval third abdominal segment, lateral view. Figs. 7, 14. *Z. townsendi* (Cockerell): 7, penis valve; 14, larval third abdominal segment, lateral view. Figs. 8, 15. *Z. vallicola* (Rohwer): 8, penis valve; 15, larval third abdominal segment, lateral view.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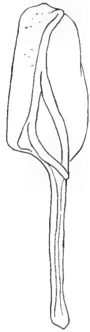
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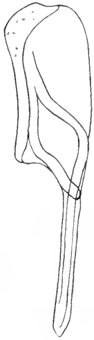
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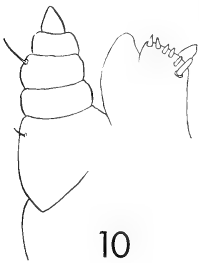
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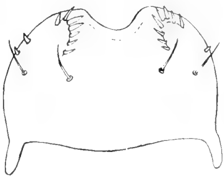
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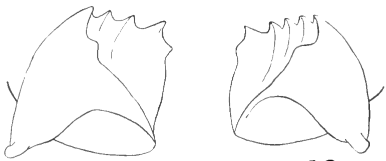
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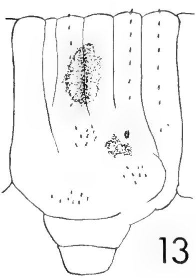
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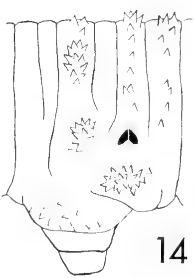
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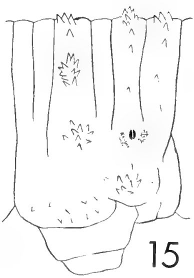
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Texture of head and body dull, with closely set punctures and fine surface sculpture. Lancet with 10 annuli, apical annulus short; first annulus straight, with 2 large teeth, annuli 2 to 10 subparallel with only third annulus slightly divergent; ventral annular teeth large (fig. 3).

Male.—Average length, 8.3 mm. Antenna black with filaments dark reddish brown. Head black; maxillary and labial palpi, labrum, and spot on each para-antennal field and posterior orbit whitish. Thorax black. Legs with each coxa, trochanter, and femur black, each tibia and tarsus white. Abdomen black; posterior half to two-thirds of each sternite and lateral portion of each tergite white; apical half of hypandrium white. Harpe and parapenis similar to that of *rohweri* (fig. 5); harpe slightly longer and narrower. Penis valve as in fig. 8.

Larva.—Final feeding stage, 25 to 35 mm. Head amber with eyespot and tip of mandibles black. Thoracic legs amber. Body whitish (preserved specimens) with small brown spot on each side of each spiriacle and very light brown longitudinal, supraspiracular stripe on each side. Body ornamentation consisting of short, conical tubercles.

Structural features as for *townsendi* except for arrangement of tubercles. First annulet with 5 to 6 tubercles on each side; second annulet with 5 to 6 tubercles on each side, about 4 of which are in cluster near dorsum; fourth annulet with 3 to 4 tubercles on each side near dorsum and 7 to 9 tubercles in cluster near center; postspiracular lobe, subspiracular lobe, and surpedal lobe each with 7 to 9 tubercles in clusters (fig. 15).

Type.—U.S.N.M. type no. 21721, ♀, from Meadow Valley, Mexico, Townsend, collector.

Distribution.—The following are my confirmed records. MEXICO: Erongaricamaro, Mich., 30-VI-30, 11-VII-30, 28-VI-30, pine; Uruapan, Mich., larva coll. March 3, 1968, emgd. June 14, 1968, on *Pinus montezumae*, Federico Islas S.

Hosts.—Pines, mainly from larval records, include: *Pinus pseudostrobus chiapenis, P. montezumae, P. michoacana, P. tenuifolia, P. oocarpa, P. leiophylla,* and *P. cembroides.* (Islas, 1970).

Discussion.—The coloration is similar to that of *townsendi*, but in the female of *vallicola* the head is reddish-brown and the markings of the mesonotum are black, and, in the male, the clypeus, supraclypeal area, thorax, and basal plates are black. The lancet of the female is distinctive, having only 2 large teeth on the first annulus compared to about 10 teeth in *townsendi*. The structural features of the larva are also similar to the larva of *townsendi*, except for fewer tubercles on the annulets of the abdominal segments. The pale color of the larva will easily separate it from the dark-colored larva of *townsendi*.

Olmedo (1932) and Lara and Ortiz (1969) discussed the biology of this species. *Z. vallicola* is the only known species of Diprionidae from Mexico. There are records of *Neodiprion* species in Mexico (Lara and Ortiz, 1969; Islas, 1970), but I have not seen specimens to confirm them.

ACKNOWLEDGMENTS

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NORTH AMERICAN DELTOCEPHALINE LEAFHOPPERS OF THE GENUS AMPLICEPHALUS DeLONG WITH A NEW GENUS AND NEW GENERIC COMBINATIONS

(Homoptera: Cicadellidae)

James P. Kramer, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—The North American species of *Amplicephalus* DeLong are redescribed, revised, and keyed. Three species, *A. simplex* (Van Duzee), *A. littoralis* (Ball), and *A. osborni* (Van Duzee), previously assigned to *Amplicephalus* and *Lonatura nebulosa* Ball comprise the genus. A new genus, **Kansendria**, is erected for *A. kansiensis* (Tuthill). *A. lawsoni* (DeLong) is assigned to *Reventazonia* Linnavuori, a genus previously known only from Neotropical America. *Arundanus duplus* DeLong is reduced to a synonym of *R. lawsoni* (DeLong). All critical diagnostic features are illustrated. New distributional records and host plant data are included.

The genus *Amplicephalus* DeLong, last keyed and defined by Oman (1949:111–119 and 178–179), belongs to a large group of deltocephaline leafhoppers which share in common a linear connective solidly fused to the base of the aedeagus. Study of the five North American species listed by Oman (1949:179), as well as members of related genera, revealed that only three species listed in *Amplicephalus* were actually congeneric; and that a fourth species, *Lonatura nebulosa* Ball, also belonged in this species cluster. One of the remaining species of *Amplicephalus*, as listed by Oman, is assigned to *Reventazonia* Linnavuori, a Neotropical genus, and the other is assigned to a new genus.

Amplicephalus DeLong

Deltocephalus subgenus *Amplicephalus* DeLong, 1926c:83. Type-species: *Deltocephalus osborni* Van Duzee.

Small to moderately large deltocephaline leafhoppers (2.5–5.3 mm). Head wider than pronotum. Anterior margin of head rounded to face. Clypeal suture distinct or obscure. Ocelli close to eyes. Pronotum short or of moderate length. Forewings long, extending well beyond apex of abdomen, exposing a portion of genital segment or much shortened, rounded apically, exposing up to four segments dorsally, with or without extra crossveins in clavus. Male genitalia: valve small; plates subtriangular, small, spine-like setae uniseriate; pygofer strongly setose; aedeagus rather short, stout, trough-like, notched apically on ventral margin, gonopore not clearly delimited or only weakly so on dorsum. Pregenital sternum of female narrowed distally and exposing underlying sclerites laterally. Color stramineous to pale brown, usually with fuscus coronal markings.

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[1] Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

Key to North American Species of **Amplicephalus**

1. Aedeagus in lateral view avicephaliform apically (figs. 5, 9); style in dorsal view with lateral lobe undeveloped (figs. 2, 7) 2
   Aedeagus in lateral view not as above (figs. 15, 21); style in dorsal view with lateral lobe developed (figs. 12, 17) 3
2. Anterior margin of crown with four black spots (fig. 1) .. **simplex** (Van Duzee)
   Anterior margin of crown unmarked or with pair of vague, elongate, subtriangular, apical pale brown spots (fig. 6) .... **littoralis** (Ball)
3. Aedeagus in dorsal view with cleft or notch on ventral margin broad and deep (fig. 14), aedeagus in lateral view (fig. 15) subacute at apex .... **osborni** (Van Duzee)
   Aedeagus in dorsal view with cleft or notch on ventral margin comparatively narrow and not deep (fig. 18), aedeagus in lateral view (fig. 21) broadly rounded at apex .... **nebulosus** (Ball)

Amplicephalus simplex (Van Duzee)
(Figs. 1–5)

Deltocephalus simplex Van Duzee, 1892:304.
Athysanus simplarius Osborn and Ball, 1902:249.
Deltocephalus (*Amplicephalus*) *simplex* Van Duzee: DeLong, 1926c:83.
Amplicephalus simplarius (Osborn and Ball): Oman, 1949:179.

Length. Males 4.5–5.0 mm. Females 5.0–5.3 mm.

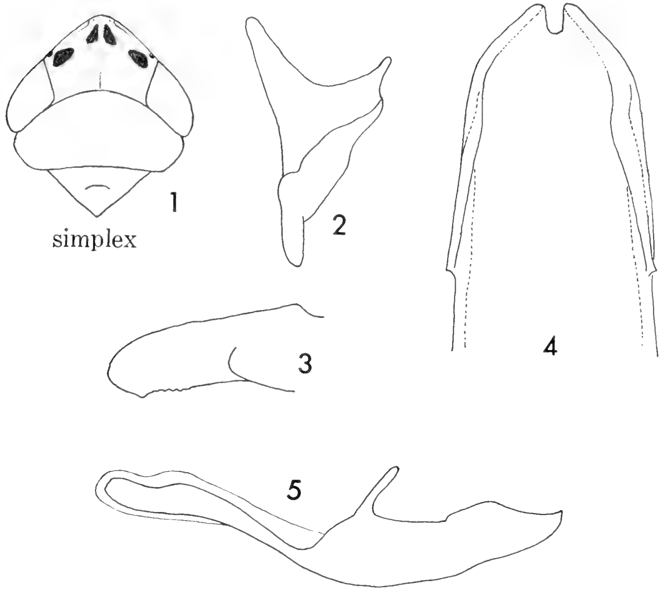
Structure. Crown in dorsal view (fig. 1) bluntly angular apically, interocular width greater than median coronal length; head in lateral view slightly flattened between eyes and convex anterior to eyes; clypeal suture distinct; forewings as long as or longer than abdomen; inner anteapical cell closed basally, rarely open; central anteapical cell divided, rarely undivided; outer anteapical cell normal to elongate; without extra crossveins in clavus.

Coloration. Venter of abdomen, thorax, and legs pale greenish yellow to pale brownish; abdominal and thoracic segments infuscated to entirely fuscus or black, legs without definite markings or setal sockets and irregular areas fuscus; face with clypeal arcs light brown to fuscus, area under antennal bases often fuscus; crown, pronotum, and scutellum stramineous to yellowish green (fig. 1); only distinct markings four fuscus to black spots along anterior margin of crown, apical pair triangular, lateral pair usually elongate oval; forewings hyaline or subhyaline with veins whitish to yellowish green.

Male genitalia. Aedeagus in lateral view (fig. 5) stout and broadly avicephaliform at apex; apical portion of aedeagus in dorsal view (fig. 4) with notch on ventral margin short and fairly wide; style in dorsal view (fig. 2) with mesal lobe stout and moderately long, lateral lobe not developed; stylar lobes in lateral view (fig. 3) with mesal lobe stout, subapical tooth on irregular ventral margin, lateral lobe short and blunt.

Female genitalia. Posterior margin similar to that of *littoralis*, but portion on each side of median lobe roundly produced (DeLong, 1926c:pl. 17, fig. 4b).

Records. The type locality is Canton Marsh, Maryland. My confirmed records: CONNECTICUT, Mystic; DELAWARE, Dover, Rehoboth; MARYLAND, Bay Ridge, Cape Anne, Canton Marsh, Chesa-



Figs. 1–5. *Amplicephalus simplex* (Van Duzee): 1, head and thoracic dorsum; 2, style in dorsal view; 3, apical portion of style in lateral view; 4, apical portion of aedeagus in dorsal view; 5, aedeagus and connective in lateral view.

peake Beach, Crisfield, Deale, Piney Point; MASSACHUSETTS, New Bedford, Woods Hole; NEW JERSEY, Hoboken; NEW YORK, Astoria, Staten Island; VIRGINIA, Cape Charles, Norfolk, Virginia Beach.

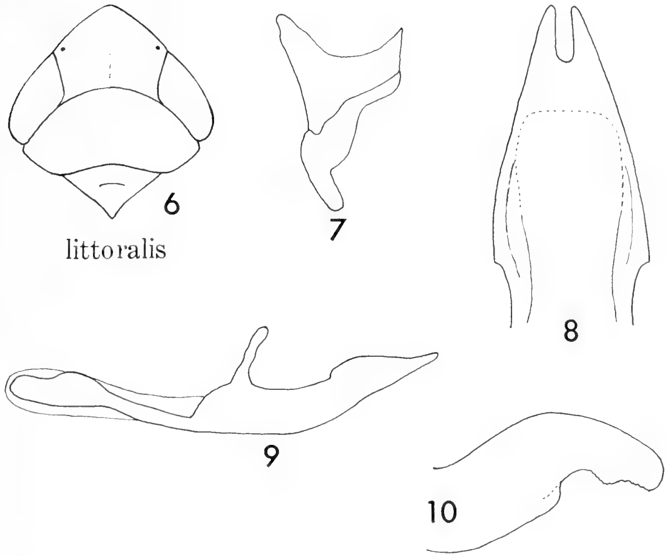
Notes. The host plant of *simplex* is saltmeadow cordgrass, *Spartina patens*. Saltmeadow cordgrass is found coastally from Maine to Florida and west to Texas in eastern North America. The leafhopper undoubtedly has the same distributional pattern.

Amplicephalus littoralis (Ball)
(Figs. 6–10)

Deltocephalus littoralis Ball, 1905:120.
Deltocephalus (*Laevicephalus*)*littoralis* Ball: DeLong, 1926c:65.
Amplicephalus littoralis (Ball): Oman, 1949:179.

Length. Males 2.5–4.0 mm. Females 3.0–4.5 mm.

Structure. Crown in dorsal view (fig. 6) angular apically, interocular width



Figs. 6–10. *Amplicephalus littoralis* (Ball): 6, head and thoracic dorsum; 7, style in dorsal view; 8, apical portion of aedeagus in dorsal view; 9, aedeagus and connective in lateral view; 10, apical portion of style in lateral view.

greater than median coronal length; head in lateral view with crown flattened between eyes and convex anterior to eyes; clypeal suture distinct; forewings long, extending beyond abdomen, or somewhat shortened and exposing genital segment and last abdominal segment; inner anteapical cell closed basally, rarely open; central anteapical cell divided or not; outer anteapical cell normal to elongate, rarely open distally; clavus rarely with few extra crossveins.

Coloration. Venter of abdomen, thorax, and legs stramineous; usually without markings, setal sockets on legs and, at times, edges of abdominal segments darker; face stramineous with clypeal arcs light brown; crown, pronotum, and scutellum stramineous to pale yellowish green, usually unmarked (fig. 6); crown rarely with a pair of vague triangular spots at apex and vague blotches on disc; forewings subhyaline with veins whitish to pale yellowish green, rarely slightly fumose.

Male genitalia. Aedeagus in lateral view (fig. 9) with apex avicephaliform; apical portion of aedeagus in dorsal view (fig. 8) with cleft on ventral margin narrow and moderately deep; style in dorsal view (fig. 7) with mesal lobe stout and moderately long, lateral lobe not developed; stylar lobes in lateral view (fig. 10) with mesal lobe curved, produced at middle on irregular ventral margin, lateral lobe short and broad.

Female genitalia. Posterior margin of pregenital sternum with a distinct median lobe, darkened on each side (DeLong, 1926c:pl. 15, fig. 3a).

Records. The type locality is Cape May, New Jersey. My confirmed records: ALABAMA, Mobile; CONNECTICUT, Mystic; DELAWARE, Dover; FLORIDA, Cedar Keys, Ft. Myers, Jacksonville, Key West, Miami, Sanford, Sarasota, Tampa, Yankeetown; LOUISIANA, Buras; MARYLAND, Annapolis, Cambridge, Crisfield, Deale, Piney Point; MASSACHUSETTS, Woods Hole; MISSISSIPPI, Port Gibson, Ship Island; NEW JERSEY, Anglesea, Cape May; NEW YORK, Sea Cliff, Yaphank; SOUTH CAROLINA, Charleston; VIRGINIA, Norfolk, Onley, Virginia Beach.

Notes. The host plant of *littoralis* is seashore saltgrass, *Distichlis spicata*. Seashore saltgrass is found coastally from Nova Scotia to Florida and west to Texas in eastern North America. The leafhopper undoubtedly has the same distributional pattern.

Amplicephalus osborni (Van Duzee)
(Figs. 11–15)

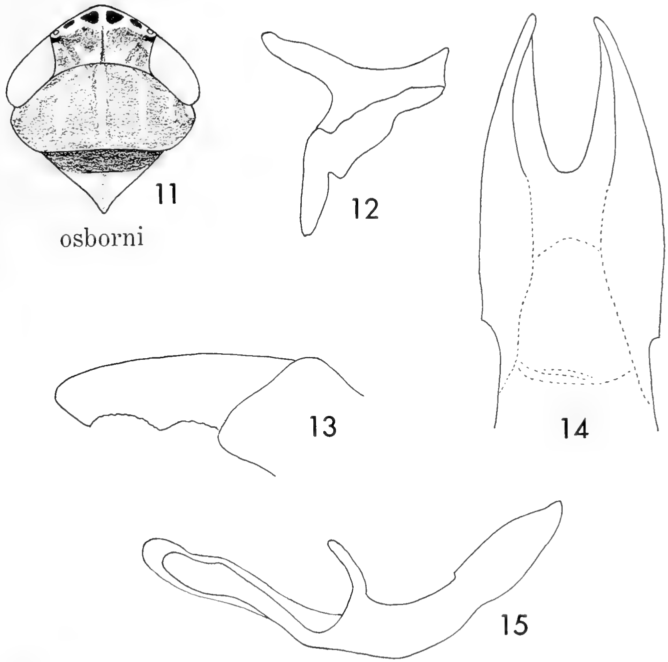
Deltocephalus osborni Van Duzee, 1892:304.
Deltocephalus (*Amplicephalus*) *osborni* Van Duzee: DeLong, 1926c:83.
Amplicephalus osborni (Van Duzee): Oman, 1949:179.

Length. Males 4.6–5.0 mm. Females 5.0–6.0 mm.

Structure. Crown in dorsal view (fig. 11) bluntly angular apically, interocular width greater than median coronal length; head in lateral view with crown flattened between eyes and slightly convex anterior to eyes; clypeal suture obscure; forewings long, extending beyond abdomen, or slightly shortened, exposing tip of genital segment; inner anteapical cell closed basally, rarely open; central anteapical cell divided; outer anteapical cell normal to elongate; usually with some extra crossveins in clavus.

Coloration. Variable; venter of abdomen, thorax, legs and face tawny yellow; marked lightly to heavily with fuscus on edges of abdominal and thoracic segments, setal sockets on legs, bands on femora, and sometimes elsewhere on legs; facial markings light brown on clypeal arcs grading to heavily fuscus on clypeal arcs, sutures, upper edges of genae, and central area of clypellus; crown, pronotum, and scutellum tawny yellow, rarely unmarked, usually marked with light brown to black (fig. 11); anterior coronal margin with two to six variably shaped narrow spots, apical pair usually largest; discal coronal area with variable blotches, blotches sometimes wanting; pronotum with six darkened longitudinal bands or stripes, bands often obscure or wanting; scutellum usually darkened near anterior angles and at middle; forewings tawny yellow subhyaline with edges of veins narrowly to rather broadly infuscated.

Male genitalia. Aedeagus in lateral view (fig. 15) constricted near middle of shaft to produce large cephalic area; apical portion of aedeagus in dorsal view (fig. 14) with cleft on ventral margin wide and deep; style in dorsal view (fig. 12) with mesal lobe moderately long and stout, lateral lobe short and subacute; stylar lobes in lateral view (fig. 13), mesal lobe hooked near apex and expanded near middle on irregular ventral margin, lateral lobe short and blunt.



Figs. 11–15. *Amplicephalus osborni* (Van Duzee): 11, head and thoracic dorsum; 12, style in dorsal view; 13, apical portion of style in lateral view; 14, apical portion of aedeagus in dorsal view; 15, aedeagus and connective in lateral view.

Female genitalia. Posterior margin of pregenital sternum more or less trilobed with central lobe usually shorter and broader than lateral pair (DeLong, 1926c: pl. 17, fig. 5*b*).

Records. The type locality is Lancaster, New York. My confirmed records: COLORADO, Fort Collins, Greeley; ILLINOIS, Antioch, Danville, Fox Lake, Volo; IOWA, Ames; KANSAS, Atchison Co., Doniphan Co., Douglas Co., Greenwood Co., Onaga, Topeka; MARYLAND, Cambridge, College Park; MINNESOTA, Ramsey Co., Two Harbors; NEBRASKA, Ruhling; NEW JERSEY, Burlington Co., Seabrook; NEW YORK, Lancaster; NORTH CAROLINA, Raleigh; OKLAHOMA, Watts; ONTARIO, Toronto; TENNESSEE, Knoxville; WISCONSIN, Grand Rapids, Madison.

Notes. The exact host plant of this widespread species is not known. DeLong (1948:101) reported *osborni* as a fresh water marsh species in the *Calmagrostis* association. Others have reported this species from grasses near borders of swampy or marshy areas. More recent data show the host plant is probably a sedge, *Carex* sp.

Amplicephalus nebulosus (Ball), n. comb.
(Figs. 16–24)

Lonatura nebulosa Ball, 1900: 341; Oman, 1949:176.
Deltocephalus sachalinensis Matsumura, 1915:168.
Deltocephalus nebulosus (Ball): DeLong, 1926b:101.
Lonatura rotunda Beamer, 1939:26.
Endria rotunda (Beamer): Oman, 1949:175; Beirne, 1956:113.
Endria nebulosa (Ball): Remane, 1961:73; Bei-Bienko, *et al.*, 1967:508; Vilbaste, 1969:3.

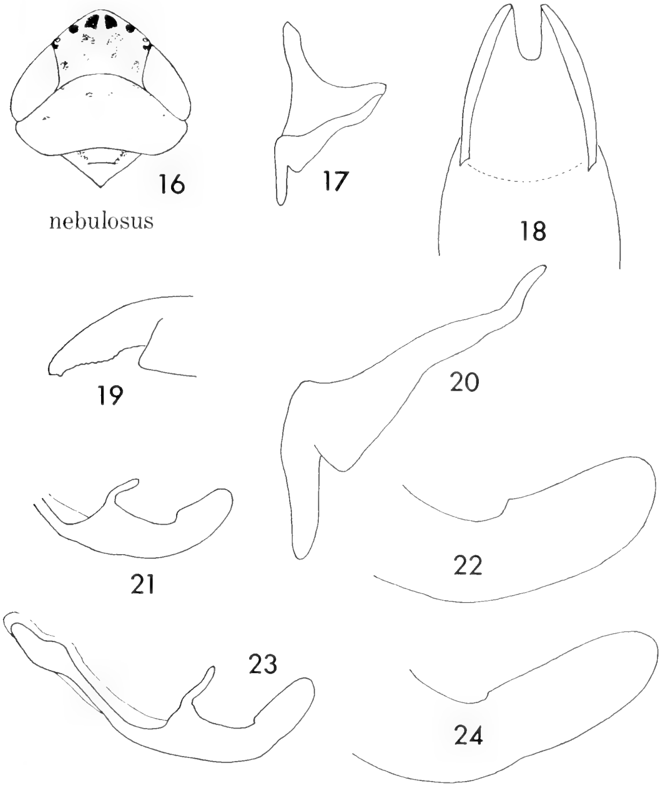
Length. Males 3.5–4.0 mm. Females 3.9–4.6 mm.

Structure. Crown in dorsal view bluntly angular apically (fig. 16), crown broad; head in lateral view with crown entirely convex, not flattened between eyes; ocelli small; clypeal suture obscure; forewings longer than abdomen, often with extra crossveins in claval areas, each appendix large, inner anteapical cells closed basally, central anteapical cells divided, outer anteapical cells normal; or forewings much shortened, rounded apically, exposing genital segment and three and partial fourth abdominal segments, with or without extra crossveins in claval areas, each appendix and apical cells essentially vestigial, anteapical cells greatly shortened, outer anteapical cells and distal half of central anteapical cells minute.

Coloration. Venter of abdomen, thorax, legs, and face pale yellowish brown; abdominal segments and thorax unmarked or variably infuscated; legs with setal sockets and some irregular banding fuscus; face without definite markings or clypeal arcs vaguely darker grading to forms with clypeal arcs, spot above each antennal base, all sutures, central portion of clypellus, irregular patches on and upper edges of genae, fuscus; crown, pronotum, and scutellum (fig. 16) with ground color of venter; anterior coronal margin with four distinct black spots between ocelli, central pair usually smaller and often subtriangular; coronal disc with pair of subapical anterior transverse brownish dashes and two or four brownish oblique spots or dashes posteriorly, dashes often poorly defined or absent; pronotum with four or six dark longitudinal bands or stripes, bands often vague or obsolete; scutellum unmarked to fuscus on all angles; forewings hyaline or subhyaline with veins sordid white or white, edges of veins not or only barely infuscated in short winged forms, edges of veins in long winged forms usually distinctly infuscated in anteapical cells and claval areas.

Male genitalia. Aedeagus in lateral view (figs. 21, 23) short, stout, with broad cephalic area; apical portion of aedeagus in dorsal view (fig. 18) with cleft on ventral margin moderately wide and deep, gonopore poorly defined near apex; style in dorsal view (fig. 17) with mesal lobe moderate in length and width; lateral lobe short and broad; stylar lobes in lateral view (fig. 19) with tooth on irregular ventral margin of mesal lobe, lateral lobe short and subacute.

Female genitalia. Posterior margin of pregenital sternum with lateral margins broadly rounded and short wide tooth at middle (Remane, 1961:fig. 6).



Figs. 16–24. *Amplicephalus nebulosus* (Ball): 16, head and thoracic dorsum; 17, style in dorsal view; 18, apical portion of aedeagus in dorsal view; 19, apical portion of style in lateral view; 20, distal portion of style in dorsal view; 21, aedeagus in lateral view (Colorado); 22, distal portion of aedeagus in lateral view; 23, aedeagus and connective in lateral view (Germany); 24, distal portion of aedeagus in lateral view.

Records. The type locality is Fort Collins, Colorado. My confirmed records: COLORADO, Fort Collins; MANITOBA, Birch River, Cowan, Keld, Swan River; MINNESOTA, Two Harbors. I have also seen specimens from southern Bavaria, Germany.

Notes. The host plant of this species in Europe is the wide-spread

Eurasian reedgrass, *Calamagrostis epigejos*, now well established in North America. U.S. National Museum herbarium records report this grass from New York, Ontario, Iowa, Kansas, South Dakota, North Dakota, and Utah. There are no known host records for *nebulosus* in North America. *A. nebulosus* is known in Eurasia from southern Germany (Remane, 1961:73); Kursk Region of European U. S. S. R. (Bei-Bienko, *et al*, 1967:508); Kongo Mt., Korea and the island of Sakhalin in Far Eastern U. S. S. R. (Vilbaste, 1969:3).

Kansendria, n. gen.

Type-species: *Polyamia kansiensis* Tuthill.

Moderately large deltocephaline leafhoppers (4.5 mm or more). Head wider than pronotum. Anterior margin of head rounded to face. Clypeal suture obscure or absent. Pronotum of moderate length. Forewings long and extending much beyond apex of abdomen, macropterous, usually with extra crossveins in clavus. Male genitalia: valve large; plates subtriangular, elongate, as long as pygofer, with submarginal spine-like setae uniseriate; pygofer strongly setose; aedeagus scaly, elongate, decurved; gonopore terminal; aedeagus fused with linear connective. Color stramineous or pale brownish with limited fuscus to black markings.

In Oman's key to the genera of North American Deltocephalini (1949:111–119), *Kansendria* will trace to couplet 127, *Amplicephalus* DeLong. It can be separated from that genus on the basis of the elongate, decurved, scaly aedeagus *versus* transverse or upturned non-scaly aedeagus.

Kansendria kansiensis (Tuthill), n. comb.
(Figs. 25–30)

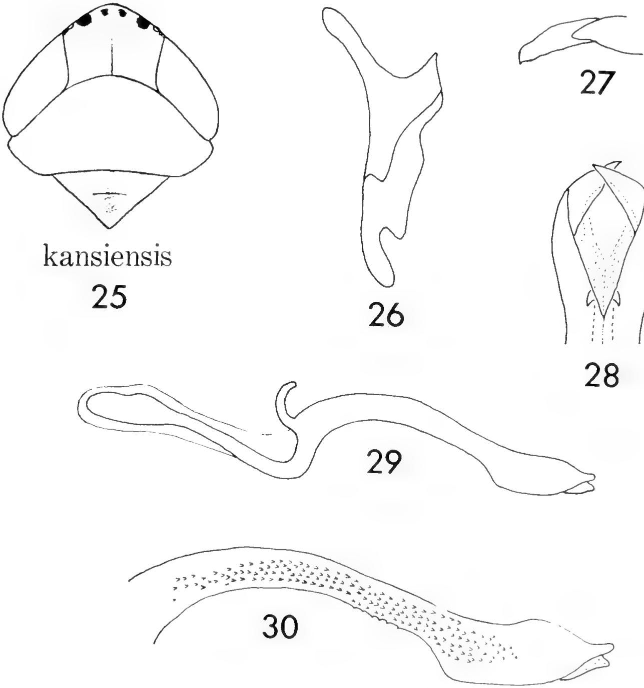
Polyamia kansiensis Tuthill, 1930:46.
Amplicephalus kansiensis (Tuthill): Oman, 1949:179.

Length. Male 4.5–4.8 mm. Female 5.0–5.3 mm.

Structure. Head in dorsal view (fig. 25) bluntly angular apically, ocelli close to eyes; forewing with inner anteapical cell closed basally, central anteapical cell once or twice divided, outer anteapical cell elongate and, at times, divided.

Coloration. Variable; venter of abdomen, thorax, legs, and face sordid stramineous to pale brown, edges of abdominal segments and legs at times infuscated, face without definite markings or with clypeal arcs, sutures, upper edges of genae, lightly infuscated; crown, pronotum, and scutellum (fig. 25) with ground color of venter, only distinct markings four fuscus marginal coronal spots between ocelli, central pair smaller and sometimes faint; forewings yellowish to brownish subhyaline, veins narrowly margined with fuscus, apical cells often darkened distally.

Male genitalia. Aedeagus in lateral view (fig. 29) slender, elongate, decurved, apically enlarged, and longer than connective; aedeagal shaft (fig. 30) scaly; aedeagal apex in dorsal view (fig. 28) with gonopore at base of crossed distal forks; style in dorsal view (fig. 26) with mesal lobe narrowed basally and curved slightly laterad; lateral lobe bluntly produced; stylar lobes in lateral view (fig. 27)



Figs. 25–30. *Kansendria kansiensis* (Tuthill): 25, head and thoracic dorsum; 26, style in dorsal view; 27, apical portion of style in lateral view; 28, apical portion of aedeagus in dorsal view; 29, aedeagus and connective in lateral view; 30, aedeagal shaft in lateral view.

with mesal lobe slightly hooked near apex on irregular ventral margin, lateral lobe acute.

Female genitalia. Pregenital sternum of female (Tuthill, 1930:fig. 4b) elongate, with median keel ending in a protruding, notched tooth on posterior margin, lateral margins narrowing distally to expose underlying sclerites on each side.

Type. Female, Saline Co., Kansas, 13 July 1923, R. H. Beamer, in Snow Entomological Collection, University of Kansas, Lawrence.

Records. The type locality is Saline Co., Kansas. My confirmed records: KANSAS, Decatur Co., Douglas Co., Ellsworth Co., Meade Co., Saline Co., Washington Co.

The unique aedeagus distinguishes *kansiensis* from all other North American leafhoppers. Externally, it resembles paler forms of *Endria inimica* (Say), but the genitalia of both sexes are of a different pattern. Nothing is known of its food or host plants.

Reventazonia lawsoni (DeLong), n. comb.
(Figs. 31–38)

Deltocephalus lawsoni DeLong, 1926a:89.
Arundanus duplus DeLong, 1941:634. **New synonymy**.
Amplicephalus lawsoni (DeLong): Oman, 1949:179.

Length. Male 4.0–4.4 mm. Female 4.3–5.0 mm.

Structure. Crown produced beyond eyes and bluntly angular apically (fig. 31); ocelli of moderate size and nearly touching eyes; crown in lateral view flattened between eyes and convex anterior to eyes; forewings long and extending well beyond apex of abdomen (males and some females) or with genital segment partly exposed (some females); forewing with inner anteapical cell closed basally, rarely open; central anteapical cell divided, rarely undivided; outer anteapical cell normal.

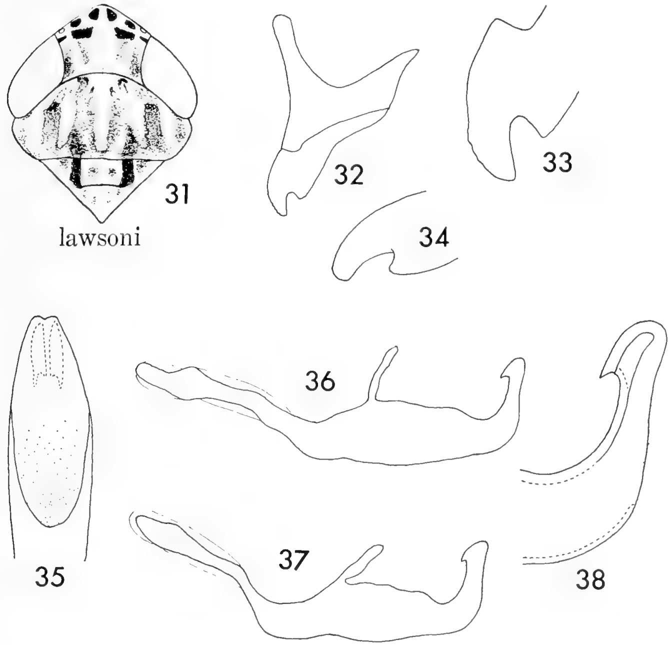
Coloration. Somewhat variable; venter of abdomen, thorax, legs, and face sordid stramineous to pale brown; edges of abdominal segments usually infuscated, setal sockets on legs darkened, at times with touches of fuscus elsewhere; face with clypeal arcs, lateral edges of clypellus, and at times spot or spots on genae near base of clypeus, fuscus; darkened clypeal arcs touch in upper portion only, central portion of clypeus and clypellus usually unmarked; crown pronotum, and scutellum (fig. 31) with ground color of venter; crown in well marked specimens with six variable black spots along anterior margin, pair of black subapical spots, and two pairs of light brown dashes on disc; pronotum with six variable brownish longitudinal stripes; scutellum usually with pair of pale brown to black narrow longitudinal stripes; forewings pale brown, subhyaline with edges of veins narrowly to rather broadly infuscated; apical cells at times darkened distally.

Male genitalia. Male plates sharply triangular, concave laterally, about as long as pygofer; aedeagus in lateral view (fig. 36–37) stout basally and broadly and sharply upturned distally; distal portion of aedeagus in lateral view (fig. 38) with hook on proximal margin; distal portion of aedeagus in posterior view (fig. 35) with exceptionally large subapical gonopore; style in dorsal view (fig. 32) with mesal lobe short and stout, lateral lobe broad and subacute; stylar lobes in lateral view (fig. 34) with mesal lobe curved and lateral lobe subacute.

Female genitalia. Pregenital sternum narrowing distally and exposing underlying sclerites laterally, posterior margin more or less trilobed with central lobe most clearly defined (DeLong, 1926a:fig. 3a).

Records. The type locality is Cherokee Co., Kansas. My confirmed records: ALABAMA, Marion Junction; GEORGIA, Prattsburg; KANSAS, Cherokee Co., Douglas Co., Garnett; MARYLAND, Beltsville, Cambridge, Potomac, Sparrows Point; MISSISSIPPI, Fulton, Vicksburg; TEXAS, Victoria.

Notes. The host plant of *lawsoni* is eastern gamagrass, *Tripsacum dactyloides*. Eastern gamagrass occurs from New York south to Florida,



Figs. 31–38. *Reventazonia lawsoni* (DeLong): 31, head and thoracic dorsum; 32, style in dorsal view; 33, stylar lobes in dorsal view; 34, distal portion of style in lateral view; 35, distal portion of aedeagus in posterior view; 36, aedeagus and connective in lateral view (Maryland); 37, same (Kansas); 38, distal portion of aedeagus in lateral view.

west to eastern Texas, and north to eastern Nebraska and southern Iowa.

The genus *Reventazonia* Linnavuori (1959:138) was described to include a single species, *Reventazonia atrifrons* Linnavuori, a Central American deltocephaline. We do not known the host plant of the type-species, but it could well prove to be a grass of the tribe Tripsaceae. The male genitalia of our North American species, *lawsoni*, and the Central American species, *atrifrons*, are similar, but *atrifrons* lacks the proximal hook on the apical portion of the aedeagus. There are other differences, too, which can best be seen by comparing figs. 36–37 and fig. 53g (Linnavuori, 1959:139).

In Oman's key to the genera of North American Deltocephalini (1949:111–119), *Reventazonia* will trace to couplet 127, *Amplicephalus* DeLong. It can be separated from that genus on the basis of a large ventral subterminal gonopore *versus* an ill defined dorsal gonopore.

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A NEW SPECIES OF PELMATOCERANDRA FROM A DIVING PETREL
(MALLOPHAGA: PHILOPTERIDAE)

K. C. EMERSON, *2704 North Kensington Street, Arlington, Virginia 22207*

and

ROGER D. PRICE, *Department of Entomology, Fisheries, and Wildlife, University of Minnesota, St. Paul, Minnesota 55101*

ABSTRACT—*Pelmatocerandra* **flinti**, n. sp., is described and illustrated from *Pelecanoides magellani* collected in Chile.

The genus *Pelmatocerandra* was erected by Enderlein (1909) for *Nirmus setosus* Giebel, 1876, found on *Pelecanoides urinatrix exsul* Salvin. Eichler (1949) described *P. enderleini* for the form found on *Pelecanoides georgica* Murphy and Harper. Clay (1958) redescribed and illustrated both of these species. We are describing and illustrating herewith a third species, *P. flinti*, collected off *Pelecanoides magellani* (Mathews).

Pelmatocerandra flinti, n. sp.
(Figs. 1–6)

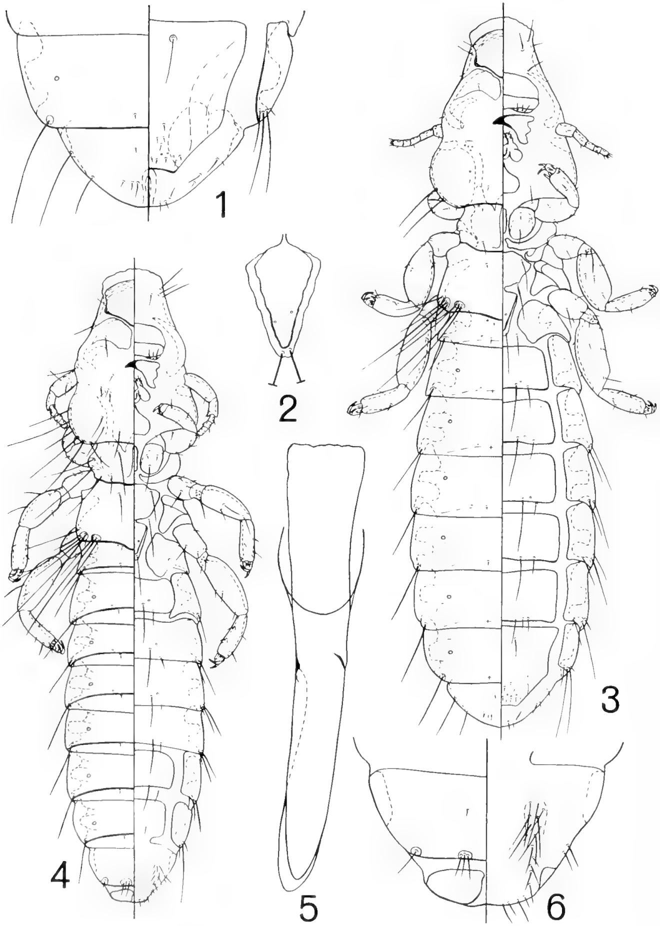
Male.—External morphology and chaetotaxy as shown in fig. 4. Terminal abdominal segments as in fig. 6. Genitalia as shown in fig. 5. Total length, 2.42 mm.

Female.—External morphology and chaetotaxy as shown in fig. 3. Terminal abdominal segments as in fig. 1. Metasternal plate as shown in fig. 2. Total length, 2.60 mm.

Discussion.—This species is closest to *P. setosa*, but can be separated from it by a number of characters. Abdominal tergal plates of both sexes are longer for *P. flinti* than for *P. setosa*. The metasternal plate is narrow, as for *P. setosa*, but with 2 medium-length setae at the posterior tip. Tergal plate of male abdominal segment IX with 1-3-3-1 medium-length setae, all shorter than for *P. setosa*; terminal abdominal sternal plate with a cluster of medium-length setae on each side, each cluster with fewer setae than for *P. enderleini* and more than for *P. setosa*. Male genitalia with 2 slender blades, each with evenly rounded distal tip; these structures are pointed on the distal tip for *P. enderleini*, and longer and not so broad for *P. setosa*. Genital plate of female terminal abdominal segments is not distinctive in shape or chaetotaxy, but between the genital plate and the latero-posterior margin of the body is a row of 7 setae on each side; in *P. setosa* and *P. enderleini* there are 8 setae grouped 2-3-3 along the margin. Both sexes have a distinctive head shape in that it is longer and narrower than for the other species, and is without a noticeably expanded post-antennal region.

Type host.—*Pelecanoides magellani* (Mathews).

Type material.—Holotype male, allotype female, and 9 paratypes collected off the type host at I. Desolacion, Pto. Churruca, Chile, on 5 October 1969 by O. S. Flint, Jr. The holotype and allotype will be



Figs. 1–6. *Pelmatocerandra flinti*, n. sp.: 1, female terminalia; 2, female metasternal plate; 3, female; 4, male; 5, male genitalia; 6, male terminalia.

deposited in the U. S. National Museum. Paratypes will be retained by each author.

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THE STATUS OF LASIODERMA CASTANEUM MELSHEIMER AND DORCATOMA AFFINIS BOHEMAN

(COLEOPTERA: ANOBIIDAE)

RICHARD E. WHITE, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—Two species names in Anobiidae have been largely overlooked since their publication. *Lasioderma castaneum* Melsheimer is probably a synonym of *L. serricorne* (Fab.). *Dorcatoma affinis* Boheman is likely a synonym of *Caenocara californicum* Leconte.

While compiling a catalogue of the Anobiidae of North America, I encountered two names which have been largely overlooked in American literature. My findings from working with these names and their descriptions follow.

The name *Lasioderma castaneum* Melsheimer has received irregular treatment since its proposal (Melsheimer, 1846), having been alternately overlooked, and referred to in different works. It did not appear in Crotch (1873). In Henshaw (1885) it was preceded by a question mark in the synonymy of *L. serricorne* (Fab.). The name was not referred to in Fall's revision of Anobiidae (Fall, 1905). In the Junk List (Pic, 1912) the name was presented as valid and not a synonym. It was listed in the synonymy of *L. serricorne* (Fab.) but preceded by a question mark in Leng (1920). Comparison of the original description of *L. castaneum* (described from Pennsylvania) with specimens of *L. serricorne* (Fab., 1792) shows very good agreement. The length given for *L. castaneum* (1¼ lines, equals 2.62 mm) compares with the length of 1.8 to 3.0 mm for *L. serricorne*, and is greater than the length of any other known species of *Lasioderma* occurring in northeastern United States. The antennal description ("serrated from the 3rd seg-

[1] Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

ment, and with the 2nd and 3rd segments small"), applies especially well. The only discrepancy that I find is the width given for *L. castaneum* (½ line, about 1.06 mm). A specimen of *L. serricorne* measuring 2.6 mm in length is 1.6 mm wide (about ¾ line). I regard the width given as probably an error, and feel that the agreement is so good as to allow *L. castaneum* to be considered probably a synonym of *L. serricorne*.

Since the original description of *Dorcatoma affinis* Boheman (1858) the name has been largely overlooked by American workers. It does not appear in Crotch (1873) nor in Henshaw (1885). It was not included in Fall's revision of Anobiidae (1905), but was in the Junk List under *Dorcatoma* (Pic, 1912, p. 76) and also in the Leng List under *Dorcatoma* (Leng, 1920, p. 244). Examination of the description leaves no doubt as to the generic placement of the name. The reference to the eyes being nearly divided ("in duas partes fere divisi") assigns the name with certainty to the genus *Caenocara*, so I hereby make the following change, *Caenocara affine* (Boheman), **new combination**.

The locality of collection of *C. affine* (California, "St. Fransisco") makes *affine* very likely a synonym of *C. californicum* LeConte (1878). The latter is the only species of *Caenocara* known from California. There is little of value in the description of *affine* to allow it to be recognized, but the length given for *affine* (1⅔ mm) is within the range of the length of *californicum* (1.5 to 1.9 mm). Though *affine* is an older name than *californicum*, it cannot be used because it is preoccupied in *Caenocara* by *C. affine* (Sturm, 1837). *C. affine* will have to be carried as probably a synonym of *californicum*, and should the synonymy be established with certainty, *C. californicum* will remain the correct name for the species.

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A NEW SPECIES OF DIORYCTRIA INFESTING LOBLOLLY PINE[1, 2]
(Lepidoptera: Pyralidae)

B. D. Schaber[3] and F. E. Wood, *Department of Entomology, University of Maryland, College Park, Maryland 20742*

ABSTRACT—A new species of Pyralidae, *Dioryctria* **taedae**, injurious to loblolly pine cones (*Pinus taeda* L.), is described. The known range of this species is Delaware, Maryland, Virginia, North Carolina, South Carolina and Georgia.

One of the phycitine moths destructive to the cones of loblolly pine (*Pinus taeda* L.) in Maryland, North Carolina, and Georgia is determined in the literature as *Dioryctria zimmermani* (Grote) (Neunzig, Cashatt and Matuza, 1964, 1964b; Coulson and Franklin, 1964; CEIR, 1964). Specimens of *Dioryctria* infesting loblolly pine cones in those states however, cannot be assigned to *D. zimmermani.* Evidence from morphological and biological studies show that those specimens represent a new species which is described below, along with a key to the species of *Dioryctria* infesting pine trees in the Atlantic coastal states.

Dioryctria taedae, n. sp.

Holotype, male: length 14 mm, length of fore wing 12 mm; head grey; palpi darker, upturned beyond vertex; antennae light brown, first 8 segments each with a dorsal black, thorn-like spine, more or less concealed by rough scales; collar fuscous; ruff grey; thorax grey above, with silver luster, flecked with darker scales; abdominal segments grey anteriorly, a band of creamy white scales posteriorly with black spots on first 2 abdominal segments; white scales predominant on venter of abdominal segments 1 through 7 and grey on segments 8, 9, and 10; femora speckled with dark and white scales; middle and hind tibiae dark with 3 ivory bands; fore tibiae without spurs; mid tibiae with 2 apical spurs; hind tibiae with 2 medial and 2 apical spurs; tarsal segments grey basally, ringed with white scales apically.

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[3] Present address: B. D. Schaber, Department of Entomology, South Dakota State University, Brooking, South Dakota 57006.

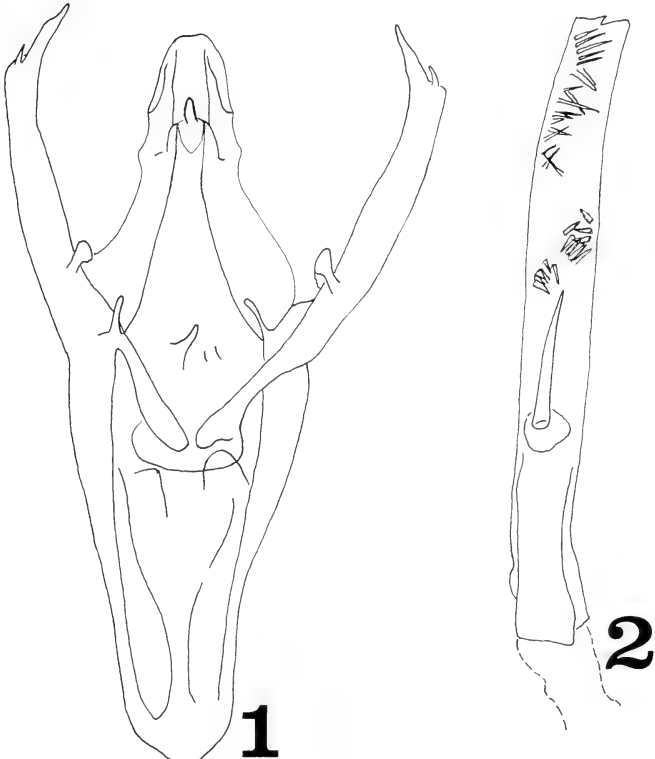
Fore wing above with a ridge of raised scales preceding the antemedial line (subbasal) and 1 following the antemedial line, and some raised scaling of the discal spot and outer median area including the subterminal line; ground color very dark brown; scales of the transverse lines, discal spot, blotch following the antemedial line, blotch near inner margin of subterminal line on posterior half of wing, and a pale area just within terminal margin grey; basal, medial, and terminal areas shaded with dark rust colored scales, more apparent between subbasal scale ridge and antemedial line, and between antemedial and subterminal ridge; subbasal ridge black, antemedial ridge greyish, flecked with reddish scales; subterminal ridge greyish; black scaling limited to thin borders of transverse lines, spot at extreme base of forewing, and terminal line; transverse lines prominent, antemedial transverse line bidentate, subterminal transverse line dentate before middle; fringe grey, scales tipped with white. Fore wing below, anterior ⅓ lighter, rest of wing darker, anterior margin almost white nearly to apex. Hind wing above, smoky-grey with a fumose border along terminal margin, fading towards base, and with a narrow dark line along termens. Hind wing below, dark along anterior margin and along most of terminal margin; fringe silvery-grey with an even dark grey band near scale bases.

Male genitalia with uncus slightly longer than broad (fig. 1), lateral margins recurved toward center; terminal margin rounded; valves with costa broadly sclerotized, terminating in a long curved pointed hook, with a short spine issuing from its lower outer margin; process on inner face of valve digitate; arms of annellus long, curved and flat with several small spines at apex, and 2 spines down the inner margin; transtilla present; cucullus narrow, pointed at apex and ending just beyond the point of spine; aedeagus (fig. 2) with posterior linear spine cluster and 2 other small spine clusters just preceding a long, narrow, straight, pointed anterior spine, spine terminating at 1st small cluster of spines.

Allotype, female: same as male but with more reddish ground color on dorsal fore wing; hind wing dorsally with much darker and broader border along terminal margin; both wings darker below.

The female genitalia (fig. 3). Ductus bursae ribbon-like and sclerotized for its entire length except for a small area preceding the genital opening; constricted behind middle, longitudinally ribbed, narrowing, and terminating in a produced, weakly trilobed, almost rounded central projection; broadening anteriorly and bent toward bursa; bursa with the spine cluster closely grouped.

Types: *Holotype*: National Museum of Natural History Type No. 71372. Male, Maryland, St. Marys Co., 2 mi E. of Scotland, 0.3 mi S. off Mur-Ray Rd., IX-19-69, B. D. Schaber, cone of *P. taeda*, Em. XI-05-69; male genitalia on slide S9-1969-7 B.D.S. 1969. *Allotype*: female, Maryland, St. Marys Co., 2 mi E. of Scotland, 0.3 mi S. off of Mur-Ray Rd., IX-18-1969, B. D. Schaber, cone of *P. taeda*, emerged XI-11-69; female genitalia on slide S9-1969-6 B.D.S. 1969. *Paratypes*: female and male, Delaware, Sussex Co., 7 mi E. of Bridgeville, 0.8 mi E. of Cokesbury Church, VIII-27-1969, B. D. Schaber, cones of *P. taeda*, Em. VIII-28-69, Em. IX-1-68; female, Maryland; Somerset Co., Marion, VII-1-1968, B. D. Schaber, cone of *P. taeda*, Em. VIII-9-68; male, Somerset Co., 0.75 mi S. of Emanuel Church, VI-25-1967, B. D. Schaber, Em.



Figs. 1–2. *Dioryctria taedae*, n. sp., male genitalia: 1, uncus with lateral margins; 2, aedeagus.

VIII-12-68, male genitalia on slide S2-2069-7, B.D.S. 1969; female, St. Marys Co., 2 mi E. of Scotland, 0.3 mi S. off of Mur-Ray Rd., IX-19-1969, B. D. Schaber, cone of *P. taeda*, Em. X-19-69, B. D. Schaber; female, Wicomico Co., 1.5 mi N. of Whitehaven, VII-18-1968, B. D. Schaber, terminal of *P. taeda*, Em. VIII-21-68. The above holotype, allotype and paratypes are in the U. S. National Museum, Washington, D.C.

Paratypes in the Canadian National Collection, Ottawa, Canada: male, Maryland: Somerset Co., 1 mi S. Kingston, behind Moores

Chapel, IX-24-1969, B. D. Schaber, cone of *P. taeda*, Em. X-28-69; 2 females, 1 male, Wicomico Co., 1.5 mi N. of Whitehaven, VII-11-1968, B. D. Schaber, cones of *P. taeda*, Em. Aug. 26, 27, 29, 1968; female, Worcester Co., reared-cones-lab., Aug. 23, 1966, F. E. Wood, female genitalia on slide S1-368-7, B.D.S. 1968; male, Worcester Co., Snow Hill, 4 mi N. ½ mi E. VII-31-1969, B. D. Schaber, cones of *P. taeda*, Em. VII-18-69.

Paratypes in British Museum (N. H.), London, England: male, Delaware, Sussex Co., 7 mi E. Bridgeville, 0.18 mi E. Cokesbury Church, VIII-28-1969, B. D. Schaber, cone of *P. taeda*, Em. X-6-69. Female, same locality, Em. X-7-69, cone of *P. taeda*.

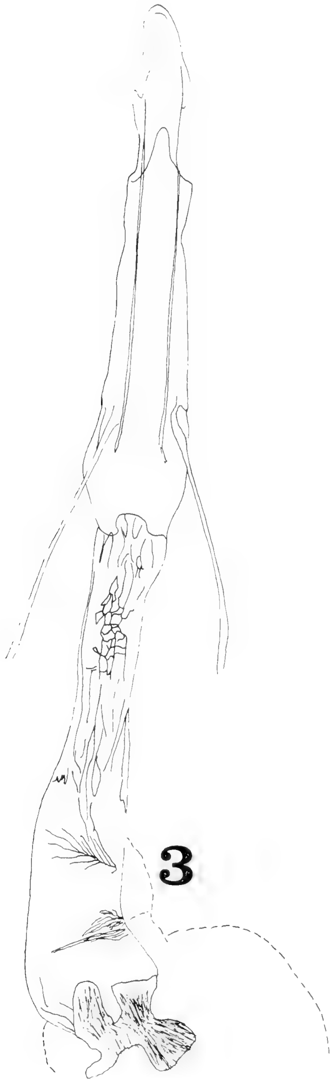
Additional Material Examined: Delaware: Sussex Co., Bridgeville, August 26, 28, 1969, from cones of *P. taeda*. Maryland: Somerset Co., Allen, August 7, 1968 from cones of *P. taeda*; Champ, July 10 and 13, 1967 from cones of *P. taeda*; Emanuel Church, June 28, 1968 from cones of *P. taeda*; Marion, July 1, 1968 from cones of *P. taeda*; 1 mi S. Kingston, behind Moores Chapel, September 24, 1969, from cones of *P. taeda*; Princess Anne, June 30, July 1967, from cones of *P. taeda*; Rehobeth, August 1, 1967, from cones of *P. taeda*; St. Marys Co., Scotland, September 18 and 19, 1969, from cones of *P. taeda*; Wicomico Co.: Quantico, September 24, 1964; Salisbury, August 27, 1964; Whitehaven, July 11 and 18, 1968, from cones and from terminals of *P. taeda*; Willards, August 27, 1964; Worcester Co., Snow Hill, November 4, 1965, February 11, 1966, July 23, 1966, July 28, 1966, September 15, 1966, November 5, 1966, November 10, 1966. Virginia: King and Queen Co., August 14, 1941, from cones of *P. taeda*; Princess Anne Co., Cape Henry, June 9, 1927. North Carolina: Lenoir Co., Kinston, June 8 and 9, 1960, from cones of *P. taeda*; Onslow Co., Richland, August 17, 1960, from cones of *P. taeda* and *P. echinata* Mill. Specimens deposited in U. S. National Museum, Washington, D.C. Georgia: Bibb Co., Coll. 2-IV-68, Macon, Ga., R. N. Coulson, Em. 29-V-68, Ex. fusiform canker (Lob.); Clark Co., Coll. 1-IV-68, Athens, Ga., R. N. Coulson, Em. 7-V-68, Ex. fusiform canker (Lob.); Green Co., Coll. 20-IV-66, Green Co., Ga., R. N. Coulson, Ex. Shortleaf, Sec. Yr. Cone, Em. 27-VII-66; Coll. 6-6-67, Green Co., Ga., R. N. Coulson, from Lob. Sec. Yr. Cone, Em. 9-10-67. Specimens in University of Georgia Collection.

Key to the Species of **Dioryctria** Infesting Pine Trees in the Atlantic Coastal States

1a. Fore wings yellow and orange .... **D. disclusa** Heinrich
1b. Fore wings grey, sometimes mottled with brown 2

→

Fig. 3. *Dioryctria taedae*, n. sp., female genitalia.



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2a. Fore wings with two crossbands each lighter than ground color of wing ---- 3
2b. Fore wings with one light crossband distally and a broad blackish band proximally ---- **D. clarioralis** (Walker)
3a. Fore wings bluish grey, light or white dusting basally, all wing scales smooth ---- **D. abietivorella** (Grote)
3b. Fore wings distinctly mottled with dark brown, dark not white basally, some patches of raised scales usually present ---- 4
4a. Fore wings reddish brown basally, hind wings almost white ---- **D. zimmermani** (Grote)
4b. Fore wings dark brown basally, hind wings tan ---- 5
5a. Fore wings with crossbands very bright white ---- **D. amatella** (Hulst)
5b. Fore wings with crossbands grey ---- **D. taedae** Schaber and Wood

The male differs from the female in having the raised scales and spines on the 1st 8 segments of each antenna. The hind wing of the male has a distinct black border. The hind wing of the female is darker with a very wide dark border. The terminal segment of the male abdomen has tufts, while the terminal segment of the female abdomen has a ring of long fine scales.

The genitalia of other North American species of *Dioryctria*, such as, *D. zimmermani, D. amatella, D. albovittella, D. cambiicola*, are apparently identical or at least very similar (Heinrich, 1956). According to Mutuura et al. (1969a) the genitalia of *D. tumicolella* (Mutuura, Munroe, Ross) and *D. cambiicola* (Dyar) are the same or at least very similar. Likewise, the genitalia of *D. contortella* (Mutuura et al.), *D. monticocella* (Mutuura et al.) and *D. banksiella* (Mutuura et al.) are very similar (Mutuura et al., 1969a). These genitalic similarities then, necessitate more weight being placed on other morphological characters, geographic ranges, and biologies.

When the wing coloration of the 3 following species are compared, it is noted that specimens of *D. zimmermani* exhibit reddish scales dorsally at the base of the fore wings. The transverse lines are a dark grey as are other of the lighter maculations. The hind wings of *D. zimmermani* are nearly white, only slightly tan around the edges, and with a very narrow brown border. The fore wings of *D. taedae* dorsally exhibit a ground color of grey brown. Reddish scales fleck the fore wings of *D. taedae* but they are not concentrated at the wing base. The transverse lines and other maculations are a light grey and the hind wings are light smoky grey medially with a broad dark grey marginal border becoming lighter toward the center of the wing. In both species, *D. zimmermani* and *D. taedae*, the fore wings below are a very dark, nearly uniform grey. The hind wings below reflect the dorsal coloration. *D. amatella* is distinct from both of the above species, in that it has bright white transverse bands and discal spots on the fore wings. The hind wings are smoky grey with a dark grey border

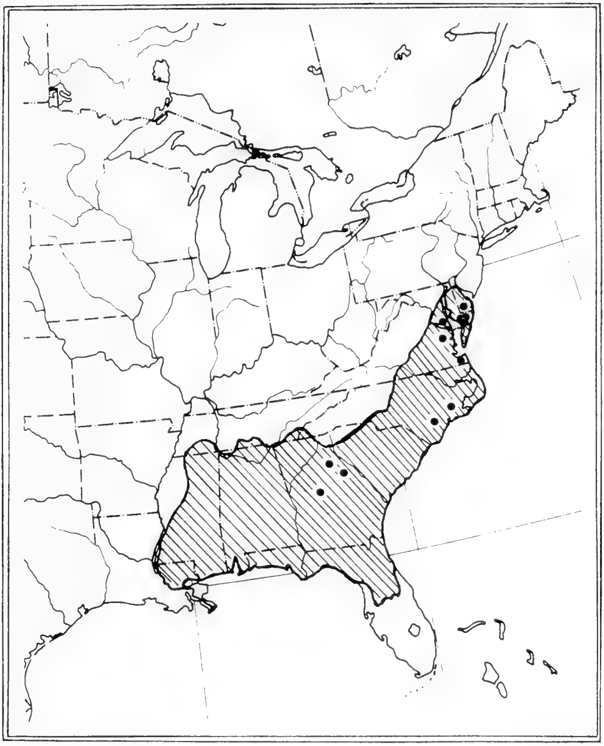

Fig. 4. Range of loblolly pine east of the Mississippi River and collection sites of *Dioryctria taedae*, n. sp.

narrower than the border of *D. taedae*. Below, the front wings of *D. amatella* are brownish.

Specimens determined as *D. zimmermani* in North Carolina and Georgia have been questioned on biological grounds by Neunzig, Cashatt and Matuza (1964), Neunzig, Rabb and Merkel (1964), Neunzig and Merkel (1967), and Coulson and Franklin (1968).

Classically tree damage by *D. zimmermani* has consisted of tunneling in the cambium of trunks and branches (Heinrich, 1956; Rennels, 1960; Schuder, 1960). Conversely in Delaware, Maryland, Virginia, North Carolina and Georgia, *Dioryctria* damage to loblolly pine has been limited to infestations of cones and tunneling in terminals by young larvae. Only one instance of boring in bark has been recorded in Georgia. Other species of trees where *D. taedae* infested cones in very limited numbers are pond pine, *Pinus seratina* Michx. (Maryland) and shortleaf pine, *Pinus echinata* (Georgia, Franklin and Coulson, 1968).

Polivka and Houser (1936) compared tip moth infestations in pitch pine, shortleaf pine, ponderosa pine and loblolly pines in Ohio. The first two species were investigated in both native stands and in plantings; the latter two only in plantings. The species of moths observed were the Zimmerman "Tip Moth," the Nantucket Tip Moth and the Comstock Tip Moth. Interestingly, there was no infestation of introduced loblolly pine or ponderosa pine by *D. zimmermani* indicating that the larvae of that species do not infest the terminals of those two pine species planted within its range.

The range of *D. taedae* (fig. 4) is from southern Delaware, the Maryland-Virginia peninsula, southern Maryland, Virginia, North Carolina to Georgia.

Heinrich (1956) in discussing a western species, *D. cambiicola* (Dyar), with genitalia similar to *D. amatella*, *D. taedae* and *D. zimmermani* commented that Dyar noted in his original description, an eastern specimen (presumably from Washington, D.C.) reared from a cone of *Pinus taeda*, Aug. 14, 1882. Heinrich further states "I have also before me a similar female from Cape Henry, reared June 9, 1927. I suspect that both these examples may be hybrids of *zimmermani* and *amatella*." The specimens to which Heinrich refers have been seen and determined as *D. taedae*.

Acknowledgments

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We would also like to express our gratitude to the following people for specimens of *Dioryctria* loaned for this study. R. N. Coulson, University of Georgia, W. D. Duckworth, U.S.N.M., F. E. Kurczewski, Syracuse University, W. J. Mattson, North Central Forest Experiment Station, St. Paul, Minn., E. P. Merkel, Southeastern Forest Experiment Station, Olustee, Florida, and L. L. Pechuman, Cornell University.

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TWO MITES AND THEIR INSECT HOSTS FROM SAN MATEO COUNTY, CALIFORNIA

(ACARINA: SCUTACARIDAE, UROPODIDAE)

During routine examination of light trap collections from San Mateo County, California, two insect specimens were found to have attached mites.

From a trap at San Carlos, California, a single male halictid, *Lasioglossum titusi* (Crawford), a ground nesting, solitary, pollen collecting bee was found which carried five mites, Scutacaridae, *Imparipes* sp., clustered ventrally at the base of the abdomen. Little information is known about this family especially this genus. Sweetman (*The Principles of Biological Control*, 1963) referred to the family Scutacaridae as being composed largely of mites predaceous or parasitic on arthropods.

A light trap collection from San Mateo, California, contained a single male staphylinid, *Philonthus longicornis* Stephens. Three immature mites, Uropodidae, were attached ventrally at the base of the abdomen. Sweetman stated that this family was often associated with arthropods.

We wish to thank Dr. E. W. Baker, Agricultural Research Service, United States Department of Agriculture, Washington, D. C., for identification of the mite specimens, Dr. Gerald I. Stage, Smithsonian Institution, United States National Museum, Washington, D. C., for determination of the male halictid, and Dr. M. V. Miller, 57 Arlena Terrace, Ramsey, N. J., for identification of the male staphylinid.
—R. H. WHITSEL *and* R. F. SCHOEPPNER, *San Mateo County Mosquito Abatement District, 1350 North Carolan Avenue, Burlingame, California 94010.*

KEY TO THE NEW WORLD CREMASTOCHEILINI, WITH NOTES AND DESCRIPTION OF A NEW GENUS
(COLEOPTERA: SCARABAEIDAE)

HENRY F. HOWDEN, *Biology Department, Carleton University, Ottawa*

ABSTRACT—**Paracyclidius bennetti**, n. gen., n. sp. is described from Mayaro, Trinidad, and is included in a key to the New World genera of Cremastocheilini. Nomenclature and relationships in the tribe are briefly discussed and a lectotype for *Lissomelas flohri* Bates is designated.

The New World tribe, Cremastocheilini, is currently divided into eight genera, four of these, *Uloptera* Burmeister, *Lissomelas* Bates, *Psilocnemis* Burmeister, and *Paracyclidius*, n. gen. being monotypic. The other genera all contain six or more species, with the largest genus, *Cremastocheilus* Knoch, being divided into several subgenera. Three of the eight cremastocheiline genera have never been included in a key relating them to the other New World genera, and one of the purposes of this paper is to rectify this. I have not seen examples of *Uloptera*, the characters mentioned being from Burmeister's original description (1842). The characters of the North American genera, including illustrations of the genitalia, have been discussed by Cazier (1938, 1940), and a key to the North American species has been published by Potts (1945).

Biological information on the New World members of the tribe is scanty. *Genuchinus* Westwood has been collected in bromeliads in Mexico and in sotol, *Dasylirion Wheeleri* Wats., in Arizona. The only genus in which the behavior of some species have been carefully studied is *Cremastocheilus*. Cazier and Mortenson (1965) have done much of this work, including in their paper a summary of all of the biological information available for the genus. Specimens in many of the genera have been collected largely by "chance" and are poorly represented in collections.

Nomenclatorially there has been confusion in the spelling of *Cremastocheilus* (vs. *Cremastochilus*) and in the usage of two subgeneric names proposed by Mann (1914). *Cremastocheilus* Knoch (1801) was emended by Burmeister and Schaum (1840) to *Cremastochilus*. Subsequent usage has been irregular, the majority of recent papers utilizing the original spelling as recommended in the "International Code of Zoological Nomenclature." In 1914 Mann proposed *Myrmecotonus* as a subgenus of *Cremastocheilus* with *C. knochii* LeConte as the type. Subsequently a printed correction slip was sent out by the journal which stated: "For *Myrmecotonus* read 'Myrmeceicon' page 179 and 180." No explanation for this change was given, but one or both names have since been cited as valid subgenera. Since *Myrmecotonus* is not preoccupied and since *Myrmeceicon* does not seem to be an emendation of spelling, the proposal of *Myrmeceicon* is invalid. Taxonomically *Myrmecotonus* is a rather poorly defined subgenus but, for completeness, is included in the subsequent key.

Lissomelas Bates (1889, p. 376) was described from a series taken at Ventanas (=Villa Corona) in Durango, Mexico, by Hoge and from Mexico City by Flohr. No type was selected by Bates and in order to avoid any possibility of confusion I hereby designate a male labeled "Ventanas, Durango, Hoge, *Lissomelas flohri* Bates ♂ [handwritten], B.C.A. Col., II (2) *Lissomelas flohri*." and with my label as lectotype. The specimen is in the British Museum (Natural History).

Key to the Genera and Subgenera of New World Cremastocheilini

1. Posterior pronotal angles rounded, unmodified; anterior pronotal angles lacking indentation at inner edges 5
   Posterior pronotal angles spinose, acute, or with a deep groove and a knob-like protrusion; anterior angles acute with a deep inner groove usually containing a dense mat of setae. North America north of Isthmus of Tehuantepec .... **Cremastocheilus** Knoch 2
2. Fore tarsi with terminal segments not enlarged or twisted; vertex lacking a distinct carina on each side above eyes 3
   Fore tarsi with terminal two segments conspicuously enlarged and twisted; vertex with a distinct longitudinal carina above each eye. Arizona, California .... subgenus **Macropodina** Casey
3. Modified spines or knobs of hind pronotal angles not extending forward ⅓ or more of length of pronotum (fig. 1) 4
   Modified posterior angles of pronotum with inner margin raised and extending forward onto disc, often dividing pronotal disc longitudinally into three unequal thirds (fig. 2). Mexico north to California and Nebraska .... subgenus **Trinodia** Casey
4. Posterior edge of mentum medially acutely angulate to abruptly rounded. Mexico and northward, largely west of Mississippi River .... subgenus **Myrmecotonus** Mann
   Posterior edge of mentum medially faintly to deeply notched. United States and Canada largely east of Mississippi River .... subgenus **Cremastocheilus** Knoch
5. Pronotal disc convex, sometimes irregularly so, but never with distinctly delimited fossae; anterior clypeal margin distinctly reflexed 6
   Pronotal disc with eleven distinctly delimited fossae, the surface of the fossae with arcuate rugae, surface between fossae smooth; anterior clypeal margin only slightly reflexed, broadly emarginate. French Guiana .... **Uloptera** Burmeister
6. All tarsal segments smooth, punctate or irregularly sculptured, but never with numerous, evenly spaced, longitudinal carinae; dorsal surface usually punctate or with head rugose or distinctly punctate 7
   All tarsal segments with numerous, evenly spaced, longitudinal carinae; dorsal surface (fig. 8) smooth, head sometimes faintly punctate be-

tween eyes and vaguely tuberculate near clypeal margin. Western Mexico, Arizona .... **Lissomelas** Bates

7. Antennal scape nearly flat or convex, surface finely to heavily punctate or rugose; dorsal surface usually partly opaque or, if shining, with white cretaceous markings 8

   Antennal scape concave, surface smooth and shining; dorsal surface shining, smooth between shallow, discrete punctures; punctures usually separated by more than their diameters. Southeastern United States; also reported from Mexico .... **Psilocnemis** Burmeister

8. Pronotal surface smooth or finely punctate. Body size large, 20 to 30 mm; cretaceous markings lacking 9

   Pronotal surface distinctly punctate, body slender, size small to moderate, 9 to 15 mm; cretaceous markings usually present. South America north to Arizona .... **Genuchinus** Westwood

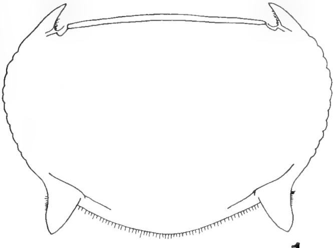
9. Anterior margin of clypeus bituberculate or with horn (figs. 5, 6) pronotum with lateral marginal bead; fore femur with anterior margin at apical third adjacent to tibia excavate to receive tibial tooth (fig. 5). South America .... **Cyclidius** MacLeay

   Anterior margin of clypeus evenly arcuate (Fig. 7); pronotum lacking marginal bead; fore femur not excavate at apical third (fig. 3). Trinidad .... **Paracyclidius**, n. gen.

Paracyclidius, n. gen.

Type-species: *Paracyclidius bennetti*, n. sp., monotypic.

Size large, 23 mm. Head with reflexed portion of clypeus extending approximately 0.3 mm above posterior surface; reflexed portion evenly arcuate; anterior clypeal edge slightly convex, nearly perpendicular, approximately 0.8 mm thick; surface finely rugose; lower margin faintly sinuate. Surface of head behind reflexed clypeus coarsely reticulate; frons and posterior of vertex moderately tumid; no carinae or ridges present. Antenna 10-segmented; 3-segmented club 1.5 mm in length, outer surface of terminal segment with scattered, erect setae; scape large, triangular, 2 mm from base to apex; outer surface slightly convex from base to apex, shallowly punctate-rugose. Mentum largely concealing mouthparts; mentum shallowly concave in central four-fifths, then rounded and slightly convex to margins; posterior margin broadly V-shaped, its apex rounded, not thickened or perpendicular as in *Cyclidius*; surface of mentum finely tuberculate, near margins finely strigose. Pronotum somewhat orbicular except near and between anterior angles; marginal bead lacking; surface finely granulate, very dull, with scattered indistinct shallow punctures. Scutellum large, acutely pointed posteriorly; surface basally punctate, shining; apical three-fourths granular, dull, punctate, margins proximal to elytra delimited by a shining band of elongate punctures or strigae; surface of scutellum distinctly below plane of elytra. Elytra similar to those of *Cyclidius*, apical swellings vague; surface completely dull, granular; striae lacking, four intervals indicated by bands of shallow, faintly shining punctures; elytral disc evenly rounded to lateral and apical margins. Pygidium very convex, basal fourth granular, remainder shining, entire surface with scattered, coarse punctures. Ventral surfaces shining, prosternum strigose, coxal cavities closed; mesosternum with numerous small punctures; metasternum shallowly indented along midline, surface laterally with scattered, shallow crescentic punctures. Abdomen with six visible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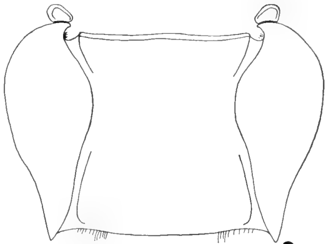
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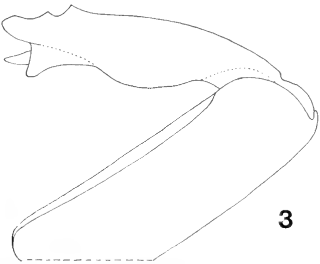
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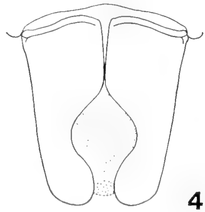
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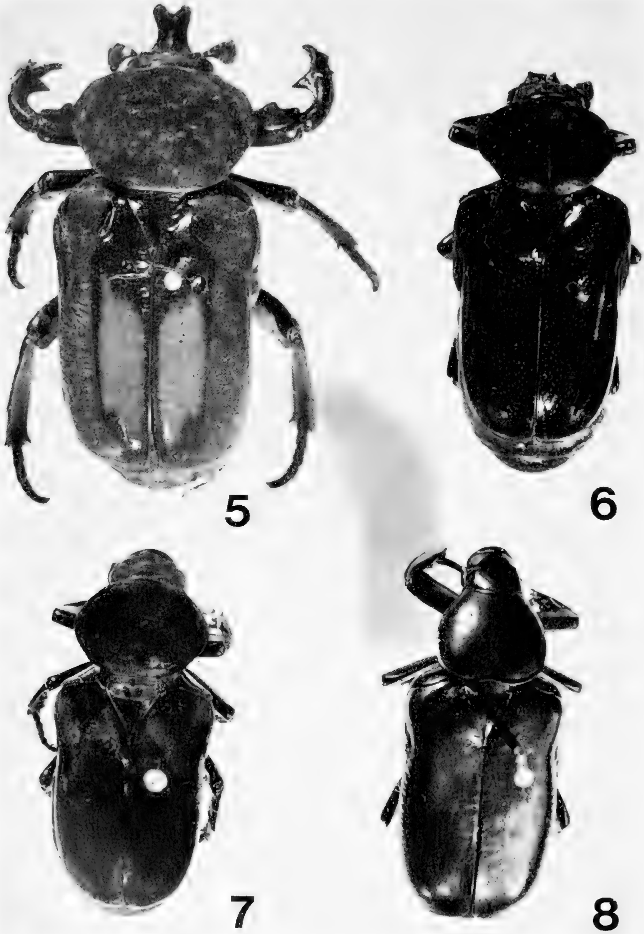
Fig. 1. *Cremastocheilus armatus* Walker, pronotum. Fig. 2. *C.* (*Trinodia*) *planipes* Horn, pronotum. Figs. 3–4. *Paracyclidius bennetti*, n. gen., n. sp.: 3, fore femur and tibia; 4, parameres of male genitalia.

sternites; the penultimate sternite with lateral, oval indentations; apical spiracle not elevated above surface. Legs not greatly modified; fore femur (fig. 3) with anterior margin straight or nearly so; fore tibia (fig. 3) lacking distinct tooth medially on inner margin; basal four tarsal segments of fore leg approximately as long as or slightly longer than wide, not distinctly wider than long; tarsal surfaces smooth, not noticeably ridged or punctate; tarsal claws simple, stout.

The genus *Paracyclidius* is most closely related to *Cyclidius*, from which it can be distinguished by the following differences; dorsal clypeal margin arcuate, not bidentate or horned as in *Cyclidius*; pronotum lacking a distinct lateral bead; fore tibia and femur as in fig. 3; terminal abdominal spiracle not elevated; fore tarsi with segments one to four as long as wide, not wider than long as in *Cyclidius*. The characters given in the generic key further distinguish the genus.

Paracyclidius bennetti, n. sp.
(Figs. 3, 4, 7)

Holotype. Male, length 23 mm, greatest width 10 mm. Shape as in fig. 7. Colour black, dorsally dull, ventrally shining. Head and vertex rugose or confluently



Figs. 5–8. Dorsal views of: 5, *Cyclidius nero* MacLeay; 6, *C. elongatus* (Oliv.); 7, *Paracyclidius bennetti*, n. gen., s. sp.; 8, *Lissomelas flohri* Bates.

punctate, the raised lines largely transverse medially, longitudinal laterally near antennal insertions. Pronotal surface distinctly granular, not dull as in *Cyclidius elongatus* (Oliv.); pronotal punctures inconspicuous, numerous and evenly spaced, separated by two to three diameters. Scutellum with dull, granular areas brownish black. Elytral surface more finely granular than pronotum; punctures in irregular rows vaguely indicating intervals, the punctures basally distinct, their bottoms flat, very finely granular, appearing lighter in colour (gray) than surrounding surface. Pygidium with scattered coarse punctures, the punctures more numerous and larger in basal fourth, smaller and separated by three or more diameters in shining apical three-fourths. Ventral surfaces as described in generic description. Fore femur and tibia as in fig. 3. Genitalia as in fig. 4, similar in general form to those of *Cyclidius* and *Lissomelas*.

Female. Unknown.

Type material. Holotype, male, Mayaro, Trinidad, W. I., June 1967, in arboreal ant nest, F. D. Bennett (Howden). Types in the Howden collection are presently housed in the Entomology Research Institute.

Remarks. *Paracyclidius bennetti* is quite distinct from any of the New World Cremastocheilini examined. It resembles most closely *Cyclidius elongatus* (Oliv.); it can be distinguished from this and other species by the characters mentioned under the generic description and in the key. Fig. 7 illustrates the differences in body form between *Paracyclidius* and *Cyclidius* (figs. 5, 6) and *Lissomelas* (fig. 8).

The species is named in honour of Dr. F. D. Bennett, who discovered it and very kindly presented it to the writer.

Notes

Relationships among the New World Cremastocheilini have been, in part, discussed by Cazier (1938, 1940). In these papers Cazier discussed wing venation, the very similar genitalia, and characterized the North American genera. The three genera *Uloptera*, *Cyclidius* and *Paracyclidius* were not included. Specimens of *Uloptera*, as stated earlier, have not been examined, but based on Burmeister's (1840) description of body shape, particularly that of the pronotum, I suspect that its closest New World relative is *Psilocnemis*. The relationship is not close, but I have not seen any Old World genus that I would consider more closely related. *Cyclidius* and *Paracyclidius* are distinctly related, being very similar in body shape, size and genitalia, with *Paracyclidius* possibly having some affinities with *Lissomelas*, particularly in respect to the clypeus. *Lissomelas*, however, is quite distinct in its tarsal characters and in the shape of the pronotum. *Lissomelas*, *Psilocnemis* and, to a lesser degree, *Genuchinus* are rather similar in their pronotal shape. In this respect *Cremastocheilus*, with the modified hind angles of the pronotum, is more similar to some Old World genera than to any of the other New World forms. *Genuchinus* and

Lissomelas show some definite affinities to the Oriental genus *Callynomes* Westwood, the similarities being discussed by Cazier (1938).

On a zoogeographic basis Cazier stated (1938, pp. 80, 81) that "Herein is merely presented evidence which would tend to support the theory of the former existence of an Arctic Continent or the derivation of the North American species from the north by way of Bering Strait." The present study does not refute this, a past Beringian connection seeming to be all that is necessary to explain the relationships between the New and Old World Cremastocheilini.

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REDESCRIPTION OF AEDES (ALANSTONEA) BREVITIBIA (EDWARDS) FROM BRUNEI, BORNEO

(Diptera: Culicidae)[1, 2]

Shivaji Ramalingam *and* K. Ramakrishnan, *Department of Parasitology, Faculty of Medicine, University of Malaya, Kuala Lumpur*

ABSTRACT—The male and pupal stages of *Aedes* (*Alanstonea*) *brevitibia* (Edwards, 1914) is described for the first time. The female and larval stages are redescribed.

Aedes (*Alanstonea*) *brevitibia* was described by Edwards (1914) from a single female from Sarawak, Borneo. He placed the species in the genus *Armigeres*. Brug (1934) described the larval stage from two full grown and five smaller larvae collected from Nepenthes pitchers from Borneo. However, as associated rearings had not been obtained it was uncertain, till now, that these were actually the larvae of *brevitibia*. Brug and Bonne-Wepster (1947) transferred *brevitibia* to the subgenus *Stegomyia* of *Aedes*. Finally, Mattingly (1960) created a new subgenus *Alanstonea* of the genus *Aedes*, in which he included two species: *brevitibia* and *treubi*. During a recent mosquito survey in Brunei (Borneo), a fairly large number of adults and immature stages were obtained, together with numerous associated rearings. It is now possible to describe all the stages of *brevitibia*.

The terminology of Belkin (1962) is used in the description of immature stages, except for hair branching. For the latter, if only one numeral is given in parentheses following the hair number it represents the only number of branches encountered in the sample; if two sets of figures are given, the first represents the modal number of branches and the second, the range encountered in the sample. The chaetotaxy of the immature stages was determined from a sample of ten individuals.

Aedes (Alanstonea) brevitibia (Edwards)

Armigeres brevitibia Edwards, 1914, Bull. Ent. Res. 5:125–128. TYPE: holotype ♀, Tabuan swamp, Kuching, Sarawak, Borneo, J. C. Moulton (BM).

Armigeres (*Armigeres*) *brevitibia* of Edwards (1917; 1922; 1932).

Armigeres brevitibia of Brug (1934).

Aedes (*Stegomyia*) *brevitibia* of Brug and Bonne-Wepster (1947); Mattingly (1954); Stone, Knight and Starcke (1959).

Aedes (*Alanstonea*) *brevitibia* of Mattingly (1960).

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[2] Immediate publication secured by full payment of page charges—Editor.

FEMALE: Wing: 3.87 mm. Proboscis: 2.43 mm. Fore femur: 2.96 mm. Abdomen: about 4 mm. Large in size, with the general appearance of *Armigeres* (*Armigeres*). Head: Eyes well separated over torus of antenna. Pale scales on head yellowish-white; dark scales brown-black. Frontal and ocular bristles present. Decumbent scales on vertex and occiput broad, flat and pale; except for two patches of dark scales on either side of midline. Few anterior erect scales pale; the rest brown; restricted to occiput region of head. Side of head mostly with dark scales. Clypeus moderate in size, broader than long, bare, with dark integument. Proboscis laterally compressed in distal third, covered over uniformly by dark scales, tip curved downwards and backwards. Palpus about 0.2 to 0.25 of proboscis length, covered with dark brown scales uniformly. Torus of antenna light brown integument; except for the dorsal side, it is covered by small grey-white scales, with a few brown scales on the inner side. Flagellum of antenna pilose; approximately 2.2 mm long.

Thorax: Integument dark brown. Top of mesonotum with narrow, flat, slightly curving, brown-black scales, with metallic lustre from certain angles; scales becoming longer towards the posterior part of the mesonotum. A broad border of narrow, curved, yellowish-white scales extending from anterior promontory and ending over root of wings. Acrostichal, dorsocentral, prescutellar and fossal bristles completely absent. Supraalar and anterior promontory bristles present. Scutellum covered over by flat, white scales in three groups. Bristles arising in three groups. Postnotum bare, integument brown. Anterior pronotal lobes of normal size; covered over dorsally by narrow, curved, yellowish white scales, and bearing a row of bristles. Posterior pronotal lobe covered over by the same type of scales that compose the pale border around the mesonotum and contiguous with it; row of bristles along posterior border. Spiracular bristles absent; a few postspiracular bristles and scales present; subspiracular area with a row of white scales. Propleuron covered over by a dense patch of white scales. Sternopleuron with large patches of white scales and 2–4 bristles along posterior border; prealar area with a group of bristles. Paratergite with a row of flat, white scales. A large patch of white scales on mesepimeron covering the anterior ¾ of the sclerite. Metapleuron bare. Meron bare; base of meron in line with base of hind coxa.

Legs: Integument dark brown, covered over by dark brown scales except for the following segments: the three coxae which bear a large patch of white scales on the anterior side; the trochanters which bear a few white scales; the fore femur which bears a line of white scales on the inner basal region; and the hind femur which is white scaled on the basal ⅔ of the anterior, ventral and posterior aspects and about ½ on the dorsal aspect. Fore femur slightly longer than proboscis. Mid and hind femora about the same length and approximately ¾ the length of the fore femur. Claws of fore and mid leg, equal in size and each with a single tooth. Claws of hind leg smaller and without tooth.

Wing: Dark scaled. Cell R2 1½ to 2 times the length of its stem. No conspicuous bristles at the base of the subcostal vein. Anal vein ending beyond fork of Cu. Alula with many scales. Squama with a row of hair-like bristles.

Halter: Base light in colour, capitulum coloured dark.

Abdomen: Terga covered on the dorsal side by dark brown scales; on the lateral aspects of each tergum there is a large white patch of scales; these patches cannot be seen from the dorsal side except for those on terga VI and VII. A few pale scales on the mid-distal aspect of tergum I. Sterna I–VII are mostly covered by dark brown scales except for white patches on the lateral, basal aspects. Sternum VIII all brown.

MALE: Wing: 4.14 mm; Proboscis: 2.55 mm; Palpus: 3.59 mm; Fore femur: 3.18 mm. Resembles the female except in the following characters. Head: Palpus approximately 1.4 the length of the proboscis. Antenna 1.88 mm. long; strongly plumose; last two flagellomeres much elongated and annulated. Legs: Fore and mid leg with one claw much enlarged, the other small; both claws with single tooth. Claws of hind leg same as in female.

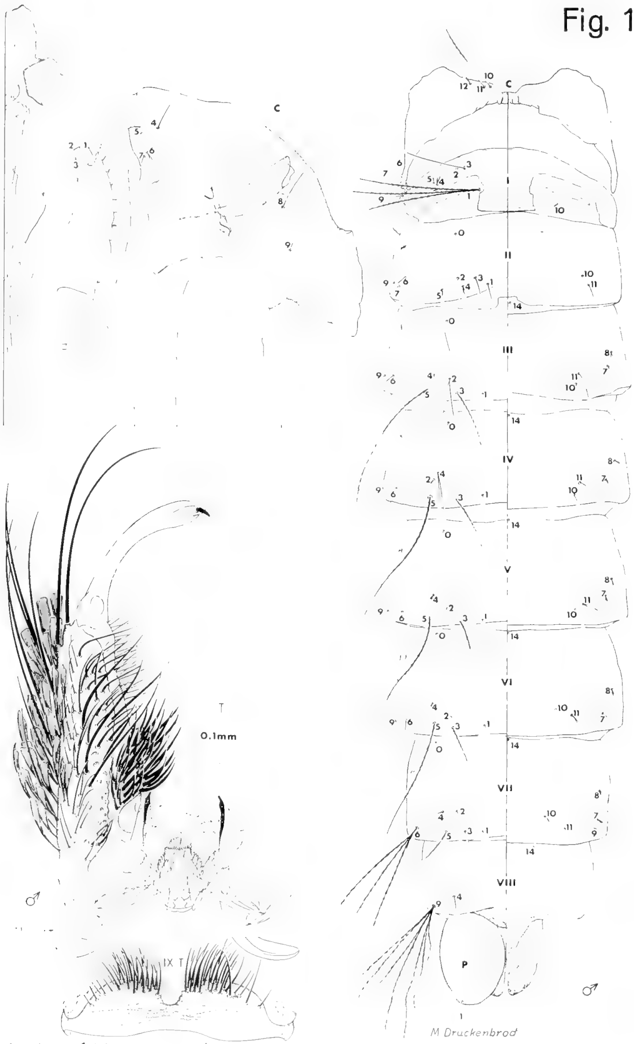
MALE TERMINALIA: (Fig. 1). As figured: Tergum of segment IX prominent, deeply bilobed, each lobe bearing many bristles. IXth sternum membranous. Basimere relatively narrow and long; outer sides densely covered by scales and on the distal end long bristles as well; shorter bristles on tergal and sternal areas of basimere; basal mesal lobes well developed and covered with prominent bristles. Distimere about ⅔ the length of the basimere; narrow at center and slightly bulged towards apex; short, thick spine at apex. Paraproct long and lightly sclerotized. Aedeagus small, with row of small teeth on sides and recurved teeth on apical margin.

PUPA: (Fig. 1). Abdomen: 5.37 mm. Trumpet: 0.63 mm. Paddle: 0.7 mm. Integument light yellow-brown pigmentation. Chaetotaxy as figured; hairs light to dark brown.

Cephalothorax: Trumpet: light yellow brown in colour. Index about 3.0 to 4.7; pina about 0.16 to 0.26 of trumpet length. Hair 1(1,1–3), 2(2,1–2), 3(1), 4(1), 5(1,1–2), 6(1,1–2), 7(1,1–2), 8(1), 9(1), 10(1), 11(1), 12(2,1–2). Abdomen: The conspicuous hairs are marked with an asterisk (*). Segment I: Float hair long with 2 to 6 main branches; branches arise about ⅓ the length of the hair; more than two times the length of the segment. 2(1,1–2), 3(1), 4(4,2–6), 5(2,1–3), 6(2,1–3), 7(1,1–3), 9(1), 10(1,1–5). Segment II: 1*(1,1–3), 2(1), 3*(1), 4(4,3–5), 5*(1), 6(2,1–3), 7(1,1–2), 9(1), 10(1,1–3), 11(1). Segment III: 1(1), 2(2,1–4), 3*(1,1–3), 4(2,1–3), 5*(1), 6(1,1–3), 7(3,2–4), 8(2,1–3), 9(1), 10(1,1–2), 11(1). Segment IV: 1(1), 2(2,1–3), 3*(1,1–2), 4(2,1–3), 5*(1), 6(1), 7(3,1–4), 8(2,1–2), 9(1), 10(1,1–3), 11(1), 12(1). Segment V: 1(1), 2(1,1–2), 3*(1), 4(4,2–5), 5*(1), 6(1), 7(4,2–7), 8(2,1–3), 9(1), 10(1), 11(2,1–2). Segment VI: 1(1), 2(1,1–3), 3*(1), 4(2,1–3), 5*(1), 6(1,1–2), 7(1,1–2), 8(2,1–3), 9(1), 10(1), 11(2,1–2). Segment VII: 1(1), 2(1,1–2), 3(1,1–2), 4(1), 5*(1,1–3), 6*(3,2–4), 7(3,2–4), 8(3,2–4), 9(1), 10(1), 11(1). Segment VIII: 4(1), 9*(5,4–7, rising from pit laterally). Paddle: Uniformally lightly pigmented, surface with microtrichia, margins serrated, midrib absent. Hair 1 single, conspicuous.

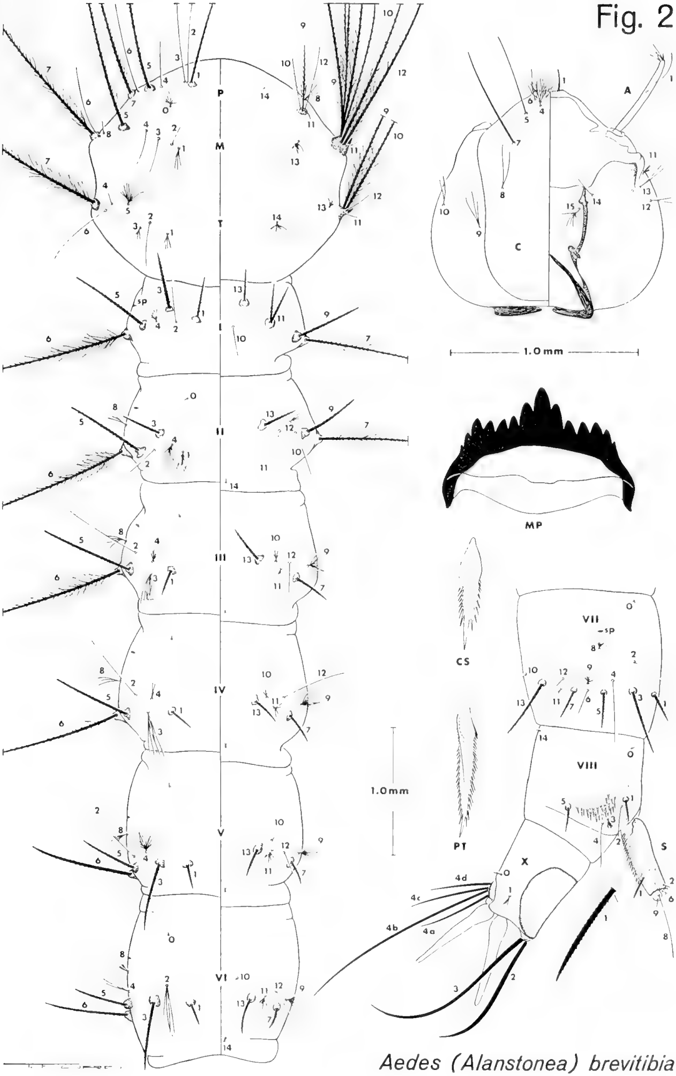
LARVA: (fig. 2). Head: 1.25 mm. Siphon: 0.62 mm. Anal saddle: 0.6 mm. Chaetotaxy as figured. Hairs light to medium brown in pigmentation. Stellate hairs and spicules absent. Integument smooth. Prominent hairs marked with an asterisk (*). Head: Very slightly wider than length (width 1.04 of length). Light yellow-brown in colour except area around mouth and collar which are slightly darker. Ocular bulge not prominent. Mental plate with a strong median trilobed tooth and with about 5 well developed teeth on either side. Hair 1(1, light pigmentation, slightly curved and tapering), 4(16,12–20), 5(1), 6(1); hairs 4,5 and 6 are well forward on the head, 7(1), 8(2,2–3), 9(3,1–4), 10(2,1–3), 11(4,2–6), 12(2,1–3), 13(2,1–4), 14(1), 15(4,2–6). Antenna: Length about 0.33 of head. Shaft only slightly broader at base than at tip.

Fig. 1



Aedes (Alanstonea) brevitibia

Fig. 2



Aedes (Alanstonea) brevitibia

Integument smooth, with spicules; yellow in colour. All hairs single; hair 1 at 0.59 from base.

Thorax: Hairs moderately pigmented; long and prominent hairs with barbs. Hairs 9,10,11 and 12 arising from a common basal plate. Prothorax: hair 0(12,8–16), 1*(1), 2(1), 3(1,1–2), 4(1,1–2), 5*(1), 6(1), 7*(1), 8(3,1–4), 9(1,1–2), 10(1,1–2), 11(1), 12(1), 14(1,1–3). Mesothorax: 1(4,3–7), 2(1), 3(1), 4(1), 5*(1), 6(1), 7*(1), 8(1), 9*(5,4–7), 10*(1), 11(1), 12*(1), 13(11,8–16). Metathorax: 1(4,2–6), 2(1), 3(4,2–6), 4(1,1–2), 5(11,7–14), 6(1), 7*(1), 9*(1), 10(1), 11(1), 12(1), 13(3,2–6), 14(15,11–18). Abdomen: Abdominal segments I to VII with the following hairs always large and arising on a prominent tubercle: 1,3 (except on segment III), 5,6 (except on segment VII), 7 and 13. Segment I: 1*(1), 2(1), 3*(1,1–2), 4(12,10–16), 5*(1), 6*(1), 7*(1), 9*(1), 10(1,1–2), 11*(2,2–4), 13*(1). Segment II: 1(6,4–8), 2(1), 3*(1), 4(13,8–18), 5*(1), 6*(1), 7*(1), 8(3,2–5), 9*(1), 10(1,1–3), 11(2,1–3), 12(5,3–8), 13*(1). Segment III: 1*(1), 2(1), 3(7,3–11), 4(4,3–6), 5*(1), 6*(1), 7*(1), 8(4,2–6), 9(11,8–14), 10(3,2–4), 11(6,4–8), 12(1), 13*(1). Segment IV: 1*(1), 2(1), 3(5,2–8), 4(4,3–5), 5*(1), 6*(1), 7*(1), 8(4,1–6), 9(11,6–14), 10(3,1–4), 11(7,4–10), 12(1), 13*(1). Segment V: 1*(1), 2(1), 3(1), 4(14,10–16), 5*(1), 6*(1), 7*(1), 8(4,1–6), 9(11,6–18), 10(1), 11(7,4–10), 12(1), 13*(1). Segment VI: 1*(1), 2(3,1–5), 3*(1), 4(4,2–6), 5*(1), 6*(1), 7*(1), 8(3,1–5), 9(7,6–12), 10(1), 11(8,4–10), 12(1), 13*(1) Segment VII: 1*(1), 2(1), 3*(1), 4(1), 5*(1), 6(1), 7*(1), 8(12,8–14), 9(12,10–14), 10(1), 11(2,1–3), 12(1), 13*(1). Segment VIII: 1*(1,1–2), 2(1,1–2), 3(6,2–8), 4(1), 5*(1). Comb scales 10–39 in one, two or more rows; lightly pigmented; free portion of central scales rounded; of outer scales pointed, in both scales fringe present from base to apex or central spine. Siphon: Narrow and small in proportion to the rest of the body. Index 3.04 (2.5–3.38). Light yellow pigmentation on ventral side, slightly darker on dorsal aspect. Pecten extending to 0.73 of siphon; teeth 15(9–20) in number, lightly pigmented. Hair 1*(1, strong, barbed and arising near apex of siphon), 2(1), 6(1), 9(1,1–2). Anal segment: Saddle incomplete with yellow pigmentation; papillae as figured, ventral pair subequal to dorsal pair. Hair 1*(5,3–8), 2*(1), 3*(1), 4a*(1,1–2), 4b*(1), 4c*(1), 4d*(1,1–2).

TAXONOMIC DISCUSSION: The inclusion, in the past, of *brevitibia* in the subgenera *Armigeres* (*Armigeres*) and *Aedes* (*Stegomyia*) indicates its affinities with these two taxa. In general appearance the adults of *brevitibia* resembles the subgenus *Armigeres* in size and general colouration; in having the proboscis curved downwards and backwards, in the absence of acrostichal and dorsocentral bristles on the mesonotum, and the presence of post spiracular bristles and scales. They differ from those of *Armigeres* in the absence of the lower mesepimeral bristle, and in the male terminalia. In the immature stages the difference is even more marked; for example the paddle of the pupa of *brevitibia* lacks a midrib and a fringe on the margin, these are both present in *Armigeres*. In the larval stage, the pecten is distinct in *brevitibia* whereas it is lacking in *Armigeres*; the siphon is narrow in *brevitibia* and very broad and stumpy in *Armigeres*; the anal papillae are narrow and pointed in *brevitibia* and are broad and with rounded tips in *Armigeres.*

The similarity of *brevitibia* to *Stegomyia* lies mainly with the male genitalia and with several larval characters. However it differs from *Stegomyia* in having a curved proboscis, and the legs which totally lack white bands. According to Mattingly (1960) the larva can be distinguished from other *Aedes* "by the combination of single upper caudal seta and ventral brush without barred area." Finally the adults of *brevitibia* can be easily distinguished from that of *treubi* by the presence of a golden-yellow median line on the mesonotum of the latter and by its absence in the former.

MATERIAL EXAMINED: 102 specimens; 18 ♀, 13 ♂, 40 larvae, 31 pupae and 32 individual rearings (21 larval, 11 pupal). 3 ♀, 3 ♂, 1 ♂ terminalia, 3 larvae, and 6 associated skins at BM; 3 ♀, 3 ♂, 2 ♂ terminalia, 7 larvae and 6 associated skins (Ramalingam); rest to SEAMP, U.S. National Museum, Washington.

BIONOMICS: Nineteen collections were made of this species from *Nepenthes* pitchers. The larvae are carnivorous and feed on other mosquito larvae. It is not known if the adults bite man.

DISTRIBUTION: Borneo: Bukit Puan Forest Reserve, Belait, Brunei; Mandor near Pontianak, Western Borneo; and Tabuan swamp, Kuching, Sarawak, E. Malaysia. Not known elsewhere.

Acknowledgments

We are grateful to members of the field team, Mr. Sulaiman bin Omar, Mr. Samuel Wilson James and Mr. Chia Yiew Wang, who made the collections in Brunei; and in acknowledging the assistance and co-operation extended to our field team by the Medical and Health Department of Brunei. We also wish to acknowledge the assistance of Thelma Ford and Mike Druckenbrod, Southeast Asia Mosquito Project, Washington, for the preparation of the illustrations.

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THOMAS ELLIOTT SNYDER
1885–1970

Thomas Elliott Snyder, international authority on the taxonomy, biology and control of termites, died in Georgetown University Hospital, Washington, D. C., on August 30, 1970, following a stroke. He had an active, good and useful life.

Dr. Snyder was born February 6, 1885, in New York City. He graduated from the Horace Mann High School there in 1903, and in 1907 he graduated from Columbia University with an A.B. degree. He then attended the Forestry School of Yale University from which he received the Master of Forestry degree in 1909. On July 1 of that year he took a position in Washington with the Bureau of Entomology of the U. S. Department of Agriculture. There he enrolled for evening courses in the Department of Zoology of George Washington University and in 1920 he received the Ph.D. degree from that institution. He worked continuously in the Bureau's Division of Forest Insects until his retirement on June 30, 1951, with the exception of a brief period in the spring of 1929 when, as Visiting Professor, he taught a course in entomology at the University of Chicago. In 1934 he was transferred to New Orleans to establish and take charge of the Forest Entomology Laboratory at the Southern Forest Experiment Station. It was the first such laboratory in the Deep South. Here, in cooperation with the staff of the Experiment Station, he conducted investigations on forest insects of prime importance to the Forest Service, as well as to lumbermen and home owners in the South. He also cooperated with the Higgins Shipbuilding Company and the U. S. Navy in studying the effectiveness of pressure-treated and naturally resistant native and tropical species of wood for the prevention of damage by marine borers. He returned to Washington in 1945, and from then until his retirement he was stationed there and at Beltsville, Maryland, where he was engaged in studies on insects injurious to forest products and their control, including cooperative investigations with the Army and Navy. During this period he also supervised the assemblage of the termite collection of the Smithsonian Institution and identified termites for individuals around the world, for pest control operators and for federal and state agencies that required them. From the time of his retirement from the Department of Agriculture until his death he served, without recompense, as Collaborator of the Department and as Honorary Research Associate of the Smithsonian Institution.

During Snyder's first years with the Division of Forest Insects he and F. C. Craighead, who was later to become Chief of the Division, worked together as a team on various field problems under the general direction of their chief, Dr. A. D. Hopkins, who was generally recognized as the "Father of Forest Entomology." At that time such problems included the mortality of chestnut trees in the southern Appalachians and of oaks in the Middle Atlantic States. Gradually, however, Snyder became the Bureau's specialist on termites and subsequently was recognized as a leading world authority on the subject. Most of his later efforts were in the development of this field.

His marriage to Marjorie Benjamin in 1922, at the end of a whirlwind courtship, balanced his scientific interests with her knowledge of literature. Their social life and gracious hospitality provided a background for his scientific work and productivity, and his social and scientific interests were combined in long membership in the Cosmos Club.

Throughout his life Snyder was unusually cooperative with his scientific colleagues and correspondents. He identified termites sent directly to him, to the Department of Agriculture and to the Smithsonian Institution. He also gave or loaned specimens under his control for use in revisional studies by other entomologists. Moreover, he always graciously accepted corrections of his own errors, which usually were the result of the lack of adequate material. He was, in fact, an excellent example to refute Theodore Roosevelt's quip that scientists "viewed the work of their colleagues with quarrelsome interest." Numerous species of insects and fungus parasites were named in his honor. Among them were eleven species of termites. Doubtless other new species, named after him, will appear in years to come.

Even after his health had worsened, and after the grevious shock of his wife's death in 1967, he kept up his studies, spending at least a few hours of most days in the Department of Entomology of the National Museum. It is greatly to his credit that he never allowed such disappointments and frustrations as are inherent in bureaucratic organizations to inhibit his research drive or lessen his loyalty to the Department of Agriculture or to the Smithsonian Institution.

Snyder traveled rather widely, especially in the New World, and he collected termites whenever he had the opportunity. From his own field collecting and from material received for identification, as well as through exchanges with other specialists and various institutions, he assembled a fine collection of the termites of the world, which, at the time of his retirement, comprised more than 230,000 specimens, representing about half of the known world fauna. This collection, which is in the Smithsonian Institution, will be used indefinitely for comparative studies and for making accurate identifications.

Although Snyder made contributions to the knowledge of several other groups of insect pests, such as beetles that destroy either green logs and lumber or seasoned wood products, his principal concentration was on termites. He conducted long-range experiments on the effectiveness of treatments for the prevention of damage to wood by subterranean termites. One of them was his "termite graveyard" which was established on Barro Colorado Island, in Panama, in 1928 and 1929. It consisted of many sapwood pine stakes that were treated with various wood preservatives by different methods before being driven into termite saturated ground. Duplicates of these tests were conducted by cooperators in Hawaii, South Africa and Australia. The experiment is an example of the thoroughness of his research projects. Twenty-eight years were required to complete it.

Furthermore, he pioneered in the treatment of the soil around dwellings with toxic chemicals, and he prepared building codes to insure protection of structures from termite damage. These codes were adopted by various states, as well as by the Federal Housing and the Veterans Administrations and other federal agencies. It is not an exaggeration to say that during the peak of his career he was the most prominent investigator of termite control methods in the world. His work was the basis of numerous government and outside publications dealing with the control of such pests as termites, wood destroying beetles and marine borers. He was also called upon frequently for consultation, talks, articles, conferences and advice, and he gave unstintingly of his knowledge and experience.

Snyder was intensely interested in the work of pest control companies that offered services relating to the control of termites and wood destroying beetles. In the early days, before these companies were well organized, he encouraged them to improve the methods they were using for the control of insect infestations. He also was influential in bringing about closer working relationships between these companies and the Federal Government. Later, after the establishment of the National Pest Control Association, he participated in the meetings of this body, the members of which fondly called him "Tommie" or "Mr. Termite." They admired and respected him, and to express their appreciation of his interest in their affairs they elected him to honorary membership in the Association on November 20, 1937, which honor he retained the remainder of his life.

As further evidence of his desire to assist the pest control operators he prepared a bulletin, published by the Association, which contained lists of the species of termites known to occur in each state of the country and in Canada, and, in addition, keys for the identification of winged adults and soldiers of the different species, as well as notes on their biology.

In addition to his pioneer work in the control of termites, and his numerous and significant publications in that field, Snyder also had a deep interest in the systematics of termites, in their biology, their geographical distribution, their fossil remains, and their social and ecological adjustments. He described approximately 160 new species of termites of the world, and he wrote many papers dealing with this group of insects that are of interest to basic science. In later years he spent most of his time recording the literature of the world concerned with termites and preparing subject indexes to it. His own bibliography includes approximately 300 titles of which more than 200 deal with termites alone. Of the latter, articles on economic damage and control rank first numerically, with 113 titles totaling 1,030 pages; 53 titles, with 990 pages, are concerned with systematics; 14 papers and books, with 554 pages, discuss the social life of termites, and the rest deal with the ecology and geographical distribution of these insects, their development, caste determination, etc. In addition there are his recently published bibliographies of termite literature. His major publications are "Our Enemy, the Termite," 261 pages, 1948; "Catalog of the Termites (Isoptera) of the World," 490 pages, 1949; and "Annotated Subject-heading Bibliography of Termites—1350 B.C. to A.D. 1954," with 305 pages, 1956, followed by supplements published in 1961 and 1968.

Snyder was an ardent canoeist and swimmer. During his early years in Washington he, Dr. Frank Craighead and Dr. Alexander Wetmore were members of the Washington Canoe Club, and they participated in numerous canoe regattas that were held on the Potomac River. Snyder, Craighead and another member of the Club, Irving Zirpel, made many canoe trips on the Potomac, some of them long ones that started at Cumberland, Maryland and ended at Washington, a distance of well over 100 miles. Craighead recalls that prior to his own and Snyder's marriage they practically lived on the Potomac River. Together with a number of other bachelors they frequently camped on weekends at a spot known as Cupid's Bower and on Black Island. A favorite sport of the better swimmers, including Snyder, was to go up the canal to Great Falls and swim down the gorge during high waters. Although he gave up canoeing some years ago Snyder continued to swim whenever conditions were suitable, even up to a few months before his death.

A member of the Entomological Society of Washington since 1911, Snyder was President for the year 1949 and Honorary President from 1964 until his death. While in Washington he attended the meetings of the Society very regularly, even in his later years. He did not have his own car but Frank Campbell and his wife Ina, who were very close friends of the Snyders, called for him and Marjorie on their way to the meetings. His passing has left a void in the Society that will not soon be filled. His integrity of character, his courage, his excellent disposition, his fine sense of humor and his goodness of spirit endeared him to all who knew him and who must feel his loss as a personal grief.

ALFRED E. EMERSON
CARL F. W. MUESEBECK
R. A. ST. GEORGE, *Chairman*

SUMMARY REPORTS OF SOCIETY OFFICERS FOR 1970

CORRESPONDING SECRETARY

(For the fiscal year 1 November 1969 to 31 October 1970)

Membership on 1 November 1969	497
Membership on 31 October 1970	500
Circulation and distribution of *Proceedings* (September, 1970 issue)	825

The membership is distributed among 46 states, the District of Columbia, 2 territories, and 16 foreign countries. The *Proceedings* go to members and subscribers in 50 states, the District of Columbia, 2 territories, and 41 foreign countries. A detailed report is on file with the recording secretary. Respectfully submitted, David R. Smith, *Corresponding Secretary.*

TREASURER

(For the fiscal year 1 November 1969 to 31 October 1970)

	General Fund	Special	Publication Fund	Total
1 November 1969	$1,307.21	$6,518.21	$13,732.69	$21,558.11
Receipts	8,932.74	5,316.90	440.01	14,689.65
Expenditures	11,323.16	10,257.00	4,900.00	26,480.16
31 October 1970	−1,083.21*	1,578.11*	9,279.70**	9,767.60

* These two columns represent one account in the National Bank of Washington, balance $494.90. ** In the Columbia Federal Savings and Loan, $5,000 in a certificate, the remainder in a pass book account. A detailed report is on file with the recording secretary. Respectfully submitted, Arthur K. Burditt, Jr., *Treasurer.*

CUSTODIAN

(For the fiscal year 1 November 1969 to 31 October 1970)

The value of stock sold by the Custodian's office amounted to $832.00. Of this, $423.00 was for 54 copies of the *Memoirs*, $6.00 for 3 copies of Weld's gall paper, and $403.00 for miscellaneous numbers and reprints of the *Proceedings.* A copy of the complete detailed report is on file with the recording secretary. Respectfully submitted, Robert D. Gordon, *Custodian.*

EDITOR

(For the calendar year 1970)

Four numbers of the *Proceedings* were published in 1970. All of the 520 pages were devoted to scientific papers, notes, book reviews, minutes of meetings, announcements, and obituaries. Eighty-eight scientific papers and notes were published. The Society and the *Proceedings* benefitted from 9 fully paid papers of 100 pages which did not cause the articles of regular contributors to be delayed. The Society was realizing some income from regular page charges, instituted at the beginning of the year, by the December issue. Respectfully submitted, Paul M. Marsh, *Editor.*

SOCIETY MEETINGS

775th Regular Meeting—January 8, 1970

The 775th regular meeting of the Entomological Society of Washington was called to order by President Krombein on January 8, 1970 at 8:00 p.m. in Room 43, USNM. Despite the harsh weather 23 members and 11 guests were in attendance. Minutes of the previous meeting were approved as read.

President Krombein announced: the 1970 nominating committee consisted of G. Hutton, chairman, V. Adler, and W. D. Duckworth; Mrs. Krombein will chairman the 1970 refreshment committee; F. W. Poos and B. A. App will write the obituary of Dr. Frances M. Wadley who died on December 26, 1969; Mrs. Helen S. Marlatt, widow of Dr. C. L. Marlatt (Ent. Soc. Wash. President of 1896–1897) died December 15, 1969.

R. I. Sailer gave the first note of the evening by reviewing the book *Genera of Ichneumonidae* by Henry Townes. G. C. Steyskal noted that the Michigan Ent. Soc. is now publishing a journal. B. Braun displayed several hymenopterous parasites reared from the pine tuber moth.

President Krombein introduced the speaker of the evening, Mr. Arnold T. Drooz, of the U. S. Forest Service, who presented an illustrated lecture on the larch sawfly which stressed the phenomenon of parasite egg encapsulization. This was followed by the excellent color motion picture, The Adler Wood Wasp and Its Enemies.

The meeting was adjourned following introduction of visitors and refreshments were served. Respectfully submitted, JOHN A. DAVIDSON, *Recording Secretary.*

776th Regular Meeting—February 5, 1970

The 776th regular meeting of the Entomological Society of Washington was called to order by President Krombein on February 5, 1970 at 8:00 p.m. in Room 43, USNM. Fifty-four members and 23 guests were in attendance. Minutes of the previous meeting were read and approved.

The names of *W. B. Grabowski, L. S. Hawkins, Jr.* and *R. M. Kirkton* were read for the first time as candidates for Society membership.

President-elect E. J. Hambleton announced planning for the spring banquet was underway and that Dr. David Pimentel would be the main speaker.

President Krombein introduced the first speaker of the evening, Mrs. Helen Sollers-Riedel, Plant Protection Division, USDA, who gave as the retiring President's address: Malaria Eradication in the U.S.S.R. The second speaker, Dr. Paul J. Spangler, U.S.N.M., presented: Collecting Water Beetles in South America. Both speakers displayed many beautiful Kodachromes to illustrate their presentations.

G. C. Steyskal exhibited the 2 books: Flies of Western N.A. by Frank Cole and Empididae of Southern Africa by Kenneth G. V. Smith. Visitor Darwin Tiemann displayed phengodid beetles in the genus *Frixothryx.*

Following the introduction of visitors, the meeting was adjourned and refreshments were served. Respectfully submitted, JOHN A. DAVIDSON, *Recording Secretary.*

777th Regular Meeting—March 5, 1970

The 777th regular meeting of the Entomological Society of Washington was called to order by Recording Secretary John Davidson on March 5, 1970 at 8:00 p.m. in Room 43, USNM. The Recording Secretary presided because the President was ill and the President-Elect out of town. Sixty members and 23 guests were in attendance. Minutes of the previous meeting were approved as read.

Following the reports of Committee Chairmen, the names of *T. J. Zavortink, E. Kaulens, G. F. Hevel, D. W. Jenkins* and *D. K. Hayes* were read for the first time as candidates for Society membership.

The speaker of the evening was Dr. David Pimentel of Cornell University who presented a stimulating lecture entitled, "Natural Regulation of Insect Numbers."

Mr. T. L. Bissell presented a note on the pavement ant with Kodachrome slides. F. L. Campbell noted the death of David E. Fink at the age of 89, a Society member in the 30's. He also noted the death of Charles M. Smith at age 80. He was a founder of the Insecticide Society of Washington.

Following general announcements and the introduction of visitors, the meeting was adjourned. Respectfully submitted, John A. Davidson, *Recording Secretary.*

778th Regular Meeting—April 2, 1970

The 778th regular meeting of the Entomological Society of Washington was called to order by President Krombein on April 2, 1970 at 8:00 p.m. in Room 43, Natural History Building. Forty members and 17 guests were in attendance. Minutes of the previous meeting were approved as read.

T. J. Zavortink, E. Kaulens, G. F. Hevel, D. W. Jenkins and *D. K. Hayes* were received into the Society and *G. R. Noonan* was presented for membership.

M. J. Ramsay reported on the current status of plans for the annual joint banquet for which tickets are now available.

President Krombein introduced the speaker of the evening, Dr. Louis Roth, of the Army Research Laboratory, Natick, Massachusetts, whose interesting illustrated lecture covered 20 years of research on the reproductive behavior of cockroaches.

Notes and exhibitions of specimens began with A. Stone reviewing the book *The Prosimulium* of Canada and Alaska by B. V. Peterson. Next, R. H. Foote exhibited Field Guide to the Insects by D. J. Borror and R. E. White, and Abstracts in Entomology. T. L. Bissell exhibited an egg mass of the eastern tent caterpillar including newly hatched caterpillars. 001—The Sick Rocket, was the catchy title of an article read by R. I. Sailer which explained how a wasp nest foiled the firing of an experimental rocket. A. B. Gurney noted the death on March 18, 1970, of Sir Boris Uvarov. Born November 5, 1889 in Russia, as Boris Petrovitch Uvarov, he was working as a professional entomologist by 1910 and was the Director of a station at Stavropol in 1912. He joined the Imperial Institute of Entomology, London, in 1920 and attained prominence for studies of phase transformation of locusts, for extensive taxonomic work on grasshoppers, for his 1931 work on Insects and Climate, and for founding and directing the Anti-Locust Research Centre 1945–59. He was Knighted by Queen Elizabeth in 1961. Photos of Sir Boris, including some taken in May 1955 during his first American visit, were shown. President Krombein announced the death of Dr. Willard King.

Following the introduction of visitors, President Krombein thanked the Hospitality Committee and adjourned the meeting. Respectfully submitted, John A. Davidson, *Recording Secretary.*

779th Regular Meeting—May 7, 1970

The 779th regular meeting of the Entomological Society of Washington was called to order by President Krombein on May 7, 1970 at 8:00 p.m. in Room 43, Natural History Building. Thirty-one members and 14 guests were in attendance. Minutes of the previous meeting were approved as read.

G. R. Noonan was received into the Society while *W. R. M. Mason* and *P. D. Hurd, Jr.* were presented for membership.

President Krombein read an amusing letter written by Dr. Louis Roth to a Boston Globe reporter, in response to an article the latter wrote about Dr. Roth and his research with cockroaches.

The speaker of the evening, Mr. John A. Fluno, Entomology Research Division, USDA, was introduced by President Krombein. Mr. Fluno had no problem maintaining audience attention as he discussed the implications of suspected entomophobia in a talk entitled "Invisible Insects, or the Trail of the Lonesome Itch."

The second part of the program consisted of presentations by 2 area science fair participants selected by Society judges for the excellence of their entomology projects. Miss Mary Ann Harding, a senior at McLean High School, discussed her experiments with *Drosophila*. Mr. Michael O'Conner, an 8th grade student at Blessed Sacrament School, Washington, D.C., presented his observations of the life history of praying mantids.

Following the introduction of visitors President Krombein announced the regular October 1970 meeting would be held one week later than usual, on October 8, 1970. Then the meeting was adjourned. Respectfully submitted, JOHN A. DAVIDSON, *Recording Secretary.*

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

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DEPARTMENT OF ENTOMOLOGY
SMITHSONIAN INSTITUTION
WASHINGTON, D.C. 20560

PUBLISHED QUARTERLY

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THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884

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All correspondence concerning Society business should be mailed to the appropriate officer at the following address:

Entomological Society of Washington
c/o Department of Entomology
Smithsonian Institution
Washington, D. C. 20560

MEETINGS.—Regular meetings of the Society are held in Room 43, Natural History Building, Smithsonian Institution, on the first Thursday of each month from October to June, inclusive, at 8 P.M. Minutes of meetings are published regularly in the *Proceedings.*

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Vol. 73 SEPTEMBER 1971 No. 3

A NEW CENTRAL AMERICAN SPECIES OF ZACOMPSIA COQUILLETT, WITH A KEY TO THE DESCRIBED SPECIES
(DIPTERA: OTITIDAE)

GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—*Zacompsia* **colorata**, n. sp., is described from El Salvador and a key to the described species is presented.

The following new species of *Zacompsia* Coquillett (Otitidae: Ulidiinae) was found in material recently received for incorporation into the United States National Museum collections.

Zacompsia colorata, n. sp.

Male. Length of body 6.25 mm; of wing 4.3 mm. Color metallic blue-black, only the following parts reddish: legs (middle legs missing), except blackish tibiae and apical four segments of fore tarsus; anterior swelling of humerus; pronotal collar; medifrons (except ocellar triangle); antenna; palpus. Thorax, except small shining area on anterior aspect of mesoscutum, rather strongly whitish pruinose with broad dark gray crossband between transverse suture and level of dorsocentral bristles. Abdomen with pruinosity similar to that of mesoscutum dorsally, laterally the segments whitish pruinose in basal half, shining aeneous apically, the last apparent segment blackish.

Head with front 0.48 of total head-width anteriorly, slightly broader posteriorly, very lightly white-pruinose, rather strongly so on broad anterior orbits; frontal setae black, rather large, proclinate; 2 reclinate upper fronto-orbitals, posterior one large, anterior one much smaller; antenna with 3rd segment oval, twice as long as wide; arista bare, slender, black, with only basal segment slightly swollen, about twice as long as wide, yellowish.

Thorax twice as long as wide; dorsocentral bristles 0.75 as far from scutellum as from each other; scutellum twice as wide as long, dorsal surface flat, slightly rugulose, both apical and basal bristles outside the rather distinct margin of the dorsal area; chaetotaxy: 1 strong *h*; 2 *ntpl*, 1 *dc*, 1 *sa*, 1 *pa*, 1 *mspl*, 1 strong posterior *stpl*.

Wing 0.3 as wide as long; medium brown in color, with hyaline root, milky

[1] Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

white as follows: wedge from costa to posterior end of anal crossvein, median transverse crossband (straight basally, gently concave apically, entirely across wing between the crossveins, but not touching either), and oval area occupying middle third of part of 1st posterior cell between posterior crossvein and wingtip and extending apically into submarginal cell; posterior crossvein straight, slightly inclined to transverse axis of wing, angle with 5th vein 90°, with 4th vein a few degrees less.

Holotype.—Male, Cerro Verde, El Salvador, 18 June 1958 (L. J. Bottimer), No. 70020 in United States National Museum.

As may be seen from the following table, *Z. colorata* is much more similar to *Z. metallica*, from Guyana, than to the type of the genus, the North American *Z. fulva.* The differences between the 2 neotropical species and the type species, however, do not seem to me sufficient to require nomenclatural distinction.

KEY TO THE KNOWN SPECIES OF **Zacompsia** COQUILLETT

1 (2) Body and head wholly reddish; ocellar triangle only slightly longer than wide; wing with posterior crossvein arcuate, turned basad in posterior half .... **Z. fulva** Coquillett

2 (1) Body and head extensively metallic blue-black; ocellar triangle twice as long as wide; wing with posterior crossvein "recurrent on anterior ⅔" or straight, brown with contrasting whitish pattern.

3 (4) Wing with median crossband extending "over" posterior crossvein and with broad, poorly defined apical pale area; humerus and large anterior portion of pleura reddish .... **Z. metallica** Curran

4 (3) Wing with whitish median crossband touching neither crossvein; apical part of wing, midway between tip and posterior crossvein with median oval whitish spot in 1st posterior and submarginal cells; only collar and anterior swelling of humerus reddish .... **Z. colorata**, n. sp.

TRACHYSPHYRUS NIGRICORNIS (BRULLÉ), PREY OF ARAIOPOGON GAYI (MACQUART)

(HYMENOPTERA: ICHNEUMONIDAE—DIPTERA: ASILIDAE)

Apparently the first record of the prey of any of the six described species of the Neotropical genus *Araiopogon* Carrera (Asilidae: Dasypogoninae) was presented by J. N. Artigas in his recent fine paper, "Los Asilidos de Chile (Diptera—Asilidae)," Gayana (Zoologia) 17:1–472, 1970. In that paper, *Halictus* sp. (Hymenoptera: Halictidae) was recorded as prey of *Araiopogon cyanogaster* (Loew). In the U.S.N.M. collection there is a female *A. gayi* (Macquart) pinned with a male *Trachysphyrus nigricornis* (Brullé) (Hymenoptera: Ichneumonidae) (det. R. Carlson). The specimens were collected at Santiago, Chile, on December 30, 1926, by R. C. Shannon.—L. V. KNUTSON, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture, c/o U. S. National Museum, Washington, D. C. 20560.*

NOTES ON THREE SPECIES OF HETEROCAMPA DOUBLEDAY WITH DESCRIPTION OF A NEW SPECIES

(LEPIDOPTERA: NOTODONTIDAE)

ANDRÉ BLANCHARD, *P. O. Box 20304, Houston, Texas 77025*

ABSTRACT—*Heterocampa* **benitensis**, n. sp., is described from Texas; this species was previously misidentified as *H. superba* Hy. Edw. or *H. subrotata* Harvey; the status of these two species and of *H. belfragei* Grote is confirmed.

I have had in my collection, for some time, a short series of an undescribed species of *Heterocampa* Doubleday. Other specimens of the same species are in the collections of the U.S. National Museum, the American Museum of Natural History, the Illinois Natural History Survey, and Dr. J. G. Franclemont. A description of this new species follows.

Heterocampa benitensis, n. sp.

Male. Head olive green; palp short, porrect, not exceeding front, brown exteriorly. Collar, disc of thorax and patagia olive green. Fore and middle tibia covered with long, loose olive green scales, with transverse medial and terminal black lines. Forewing olive green; t. a. line double, wide, filled with ground color, excurved between veins, especially in cell Cu2 and below anal vein. Basal space darkened by sprinkling of black scales; t. p. line double, strongly lunulate and outwardly dentate on veins, narrower than t. a. line, filled with ground color, best defined between R5 and Cu2; inner component black, narrow; outer component more diffuse. Adterminal line continuous, black, narrow, slightly outwardly dentate on veins, parallel to outer margin at a distance from it about equal to width of fringe. Terminal line obsolescent. Fringe olive green indistinctly checkered with black scales at vein ends. S. t. line represented, midway between t. p. and adterminal lines, from cells R5 to Cu1, by dark shadow accented by black spots between veins, more markedly in cells R5 and M3. A conspicuous, almost pure white fascia from apex to between t. p. line and top black spot of s. t. line. Reniform a narrow black lunule. Median space darkened along a diffuse barely traceable median shade and beyond reniform lunule. Succession of blackish and lighter spots on costa, the spot above reniform being nearly pure white. Hindwing sordid white, darker along termen. Undersurface of forewing fuscous, darker in costal half; three to four black spots on costa at ends of radial veins. Undersurface of hindwing whitish.

Wing expanse: 29 to 33 mm.

Female. Forewing olive green, spotted mostly in outer half with reddish. Differs strikingly from male in having a subterminal line of nearly confluent black spots, extending almost from apex to inner margin, widest in cell M2, constricted in cell M3, preceded by a whitish shade in its upper half. Subterminal spot in Cu1 and lunulate reniform meet on a diffuse black shadow and together form a bold black half circle. Hindwing fuscous, darker beyond a fine mesial shade line.

Wing expanse: About 38 mm.

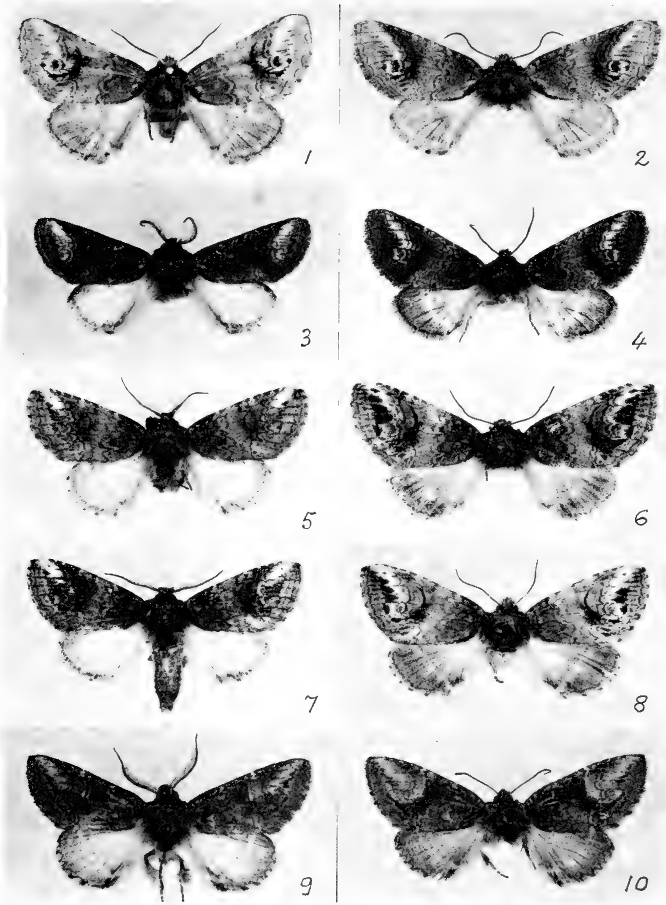
Male genitalia: As shown in figs. 11, 11a, 11b, and 11c.
Female genitalia: As shown in fig. 12.

Holotype male, Brownsville, Texas, 8 August 1967, A. & M. E. Blanchard collectors, genitalia on slide A.B. 688, deposited in the U.S. National Museum, type number 64647.

Paratypes: One female, San Benito, Texas, 8 Sept. 1915, genitalia on slide A.B. 2270, in the collection of the Illinois Natural History Survey. One male, Shovel Mountain, Texas, May 1916, "Barnes Collection", genitalia on slide A.B. 1361; one male, Brownsville, Texas, 23 Oct. 1928, F. H. Benjamin collector, "Barnes Collection", genitalia on slide A.B. 1362; one female, San Benito, Texas, 8 Sept. 1915, " Barnes Collection"; one female, Esper Ranch, Brownsville, Texas; one female, San Benito, Texas, 8 Sept. 1915, " Barnes Collection", genitalia on slide A.B. 1359; one female, San Benito, Texas, 8 Sept. 1915, "Barnes Collection", genitalia on slide A.B. 1357, in the U.S. National Museum. One male, Brownsville, Texas, 3 April 1929, "Otto Buchholz Collection", F. H. Benjamin collector, genitalia on slide A.B. 2402; one male, Brownsville, Texas, 22 October 1928, "Otto Buchholz Collection", genitalia on slide A.B. 2403; one male, Brownsville, Texas, 19 October 1928, "Otto Buchholz Collection", F. H. Benjamin collector, genitalia on slide A.B. 2404, in the collection of the American Museum of Natural History. One male, Sinton, Texas (Welder Wildlife Foundation), 2 May 1967, A. & M. E. Blanchard collectors, genitalia on slide J.G.F. 5456; one male, Brownsville, Texas, 8 May 1967, A. & M. E. Blanchard collectors, in J. G. Franclemont's collection. One male, Santa Rosa, Texas, 18 November 1965; one male, two females, Santa Rosa, Texas, 14 April 1966, female genitalia on slides A.B. 1353 and A.B. 2269; three males, Brownsville, Texas, 5 and 9 November 1969; one male and two females, Santa Ana National Wildlife Refuge, 23 and 26 October 1970, in A. & M. E. Blanchard's collection.

Some specimens of *H. benitensis* have been in several collections for a long time. It seems that they were, either set apart for further study or tentatively identified as *H. superba* Hy. Edwards. As *H. superba* Hy. Edwards (1884) was first synonymized with *H. subrotata* Harvey (1874) by Neumoegen and Dyar (1894), this course of action amounted to doubting the synonymy. This writer, for a time, was among the doubters.

The female type of *H. superba*, originally part of the Bolter collection, is now in the collection of the Illinois Natural History Survey. Dr. R. W. Poole of that institution and the writer examined it, prepared its genitalia, took a picture of it (fig. 1), and concluded in agreement with Neumoegen and Dyar (1894) and Packard (1895), that *H. superba*, which was described from that single female specimen, is definitely a junior synonym of *H. subrotata*.



Figs. 1–10, *Heterocampa* species: 1, *superba* Hy. Edw., type ♀, coln. Ill. Nat. Hist. Sur., orig. Bolter Coln., slide A.B. 2271; 2, *subrotata* Harvey, ♀, Sinton, Texas, Welder Wildlife Found. Ref., slide A.B. 2268; 3, *subrotata*, ♂, Sheffield, Texas, dark specimen, slide A.B. 1343; 4, *subrotata*, ♀, Laguna Park, Texas, dark specimen, slide A.B. 2267; 5, *benitensis*, n. sp., holotype ♂, Brownsville, Texas, slide A.B. 688; 6, *benitensis*, paratype ♂, Santa Rosa, Texas, slide A.B. 2269; 7, *benitensis*, paratype ♂, Santa Rosa, Texas; 8, *benitensis*, paratype ♀, San Benito, Texas, coln. Ill. Nat. Hist. Sur., slide A.B. 2270; 9, *belfragei* Grote, ♂, Laguna Park, Texas, slide A.B. 2187; 10, *belfragei*, ♀, Laguna Park, Texas, slide A.B. 2238.

The maculation of *H. benitensis*, male as well as female, resembles that of the corresponding sex of *H. subrotata*, but there are differences, as can be recognized from a close examination of figs. 1 to 8. Most typical are the differences in the white apical fascia of the male and the subterminal spots of the female. The genitalia, male as well as female, are abundantly different.

H. subrotata is somewhat variable. The ground color varies from a light ashy green to blackish, and the whitish fascia near the apex may be entirely missing. It is far from certain that any of these forms deserves a subspecific name. Dr. Allan Watson of the British Museum (Natural History) compared my drawing of slide A.B. 1346 with the genitalia of the types of *H. subrotata* and *H. celtiphaga* and concluded: "The genitalia of the types *subrotata* and *celtiphaga* are identical and correspond perfectly with A.B. 1346" (fig. 13). He also confirmed that the expanse given for the type of *celtiphaga* as 18 mm. should be 28 mm. which is the expanse shown in the figure given with the original description (Harvey, 1874).

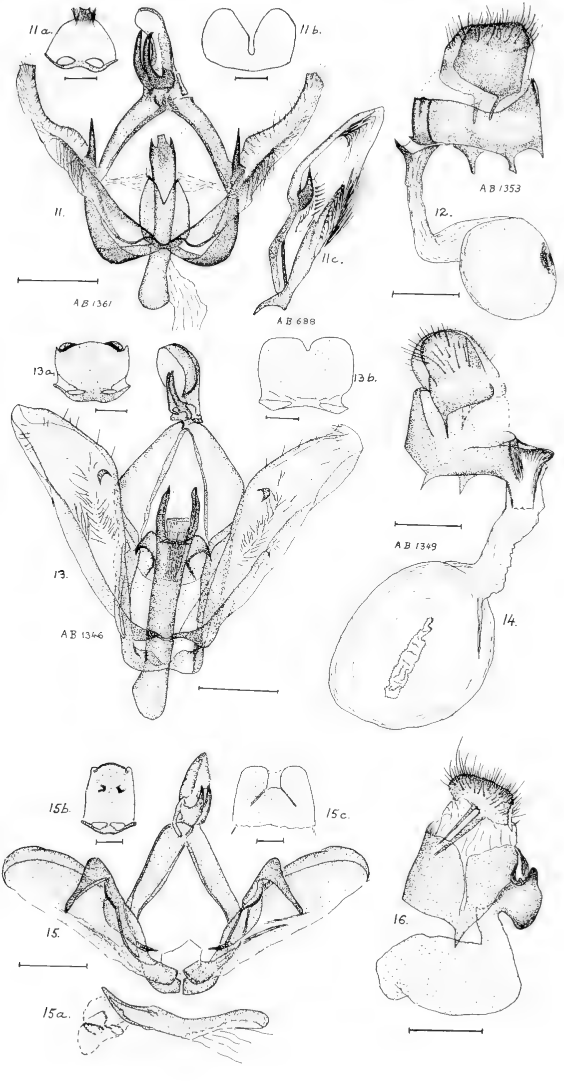
Another *Heterocampa* species which is still rare in collections, and as a consequence of this appears to be generally not well understood is *H. belfragei* Grote (1879). The male lectotype and three male paralectotypes are in the British Museum (Natural History). I have in my collection four males and one female which I consider to be authentic *belfragei*, and I hope to clarify the status of this species by publishing pictures of one male and one female (figs. 9 and 10), a drawing of the genitalia of the male lectotype (figs. 15 and 15a), and of my only female (fig. 16).

My specimens agree extremely well with Grote's original description (1879) which follows:

"This species is less distinctly marked than usual, of moderate size. The tone of the forewings is olive gray with a narrow curved brown discal mark, and the broken subterminal line is composed of brown spots, indented on interspace between veins 4 and 5, and preceded by a diffuse whitish shade superiorly. A short narrow curved black basal streak. Median lines double, interspaceably lunate, indistinct. Hindwings pale, more or less markedly dusky on costa and internal margin, crossed by incomplete double extramesial shade lines. Thorax like forewings; the tuft behind blackish, and the tegulae edged incompletely with black.

→

Figs. 11, 12, *Heterocampa benitensis*, n. sp.: 11, ♂ genitalia (A.B. 1361); 11a, 8th sternite; 11b, 8th tergite; 11c, right valve, inner aspect (A.B. 688); 12, ♀ genitalia, lateral aspect (A.B. 1353). Figs. 13, 14, *H. subrotata* Harvey: 13, ♂ genitalia (A.B. 1346); 13a, 8th sternite; 13b, 8th tergite; 14, ♀ genitalia, lateral aspect (A.B. 1349). Figs. 15, 16, *H. belfragei* Grote: 15, ♂ genitalia of type, aedeagus omitted; 15a, aedeagus, vesica exserted; 15b, 8th sternite; 15c, 8th tergite (slide prepared by J. G. Franclemont); 16, ♀ genitalia (A.B. 2238). All lines represent 1 mm.


11a.
11b.
11.
AB 1361
11c.
AB 688
12.
AB 1353
13a.
13b.
13.
AB 1346
AB 1349
14.
15b.
15c.
15.
15a.
16.

Beneath pale, without markings, except a dark common shade line near the margin of the wings, which is not always noticeable. Average expanse 36 millimeters."

Dr. Allan Watson compared the photographs of *H. belfragei* (figs. 9 and 10) with the specimens in his care and concluded that they "seem to match the lectotype of *belfragei* quite well, although the dark spots on the fringe of the forewing at the distal end of each vein seem to be much more conspicuous in your specimens than in the type or the three paralectotypes". Dr J. G. Franclemont had prepared a slide from the lectotype and had it on loan from the British Museum when he visited with us lately. We compared it with my three male slides and concluded that they matched satisfactorily. Three of my specimens were collected at Laguna Park, Texas, less than fifteen miles from Clifton (Bosque Co.) where Belfrage lived and is the type locality. Of the other two specimens in my collection, one was taken at Lake Brownwood State Park, the other at Big Bend National Park.

Acknowledgments

The U. S. National Museum loaned me ten specimens of the new species; Dr. E. L. Todd arranged the loan of these specimens, informed me of the location of the type of *H. superba*, reviewed the manuscript, and made many helpful suggestions. Dr. R. W. Poole, of the Illinois Natural History Survey, dissected the type of *H. superba* and arranged for its loan. Dr. F. H. Rindge examined and dissected several specimens in the American Museum of Natural History and arranged for their loan. Dr. Allan Watson of the British Museum (Natural History) compared my drawings and photographs to specimens in his care. Dr. J. G. Franclemont suggested this project and offered points of advice all along. To each of these men I extend my gratitude. I would also like to thank the Bureau of Sport Fisheries and Wildlife for authorization to collect in the Santa Ana Refuge, and the Texas Parks and Wildlife Department for authorization to collect in the State owned Wildlife Management Areas.

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NORTH AMERICAN DELTOCEPHALINE LEAFHOPPERS OF THE GENUS PLANICEPHALUS WITH NEW GENERIC SEGREGATES FROM DELTOCEPHALUS
(HOMOPTERA: CICADELLIDAE)

JAMES P. KRAMER, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—The North American species of *Planicephalus* Linnavuori are redescribed, revised, and keyed. Three species are included: *P. flavicosta* (Stål), *P. flavocostatus* (Van Duzee), and *P. luteoapicalis* (Beamer). *Deltocephalus laredanus* Oman is assigned to *Mendozellus* Linnavuori, a genus previously known only from Neotropical America. *Deltocephalus marinus* Metcalf and Osborn is assigned to a new genus, **Tideltellus.** *Deltocephalus obesus* Osborn and Ball is assigned to a new genus, **Deltazotus**. *Deltocephalus comesus* DeLong and Sleesman is reduced to a synonym of *D. obesus.* All critical diagnostic features are illustrated. New distributional records and host plant data are included.

The genus *Deltocephalus* Burmeister in North America, as defined in the past, was a catch-all for numerous species of leafhoppers which had little in common. Oman (1949) redefined the genus and described many generic segregates from *Deltocephalus.* More recent studies of the Neotropical and Eurasian faunas now show that further restriction of the genus is necessary for reasons of zoogeography and refinement of definitions. Two genera, *Planicephalus* Linnavuori and *Mendozellus* Linnavuori, formerly known only from the Neotropics, and two new genera described here are North American segregates from *Deltocephalus.* Elsewhere, other species of *Deltocephalus* listed in Oman (1949: 173–174) will be discussed and revised.

Planicephalus Linnavuori, n. status

Deltocephalus subgenus *Planicephalus* Linnavuori, 1954:143. Type-species: *Jassus (Deltocephalus) flavicosta* Stål.

Small to medium sized deltocephaline leafhoppers (2.4–3.8 mm). Head slightly wider than pronotum. Anterior margin of head rounded to face. Clypeal suture obscure. Pronotum of moderate length. Macropterous with forewings extending much beyond apex of abdomen or submacropterous and exposing tip of abdomen. Male genitalia: valve large; plates moderately long, stout, subtriangular, with uniseriate marginal spinelike setae laterally; pygofer strongly setose, entirely membraneous dorsally except for narrow basal strip, and apex modified; aedeagus moderately stout and strongly upturned distally, with or without keel or tooth on ventral margin and appressed finlike processes on shaft; gonopore subapical on ventral margin of shaft; aedeagus fused with linear connective. Color stramineous to black with costal margins of forewings yellow.

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[1] c/o U. S. National Museum, Washington, D. C. 20560.

In Oman's key to the genera of North American Deltocephalini (1949:111–119), *Planicephalus* will trace to couplet 129, *Deltocephalus* Burmeister. It can be separated from that genus on the basis of the largely membraneous dorsum of the male pygofer, the modified distal portion of the male pygofer, and the subapical gonopore on the ventral margin of the aedeagal shaft *versus* largely sclerotized dorsum of male pygofer, the simple distal portion of the male pygofer, and the terminal gonopore at the apex of the aedeagal shaft.

Planicephalus Linnavuori (1954:143) was originally described as a subgenus of *Deltocephalus*. In my opinion, it is sufficiently distinct from that genus to deserve full generic status.

Key to the North American Species of **Planicephalus**

1. Crown dark fuscus to black with anterior margin broadly yellow (fig. 1); aedeagus without a keel or tooth on ventral margin (fig. 6) .... **luteoapicalis** (Beamer)
   Crown not as above; aedeagus with a keel or tooth on ventral margin 2
2. Aedeagus with a large keel on ventral margin (fig. 13) .... **flavocostatus** (Van Duzee)
   Aedeagus with a variously shaped tooth on ventral margin (figs. 15–16) .... **flavicosta** (Stål)

Planicephalus luteoapicalis (Beamer), n. comb.

(Figs. 1–7)

Deltocephalus luteoapicalis Beamer, 1938:81.

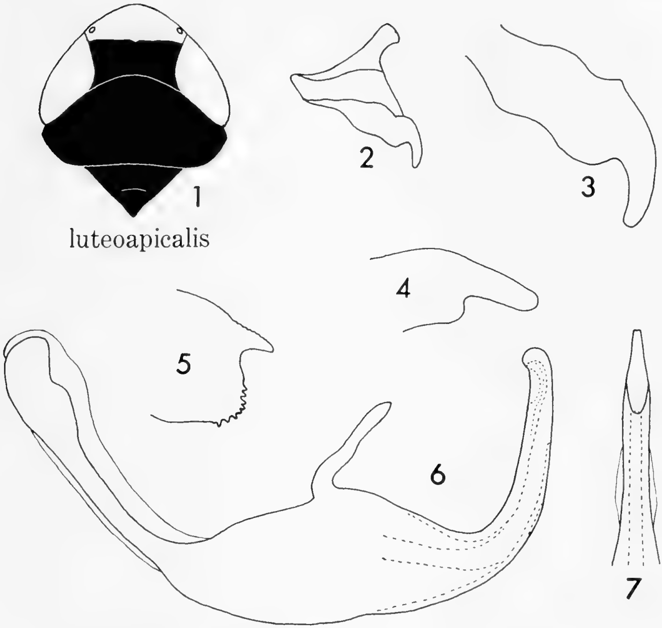
Length. Male 2.4–2.6 mm. Female 2.5–3.0 mm.

Structure. Head in dorsal view (fig. 1) bluntly angular at apex, ocelli moderately large and fairly close to eyes; males macropterous; females submacropterous, exposing part of genital segment dorsally, venation obscure, each appendix reduced, apical cells shortened, inner anteapical cells usually closed basally, central anteapical cells divided or not, outer anteapical cells normal or slightly reduced.

Coloration. Venter of abdomen fuscus to dark fuscus, at times with variable paler areas; venter of thorax yellow with or without touches of fuscus; face yellow with clypeus, except for upper edge, and upper edges of genae dark fuscus to black; crown, pronotum, and scutellum (fig. 1) dark fuscus to black, apical portion of crown broadly yellow; forewings dark fuscus to black, costal margin yellow posteriorly to a point near base of outer anteapical cell, veinlets from base and apex of outer anteapical cell broadly yellow or whitish, tip of forewing narrowly yellowish or whitish.

Male genitalia. Apex of pygofer with a projection dorsally and blunt teeth ventrally (fig. 5); aedeagus in lateral view (fig. 6) without a keel or tooth on ventral margin, somewhat constricted on dorsal margin near apex, prolonged basally; aedeagal shaft in posterior view (fig. 7) slender with gonopore subapical; style in dorsal view (fig. 2) with mesal lobe moderately long and slender, lateral lobe broad and blunt; distal portion of style in lateral view (fig. 4) as shown.

Female genitalia. Pregenital sternum narrowed posteriorly, exposing under-



Figs. 1–7, *Planicephalus luteoapicalis* (Beamer): 1, head and thoracic dorsum; 2, style, dorsal view; 3, stylar lobes, dorsal view; 4, stylar lobes, lateral view; 5, apical portion of pygofer, lateral view; 6, aedeagus and connective, lateral view; 7, aedeagal shaft, posterior view.

lying sclerites laterally, posterior margin broadly rounded laterally, concave on middle half with a variably distinct broad median tooth (Beamer 1938:fig. 7a).

Records. The type locality is San Antonio, Texas. My confirmed records: TEXAS, Elmendorf, George West, Peeler, San Antonio.

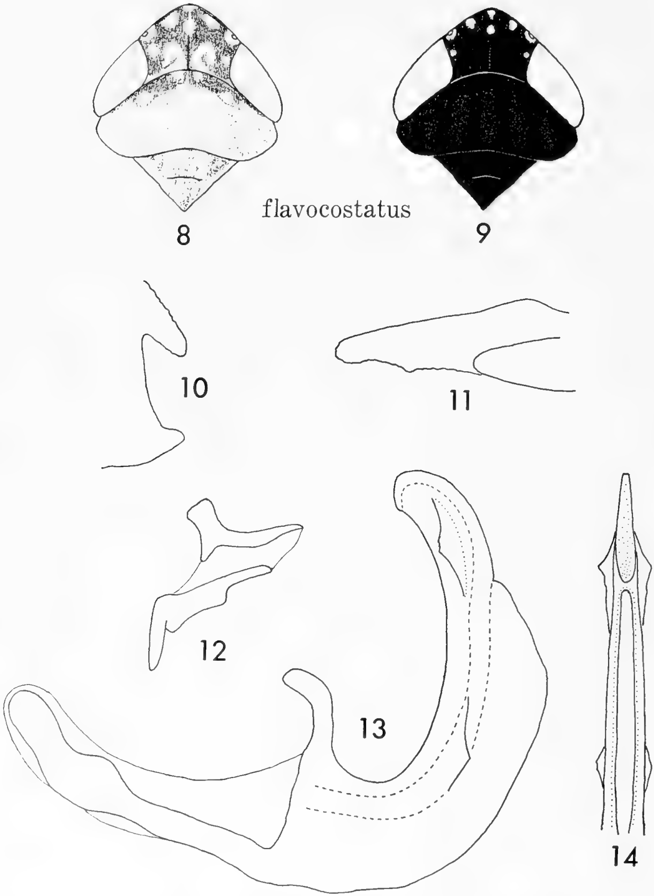
Notes. This species is easily recognized on the basis of the essentially dark dorsum with the strongly contrasting yellow coronal tip and yellow costal margins of the forewings. The male genitalia are unique. No host data are known.

Planicephalus flavocostatus (Van Duzee), n. comb.

(Figs. 8–14)

Deltocephalus flavocostatus Van Duzee, 1892:116.

Length. Male 2.8–3.3 mm. Female 3.2–3.6 mm.



Figs. 8–14, *Planicephalus flavocostatus* (Van Duzee): 8, head and thoracic dorsum, light form; 9, same, dark form; 10, apex of pygofer, dorsolateral view; 11, stylar lobes, dorsolateral view; 12, style, dorsal view; 13, aedeagus and connective, lateral view; 14, aedeagal shaft, posterior view.

Structure. Head in dorsal view (figs. 8–9) bluntly angular apically, ocelli moderately large and close to eyes; in macropterous forms, each appendix well developed, apical cells large, with inner anteapical cell closed basally, central anteapical cell divided (rarely undivided), outer anteapical cell normal or slightly reduced (rarely open distally); submacropterous forms unknown.

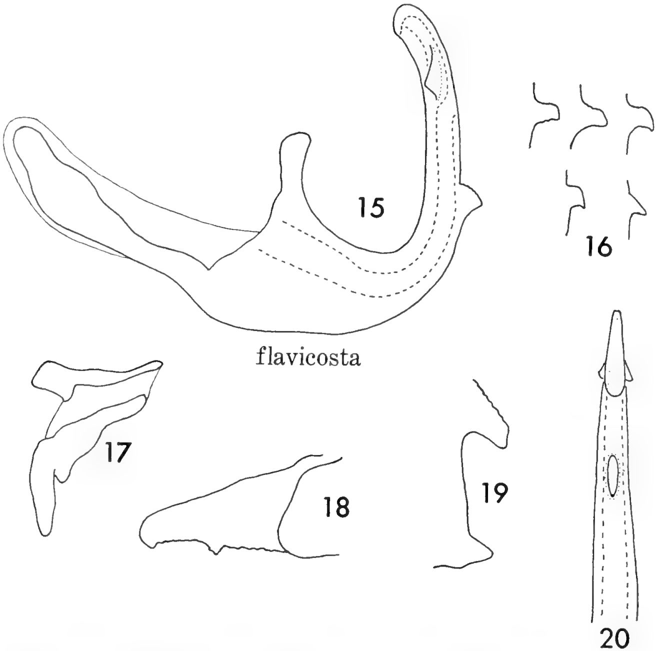
Coloration. Highly variable; venter of abdomen and thorax pale brown to yellowish and moderately to heavily infuscated with only edges of segments paler to nearly all black; legs with ground color of venter and unmarked or with infuscations on apex of hind tibiae and tarsi; face with ground color of venter and infuscated on clypeal arcs and variably on lower face grading to entirely dark fuscus or black with few pale markings on upper clypeus and edges of genae; crown, pronotum, and scutellum (figs. 8–9) with ground color of venter; dark coronal markings distinct only on distal half, pronotum faintly longitudinally striped, scutellum darkened at basal angles, grading to entirely dark fuscus or black with only scattered light areas on crown; forewings brownish subhyaline with veins irregularly whitish, and apical cells darkened, grading to entirely dark fuscus with veins irregularly paler only in distal half; in all color forms, costal margin distinctly yellow posteriorly to a point near base of outer anteapical cell, veinlets from base and apex of outer anteapical cell to costal margin whitish.

Male genitalia. Apex of pygofer in dorsolateral view (fig. 10) with a thickened, black or fuscus, short, blunt, irregular projection dorsally; aedeagus in lateral view (fig. 13) with a large ventral keel and appressed finlike processes near base and apex; aedeagal shaft in posterior view (fig. 14) slender with gonopore subapical and keel narrow; style in dorsal view (fig. 12) with mesal lobe moderately long and slender, lateral lobe short; distal portion of style in dorsolateral view (fig. 11) irregular on ventral margin of mesal lobe.

Female genitalia. Pregenital sternum somewhat narrowed posteriorly exposing underlying sclerites laterally, posterior margin more or less sinuate, sometimes with four feebly developed lobes (DeLong 1926:pl. 18; fig. 6a).

Records. The type locality is Mississippi [State College?]. My confirmed records: ALABAMA, Auburn; ARKANSAS, Lee Co.; DELAWARE, Milford; FLORIDA, Hilliard, Jacksonville, La Belle, Miami, Palm Beach, Polk City; GEORGIA, Athens; ILLINOIS, Urbana; INDIANA, Lafayette; IOWA, Montrose; KANSAS, Onaga, Topeka, Wichita; LOUISIANA, Opelousas; MARYLAND, Calloway, Forest Glen, Glen Echo, Plummers Island; MISSISSIPPI, Sardis, State College; MISSOURI, Buckner, Hollister; NEW JERSEY, Hoboken, Newark; NEW YORK, Babylon, Poughkeepsie; NORTH CAROLINA, Balsam, Raleigh, Southern Pines; OHIO, Salineville; OKLAHOMA, Watts; PENNSYLVANIA, State College; SOUTH CAROLINA, Clemson, Columbia; TENNESSEE, Hamilton Co.; VIRGINIA, Arlington, Bluemont, Nelson Co.; WEST VIRGINIA, Fairmont, Mannington.

Notes. Except for DeLong and Sleesman (1929:98), *flavocostatus* has been treated as a synonym of *flavicosta* by previous workers. The two species are easily separated by the features noted in the key. *P. flavocostatus* is widely distributed in the eastern and middle western



Figs. 15–20, *Planicephalus flavicosta* (Stål): 15, aedeagus and connective, lateral view; 16, variations in ventral aedeagal tooth; 17, style, dorsal view; 18, stylar lobes, lateral view; 19, apex of pygofer, dorsolateral view; 20, aedeagal shaft, posterior view.

states; it is sympatric with *flavicosta* in Louisiana and Florida. The only plant associations I have seen with specimens are alfalfa, Bermuda grass, and crab grass.

Planicephalus flavicosta (Stål), n. comb.
(Figs. 15–20)

Jassus (*Deltocephalus*) *flavicosta* Stål, 1862:53.
Deltocephalus (*Planicephalus*) *flavicosta* (Stål): Linnavuori, 1954:143–144.

Length. Male 3.3–3.8 mm. Female 3.4–3.8 mm.

Structure. Not different from that of *flavocostatus*.

Coloration. Within variations described for *flavocostatus*. Some forms entirely stramineous with only costal areas of forewings yellow.

Male genitalia. Apex of pygofer in dorsolateral view (fig. 19) similar to that of *flavocostatus*; aedeagus in lateral view (fig. 15) with a variably developed tooth (fig. 16) at center of posterior margin and appressed finlike process near apex; aedeagal shaft in posterior view (fig. 20) slender with gonopore subapical; style in dorsal view (fig. 17) with mesal lobe moderately long and stout, lateral lobe short; distal portion of style in lateral view (fig. 18) irregular on ventral margin of mesal lobe.

Female genitalia. Pregenital sternum not different from that of *flavocostatus*.

Records. The type locality is Rio de Janeiro, Brazil. My confirmed records: FLORIDA, Alachua Co., Archbold Biological Station, Cedar Keys, Dunedin, Eifers, Hilliard, La Belle, New Port Ritchey, Orlando, Plant City, Polk City, Royal Palm Park, Venice, Zolfo Springs; LOUISIANA, Opelousas; TEXAS, Brownsville, Goliad, Kerrville, Victoria.

Notes. This species is easily separated from its close relative, *flavocostatus*, by the features noted in the key. *P. flavicosta* is one of the most common leafhoppers in the West Indies and Central America; it has been reported from as far south as northern Argentina. On the basis of our present information, *flavicosta* is probably limited to our states bordering the Gulf of Mexico.

Mendozellus laredanus (Oman), n. comb.
(Figs. 21–25)

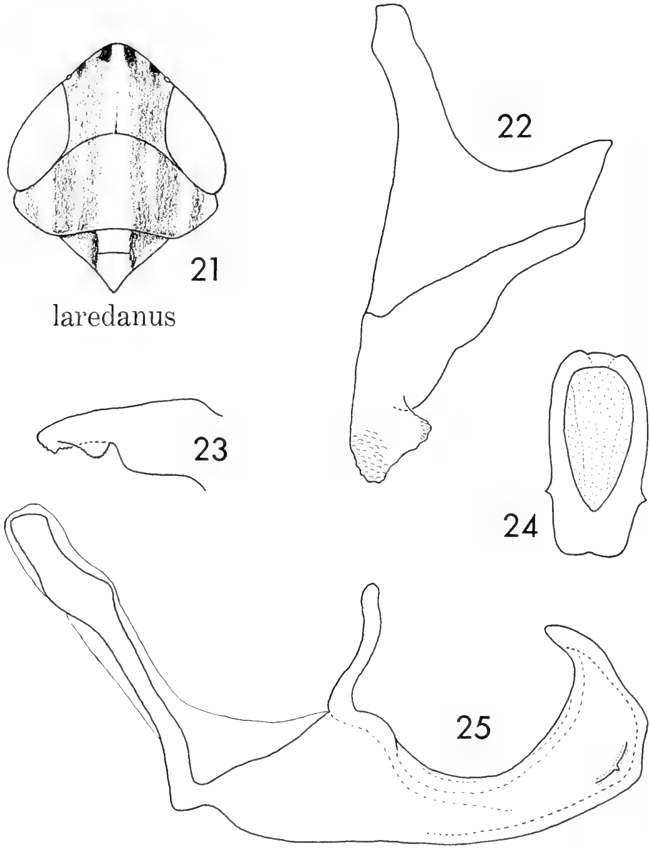
Deltocephalus laredanus Oman, 1934:78.

Length. Male 3.0–3.4 mm. Female 3.2–3.4 mm.

Structure. Crown produced beyond eyes and bluntly angular at apex (fig. 21); ocelli of moderate size and close to eyes; crown in lateral view flattened between eyes and convex anterior to eyes; forewings long and extending well beyond abdomen with inner anteapical cell closed basally, central anteapical cell divided, and outer anteapical cell normal.

Coloration. Venter of abdomen, thorax, legs, and face pale yellowish brown; lateral edges of abdominal segments and clypeal arcs at times vaguely darker, usually with vague dark spot under each ocellus; crown, pronotum, and scutellum (fig. 21) bright yellowish brown to golden brown and marked with four small dark spots between ocelli on anterior margin, moderately wide ivory stripe centrally from coronal apex to scutellar apex, often with a pair of narrower longitudinal ivory stripes flanking each side of central stripe on pronotum; forewings stramineous, subhyaline, veins whitish to ivory and often faintly margined with fuscus, commissural margins of clavus frequently distinctly ivory and appearing as narrow extension of central coronalthoracic stripe.

Male genitalia. Male plates bluntly triangular and shorter than pygofer. Aedeagus in lateral view (fig. 25) stout and broadly upturned on distal third, with tooth near ventral margin distally and extreme apex narrowed; distal portion of aedeagus in posterior view (fig. 24) with gonopore subapical and exceedingly large; style in dorsal view (fig. 22) with mesal lobe expanded laterally, rugulose laterally and distally, mesal lobe short and blunt; distal portion of style in lateral view (fig. 23) with mesal lobe expanded anterior to small tooth on ventral margin.



Figs. 21–25, *Mendozellus laredanus* (Oman): 21, head and thoracic dorsum; 22, style, dorsal view; 23, stylar lobes, lateral view; 24, apical portion of aedeagus, posterior view; 25, aedeagus and connective, lateral view.

Female genitalia. Pregenital sternum narrowed posteriorly, exposing underlying sclerites laterally, posterior margin broadly and shallowly excavated with a variably developed median tooth.

Records. The type locality is Laredo, Texas. My confirmed records: TEXAS, Alpine, Austin, George West, Laredo, Mission, San Antonio, Sarita.

Notes. The markings and male genitalia distinguish this species. The lateral pair of anterior coronal markings are often obsolete. In heavily pigmented specimens, particularly on the scutellum, the median ivory stripe is margined with fuscus. The lateral ivory pronotal stripes may be obsolete.

Mendozellus Linnavuori (1959:117) was described as a subgenus of *Amplicephalus* DeLong. In my opinion, it is sufficiently distinct from that genus to deserve full generic status. *M. laredanus* is closest to *M. isis* (Linnavuori), an Argentine species. Oman, in the original description, correctly stated that *laredanus* was more closely related to several South American species than to the North American species of *Deltocephalus*.

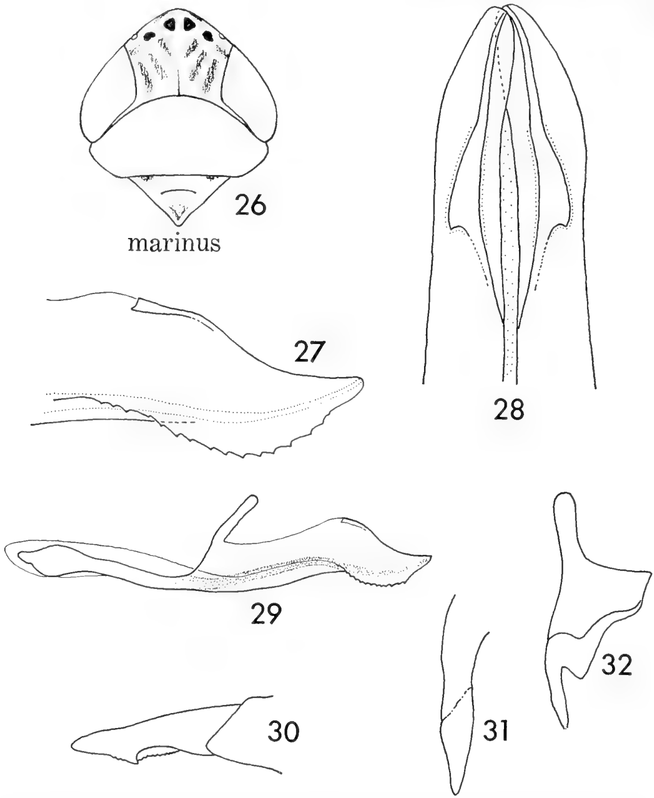
In Oman's key to the genera of North American Deltocephalini (1949: 111–119), *Mendozellus* will trace to couplet 129, *Deltocephalus* Burmeister. It can be separated from that genus on the basis of the broad and stout mesal lobe of the style, toothlike projections near ventral margin of aedeagus distally, and in *laredanus*, the large subapical gonopore on the ventral margin of the aedeagus *versus* long slender mesal lobe of the style, no toothlike projections as above, and a small gonopore at apex of aedeagus.

Tideltellus, n. gen.

Type-species: *Deltocephalus marinus* Metcalf and Osborn

Small deltocephaline leafhoppers (3 mm or less). Head wider than pronotum. Anterior margin of head broadly rounded to face. Clypeal suture obscure or absent. Pronotum short. Forewings: macropterous and extending beyond apex of abdomen or submacropterous and exposing tip of abdomen. Male genitalia: valve large; plates exceptionally large and exceeding apex of pygofer; plates elongate, subtriangular, and acute with marginal spine-like setae uniseriate; pygofer strongly setose; aedeagus transverse and cleft in dorsal or ventral view nearly to base; aedeagus fused with linear connective. Color stramineous or pale brownish with limited fuscus to black markings.

In Oman's key to the genera of North American Deltocephalini (1949: 111–119), *Tideltellus* will trace to couplet 132, *Destria* Oman. It can be separated from *Destria* on the basis of the small size, 3 mm or less, the aedeagus cleft nearly to its base in dorsal or ventral view *versus* larger size, 4 mm or more, the aedeagus with at most a deep apical notch in dorsal or ventral view.



Figs. 26–32, *Tideltellus marinus* (Metcalf and Osborn): 26, head and thoracic dorsum; 27, apical portion of aedeagus, lateral view; 28, distal portion of aedeagus, dorsal view; 29, aedeagus and connective, lateral view; 30, stylar lobes, lateral view; 31, mesal lobe of style, dorsal view; 32, style, dorsal view.

Tideltellus marinus (Metcalf and Osborn), n. comb.
(Figs. 26–32)

Deltocephalus marinus Metcalf and Osborn, 1920:110.

Length. Male 2.0–2.5 mm. Female 2.3–3.0 mm.

Structure. Head in dorsal view (fig. 26) bluntly angular at apex, eyes, proportionally large, somewhat bulging, nearly touching posterior margin of pronotum;

forewings long and extending well beyond abdomen or shortened and exposing most of genital segment; in forms with shortened forewings, known only from females, each appendix reduced and apical cells shortened; in both wing forms, inner anteapical cell closed basally, central anteapical cell undivided, outer anteapical cell normal or slightly reduced.

Coloration. Variable; venter of abdomen, thorax, and legs sordid stramineous to pale brownish variously touched with fuscus or not; face with ground color of venter and unmarked or with clypeal arcs and rarely irregular areas on lower face lightly embrowned; crown, pronotum, and scutellum with ground color of venter and in well marked specimens (fig. 26) with four small black spots on anterior margin between ocelli, four to six oblique dashes on coronal disc, and six longitudinal brownish stripes on pronotum, frequently only observable markings are the dark spots at anterior coronal margins; forewings sordid straminous, subhyaline, with veins concolorous; edges of cells lightly embrowned or not, usually traces of embrowning most distinct on inner and central anteapical cells.

Male genitalia. Aedeagus in lateral view (fig. 29) transverse and broadly decurved on distal third; distal portion of aedeagal shaft in lateral view (fig. 27) serrated ventrally and concave dorsally; distal portion of aedeagus in dorsal view (fig. 28) with a finlike structure on each half of bifurcated shaft; style in dorsal view (fig. 32) with lateral lobe broad and moderately produced and mesal lobe (fig. 31) long, slender, and somewhat irregular on inner margin; distal portion of style in lateral view (fig. 30) with preapical tooth on irregular ventral margin.

Female genitalia. Pregenital sternum narrowed posteriorly, exposing underlying sclerites laterally, posterior margin broadly concave, at times with traces of median tooth (DeLong 1926:pl. 18, fig. 3a).

Type. Male, Wrightsville Beach, North Carolina, 27 July 1919, H. Osborn and Z. P. Metcalf, in North Carolina State University Collection, Raleigh.

Records. The type locality is Wrightsville Beach, North Carolina, where specimens were collected on a small grass below level of high tide on tidal flats. My confirmed records: FLORIDA, Cedar Keys, Clearwater, Daytona, Islamorada, Jacksonville, Key Largo, Key West, New Smyrna Beach, Tampa, Venice; NORTH CAROLINA, Wrightsville Beach.

Notes. Its small size and male genitalia distinguish this species. The type series was taken on "a very fine-leaved grass" on the seashore in North Carolina. DeLong (1926:89) reported *marinus* on prairie grass at La Belle, Florida, several miles from the tidal conditions. None of the Florida collections I have studied have host data. The ecology of this species needs attention.

Deltazotus, n. gen.

Type-species: *Deltocephalus obesus* Osborn and Ball

Small to medium sized deltocephaline leafhoppers (2.4–3.8 mm). Head as wide as or wider than pronotum. Anterior margin of head broadly rounded to face.

Clypeal suture absent. Pronotum of moderate length. Forewings macropterous and extending much beyond apex of abdomen or brachypterous with apices rounded and exposing up to three and a partial fourth abdominal segment dorsally. Male genitalia: valve large; plates short and subtruncated apically, with few uniseriate submarginal spine-like setae and hairlike filaments laterally, and long hairlike filaments distally on subtruncated portion; pygofer strongly setose; aedeagus elongated, bowed, with short pair of ventral processes, and gonopore moderately large, subapical on dorsum of shaft; aedeagus fused with linear connective. Color light brown or yellowish brown with fuscus or black markings.

In Oman's key to the genera of North American Deltocephalini (1949:111–119), *Deltazotus* will trace to couplet 129, *Deltocephalus* Burmeister. It can be separated from *Deltocephalus* on the basis of the subtruncated male plates and the presence of ventral aedeagal processes *versus* acute male plates without ventral aedeagal processes.

Deltazotus obesus (Osborn and Ball), n. comb.
(Figs. 33–39)

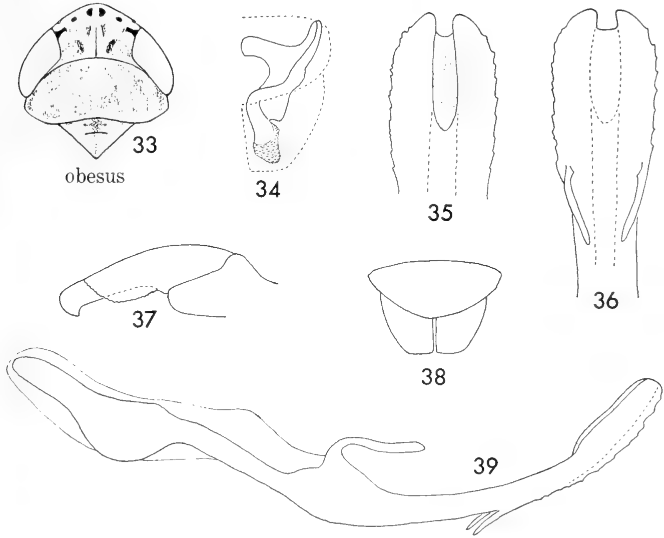
Deltocephalus obesus Osborn and Ball, 1898:81.
Deltocephalus comesus DeLong and Sleesman, 1929:104. **New synonymy.**

Length. Male 2.4–3.6 mm. Female 2.8–3.8 mm.

Structure. Head in dorsal view (fig. 33) bluntly angular at apex, ocelli of moderate size and removed from eyes; in long winged forms, each appendix well developed, apical cells large, with inner anteapical cell closed basally, central anteapical cell divided, and outer anteapical cell narrow; in brachypterous forms, each appendix absent, apical cells obsolete or nearly absent, all anteapical cells shortened with outer anteapical cell often open distally.

Coloration. Variable; venter of abdomen ranging from light brown and variously infuscated to nearly all fuscus or black; venter of thorax fuscus to black and paler only at segmental margins; legs pale brown and lightly or heavily infuscated; face pale brown and marked with fuscus to black on clypeal arcs, all sutures, central portion of clypellus, upper edges of genae, and spots under each ocellus; crown, pronotum, and scutellum (fig. 33) light brown to yellowish brown; anterior coronal margin with six small fuscus to black spots, spots vary in size and shape, those next to eyes usually elongated, coronal disc with blotches of various shades of brown, blotches often obsolete; pronotum with six longitudinal brownish stripes, stripes often obsolete; scutellum darkened at anterior angles and at middle or not at all; forewings whitish subhyaline with veins concolorous, cells not or but slightly infuscated marginally, infuscation, when present, most distinct in clavus, discal cell, anteapical and apical cells.

Male genitalia. Valve large with plates short (fig. 38). Aedeagus in lateral view (fig. 39) elongated, somewhat enlarged apically with ventral margin serrated, processes small and lanceolate near middle of shaft; distal portion of aedeagus in ventral view (fig. 36) notched apically, in dorsal view (fig. 35) with gonopore elongated and U-shaped; style in dorsal view (fig. 34) with rugulose distal cap on mesal lobe and lateral lobe short and blunt; distal portion of style in lateral view (fig. 37) with mesal lobe long, subapical tooth on its irregular ventral margin.



Figs. 33–39, *Deltazotus obesus* (Osborn and Ball): 33, head and thoracic dorsum; 34, style, dorsal view; 35, apical portion of aedeagus, dorsal view; 36, distal half of aedeagus, ventral view; 37, stylar lobes, lateral view; 38, valve and plates, ventral view; 39, aedeagus and connective, lateral view.

Female genitalia. Pregenital sternum not exposing sclerites laterally, posterior margin with a broad and deep U-shaped excavation, with or without a median tooth (DeLong 1926:pl. 13, fig. 7a).

Type. Male, Arizona [2089], in Iowa State University Collection, Ames.

Records. The type locality is Arizona. My confirmed records: ARIZONA, Granite Dell, Huachuca Mts., Patagonia, Phoenix, Santa Rita Mts., Tubac, Tucson, Williams, Yuma; CALIFORNIA, San Bernardino, San Diego; LOUISIANA, Calcasieu Parish, Creole, Shreveport; NEW MEXICO, Chaves Co., Eddy Co., Mesilla Park; OKLAHOMA, Hinton, Willis; TEXAS, Brownsville, Cameron Co., El Paso Co., Harris Co., Jackson Co., Kendall Co., Kerrville, Orange Co., Spur, Victoria; UTAH, Hurricane, Leeds, St. George.

Notes. The male genitalia distinguish this species. Other than grasses, the host plants are not known. The species has a wide distribution west of the Mississippi River.

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NABIS PROPINQUUS REUTER RANGES SOUTHWARD INTO MARYLAND

(HEMIPTERA: NABIDAE)

Specimens of *Nabis propinquus* Reuter collected by John L. Hellman in a swamp on Deal Island, Somerset County, Maryland, on June 29, 1970, represent a marked southward extension of range along the Atlantic seaboard for that species. Blatchley (1926, Heteroptera or True Bugs of Eastern North America, p. 598) reported it as far south as "New England" and Harris (1928, Ent. Amer. 9:52) reported it ranging as far south as the State of New York. The national collection contains 2 collections from New Jersey (White's Bay, July 20, 1914, and Snake Hill, without date) suggesting that the species occurs regularly in marsh habitats as far south as southern Maryland.

The Hellman series contained 3 brachypterous males, one brachypterous female, and one macropterous female with membrane reaching onto last pregenital abdominal segment (the second macropterous individual in the national collection); all the New Jersey specimens are brachypterous. These data add support to Harris' (supra, p. 53) statement, "Macropterous examples are extremely rare, the males perhaps never occurring in this form."—RICHARD C. FROESCHNER, *Department of Entomology, Smithsonian Institution, Washington, D. C. 20560.*

FIFTEEN NEW WEST INDIAN CHRYSOMELID BEETLES

Doris H. Blake, *Department of Entomology, Smithsonian Institution, Washington, D. C. 20560*

ABSTRACT—Descriptions and illustration are given for fifteen new species of chrysomelid bettles from various islands in the West Indies.

This paper deals mostly with new species from the Dominican Republic that were collected by Professor Eugenio de Jesus Marcano of the University of Santo Domingo and sent to the United States National Museum of Natural History for determination. Another of his beetles represents a species described by the writer 30 years ago from poor material and a drawing of this has been made to correct the earlier illustration. The other six new species are a miscellaneous lot from various West Indian islands.

Chalcosicya setosella, n. sp.

(Fig. 1)

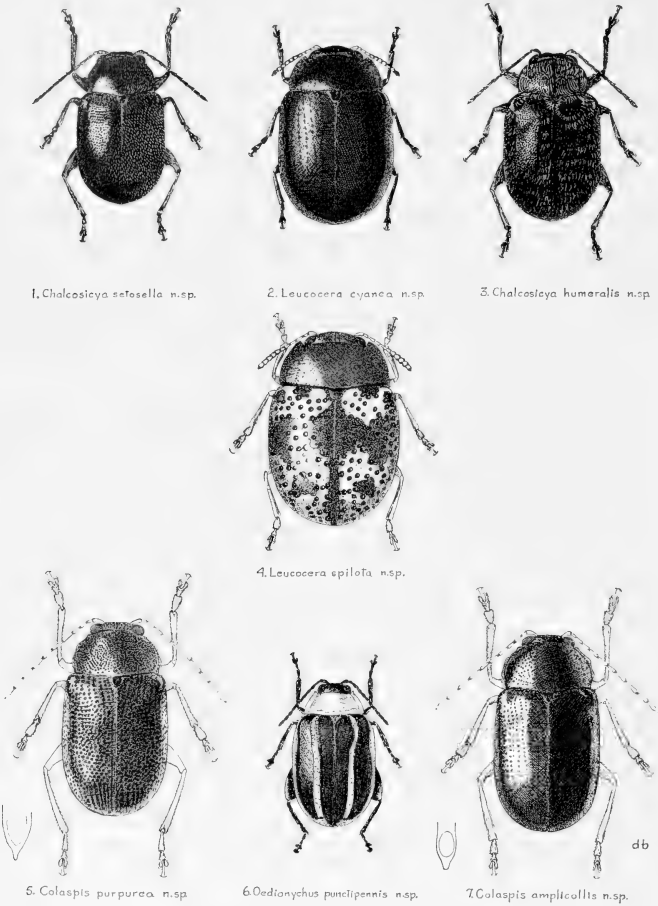
About 2.8 mm in length, oblong oval, lustrous piceous black with deep reddish brown tibiae, tarsi, and antennae; evenly covered with short, and on the elytra, erect, white pubescence; surface below this pubescence on head and pronotum finely punctate, elytra coarsely punctate, a hair from each puncture.

Head alutaceous and rather sparsely punctate with a short white hair from each puncture, a wide, depressed furrow from occiput down front, interantennal area wide and flat, labrum small. Antennae reddish brown, extending below humeri. Prothorax not twice as wide as long with arcuate sides and sinuous basal margin, smoothly rounded, only moderately convex, finely and not very densely punctate with a median smooth line, a short, pale, appressed hair from each puncture, moderately shiny although faintly alutaceous. Scutellum polished, impunctate. Elytra wider than prothorax with sharp humeri and short intrahumeral sulcus and a transverse depression below basal umbone, punctation coarse and dense and in transverse depression ridged, finer and not so coarse or dense towards apex, a short, erect, pale pubescence evenly covering but not obscuring elytral surface. Body beneath with breast and prosternum hairy but abdomen with scant pubescence, finely punctate and alutaceous; legs with pale pubescence, tibiae and tarsi reddish brown; femora toothed. Length 2.8 mm; width 1.6 mm.

Type.—Male, U.S.N.M. Type No. 70962.

Type locality.—Pico Suarte, Dominican Republic, March 27, 1964. Eugenio Marcano.

The even, short, erect pubescence over all the elytra characterizes this species. The beetle is entirely black without bronzy or greenish lustre.



1. Chalcosicya setosella n.sp.

2. Leucocera cyanea n.sp.

3. Chalcosicya humeralis n.sp.

4. Leucocera spilota n.sp.

5. Colaspis purpurea n.sp.

6. Oedionychus punctipennis n.sp.

7. Colaspis amplicollis n.sp.

Chalcosicya humeralis, n. sp.
(Fig. 3)

Approximately 4.2 mm in length, ovate, shining bronze in color with scattered long, coarse, white and finer brown pubescence that on the elytra is erectish and on the pronotum more appressed and denser; surface below pubescence densely and often contiguously punctate, humeri on elytra very prominent.

Head coarsely and contiguously punctate throughout with a median depressed line from occiput down front, shining with a rosy light beneath the long white pubescence, mouthparts reddish brown. Antennae reddish brown, extending below humeri. Prothorax approximately twice as wide as long, sides only slightly curved, nearly straight, narrowed anteriorly; only moderately convex with sinuate basal margin; moderately coarsely and contiguously punctate with a bare median line and with densely appressed white hairs forming scroll-like pattern on sides. Elytra more than three times as long as prothorax with prominent humeri set off by deep intrahumeral furrow and acute, sharp curving side, considerably broader than prothorax, a depression below basal umbone; convex and at apical angle with a poorly marked costate prominence; surface shining bronzy piceous with dense and in places contiguous punctures becoming a little finer at apex and with coarse pale pubescence mixed with finer brown hairs that tend to be erectish and in somewhat of a transverse alternating pattern. Body beneath with breast and epipleura densely punctate, abdomen obsoletely punctate, all covered with pale pubescence; legs with femora bronzy, tibiae and tarsi reddish. Length 4.2 mm; width 2.7 mm.

Type.—Female, U.S.N.M. Type No. 70963.

Type locality.—Los Ramones proximo Palo Alto, Stgo. en Cordillera Septentrional, 1000 meters alt. Dominican Republic, Aug. 1, 1965, Eugenio Marcano.

This is one of the largest species of *Chalcosicya* and is conspicuous because of its prominent and sharp humeri set off by a deep intrahumeral furrow. The elytra are unusually convex, having a poorly defined lateral costa near apex, and the pubescence on the elytra is noticeable because of pale mixed with finer brown hairs.

Colaspis purpurea, n. sp.
(Fig. 5)

From 5.2 to 5.5 mm in length, broadly ovate, shining deep green or bluish green, often with a purplish lustre, head sometimes entirely reddish brown but usually with green metallic lustre more or less pronounced on occiput, lower part of face reddish brown in 3 of 4 specimens. Antennae and legs reddish brown; pronotum and elytra densely and elytra coarsely punctate, head with sparse punctation.

Head wide across top but narrowed in lower part with clypeus distinctly separated, usually rather sparsely punctate with a deep median furrow from occiput gradually widening to clypeus which is somewhat depressed between antennal sockets and in type specimen much more densely punctate. Antennae pale reddish or yellowish brown, slender and extending below humeri. Prothorax approximately twice as wide as long, densely and moderately coarsely punctate except along basal margin, lustrous bluish green often with purplish lustre. Elytra fully three times as long as prothorax and not much wider but more convex, with prominent humeri; surface densely and coarsely punctate with a tendency to being striate at base, apex and along sides; somewhat costate on sides and at apex; lustrous bluish green, often with a violet tinge, in 3 of the 4 specimens. Body beneath dark brown with a greenish or purplish lustre. Length 5.2–5.5 mm; 3–3.2 mm.

Type.—Male, U.S.N.M. Type No. 70964.

Type locality.—El Cachon, Jimini, Dominican Republic, 2 Oct. 1965, E. Marconi.

Other locality.—Hatillo Palma, Dominican Republic, 16 Sept. 1964, E. Marconi.

The type specimen from Jimini is dark green without purplish lustre, but the three other specimens from Hatillo Palma have a distinct purple tinge and one is deep violet with a reddish brown head. All of them have the same head formation which is peculiar to this species—a deep, widening furrow down the front and a somewhat depressed clypeus between prominent antennal sockets. All of them have coarse dense pronotal and elytral punctation. This species is most like *Colaspis alcyonea* Suffrian and *Colaspis orientalis* Blake from Cuba in its dense punctation and in being bluish green or violet. But it differs from them both in not having the rounded first tarsal joint in the two pairs of anterior legs in the male. The tarsal joint is widened but elongate rather than rounded. The aedeagus is not like that of any other *Colaspis* in the West Indies.

Colaspis amplicollis, n. sp.

(Fig. 7)

Between 4.5 and 5.2 mm in length, broadly oval, lustrous blue green occasionally with a purplish tinge and with pale yellow brown antennae and legs; prothorax with distinct but not very dense punctures, elytra also with rather sparse striate punctation.

Head coarsely and densely punctate throughout, often with faint line down front, shining green with brown mouthparts. Antennae entirely pale yellow brown, slender, extending below humeri. Prothorax nearly twice as wide as long with angulate sides and moderately coarse and rather dense punctures, entirely shining bluish green. Scutellum shining green. Elytra not much wider than prothorax and scarcely three times as long, lustrous bluish green with semi-striate punctures becoming fine at apex, but on sides coarser and with a tendency to being costate in apical half. Body beneath shining bluish green with yellowish or reddish brown legs. Length 4.5–5.2 mm; width 2.5–3 mm.

Type.—Male, U.S.N.M. Type No. 70965, and two paratypes.

Type locality.—Majaqual, Sanchez, April 12, 1965, E. Marcano.

Other localities.—Punta Gorda, Sanchez, April 11, 1965, E. Marcano.

This is a smaller species than *Colaspis smaragdula* Olivier and more of the shape of *Colaspis fervida* (Suffrian) of Cuba, but with yellowish brown instead of dark legs. The aedeagus, too, resembles that of *fervida*. There is, however, no serration on the hind leg of the male nor are the first tarsal joints of the male so rounded. The prothorax is proportionately larger than in *smaragdula* or other species of *Colaspis* from Hispaniola.

Leucocera cyanea, n. sp.

(Fig. 2)

Approximately 7 mm in length, broadly ovate, moderately shining blue with a slightly greenish lustre, and pale antennae; pronotum with less than a dozen coarse punctures on each side near margin and a row along basal margin, otherwise impunctate, elytra with somewhat elongate and not densely placed striate punctures becoming indistinct near apex.

Head with widely separated, small, entire eyes, occiput and front polished, impunctate, a weakly defined median line from occiput down, lower front short, jaws large and piceous. Antennae short, pale yellowish white with the apical joint pale brown, joints nearly as broad as long, not enlarged much in apical half. Prothorax more than twice as wide as long with sides produced acutely beside eye, smooth and slightly convex, on each side near margin about 7 coarse punctures and along base a row not extending to middle. Scutellum small. Elytra smoothly convex, nearly four times as long as prothorax with elongate, well spaced, striate punctures becoming indistinct near apex and a little larger along sides. Body beneath entirely dark blue with a greenish lustre except tarsal joints which are reddish brown; claws appendiculate. Length 7 mm; width 4.7 mm.

Type.—? Female. U.S.N.M. Type No. 70966.

Type locality.—Esperanza, Dominican Republic, June 25, 1965, Eugenio Marcano.

There are at least two other dark blue species of *Leucocera*, one from Cuba, *apicornis* Chev., and the other from Puerto Rico, *laevicollis* Weise. The one from Cuba has many more punctures on the sides of the prothorax and irregularly and closely set striate punctures on the elytra. It is also of a more purplish color. *L. laevicollis* Weise from Puerto Rico has an impunctate prothorax and is of a lustrous purple color. As in so many other species of West Indian genera, these three species are very closely related, each island having its distinctive race differing in small details.

Leucocera spilota, n. sp.

(Fig. 4)

Approximately 7.5 mm in length, broadly ovate, convex, somewhat shiny, pronotum finely alutaceous, head, pronotum, markings on elytra and undersurface chocolate brown, background of elytra and antennae, except tip of terminal joint, pale yellowish white, the scattered semi-striate punctures on elytra brown.

Head broad with widely separated eyes, a median faintly depressed line from occiput down front, with fine punctures on each side, a groove on inner margin of eyes and narrow line of punctures along interantennal area; jaws large, head entirely brown. Antennae extending below humeri, pale yellowish white, tip of apical joint brown, joints 8–11 broader than long and twice as broad as joints 2–5. Prothorax more than twice as broad as long with anterior angle projecting forward by eye and basal margin somewhat sinuate over scutellum; disc smoothly rounded but not very convex with finely alutaceous surface and on each side near lateral margin coarse punctures; a few finer ones scattered in middle and along basal margin; entirely faintly shining, chocolate brown. Scutellum also brown. Elytra barely three times as long as prothorax, smoothly convex without depressions except the coarse but not dense semi-striate punctures which are in the form of conspicuously marked brown spots scattered over the shining pale yellowish white background. Other chocolate brown markings in form of an irregular spot on humerus and one in middle of base, a wide irregular band before middle extending across from margin to margin, and an irregular spot varying in size near apex, also brown sutural markings varying in width the entire length of suture. Epipleura pale yellowish white, rest of undersurface and legs shining brown, with punctures along sides and front of metasternum. Length 7.5 mm; width 6 mm.

Type.—U.S.N.M. Type No. 70967.

Type locality.—San Cristobal, Dominican Republic, Eugenio Marcano.

Other locality.—Hatillo Palma, Dominican Republic, Sept. 16, 1964, E. Marcano.

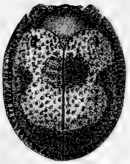
The pattern of the elytral markings is almost the same as that of 2 of the 3 specimens that I described as *Leucocera hoffmani* from Hinche, Haiti, which is in the north central part of Haiti. San Cristobal, the type locality of this species, is near the southeastern coast of the Dominican Republic, and the other specimen was from Hatillo Palma, which is in northern Dominican Republic. In 2 of the 3 specimens of *hoffmani* there are elytral bands extending from margin to margin. The third specimen is lacking both bands, having only the median basal and humeral blotches. The coloring of *hoffmani* is unlike this species in that the prothorax and background of the elytra are reddish brown with the markings an aeneous green. Even the punctures are aeneous green instead of chocolate brown. This difference in coloring is such that I believe it cannot be merely a color variety of one species. In addition, the elytra are proportionately longer in *hoffmani* being more than three times as long as the prothorax, whereas in this species the elytra in the two specimens known is scarcely 3 times as long. This coloring of chocolate brown on creamy white is unusual in the genus in which the species are mostly shining blue or green with pale yellow or red spots.

Galerucella decemvittata, n. sp.

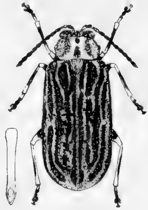
(Fig. 9)

Between 3.8 and 5 mm in length, elongate oblong oval, elytra nearly 6 times as long as prothorax, head and antennae dark brown or piceous, prothorax dirty yellow brown, elytra with 10 black irregular vittae and between these 8 narrower, irregular dirty yellow brown vittae appearing somewhat costate; legs yellow with dark median rings on femora and tibiae, tarsi dark, a fine pubescence over all.

Head with interocular space half width of head, an impressed line from occiput down front which is wrinkled and alutaceous, lower front short, pale yellow brown, labrum and jaws dark brown to piceous. Antennae extending slightly below humeri, 3rd joint longest, remainder almost as broad as long, dark brown or piceous

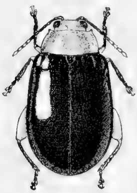


8. Hemispaerota quadrimaculata n.sp



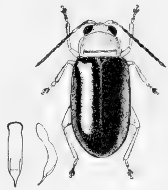
9. Galerucella decemvittata n.sp.

10. Hemisphaerota bimaculata n.sp

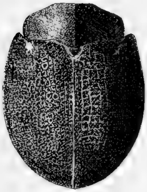


11 Oedionychus viridipennis n.sp.

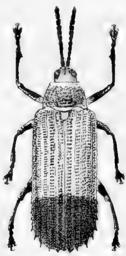
12. Diabrotica marcanoi n.sp.



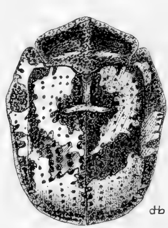
13. Lactica xanthopus n.sp.



14. Cyrtonota cyanea insulae n.subsp.



15. Xenochalepus cyanura n.sp.



16. Paratrikona rubescens Blake

with three basal joints slightly paler. Prothorax approximately twice as broad as long with angulate sides, dirty yellow brown, often with darker shading in depressions down median line and on sides, densely and obsoletely punctate and with short, fine and appressed, pale pubescence. Scutellum large, usually brown, with short pale pubescence. Elytra wider than prothorax and usually nearly 6 times as long, with black irregular vittae composed of sutural and marginal and three others on each elytron with frequent cross bands, between these dark vittae are narrower yellow brown vittae, often broken, and tending to be costate; surface rough with obsolete punctures and fine short pubescence. Body beneath dark brown, legs pale yellow with wide median dark areas on both femora and tibiae, tarsi mostly dark. Length 3.8–5 mm; width 1.8–2.5 mm.

Type.—Male and 25 paratypes of which 12 are in U.S.N.M., 13 in collection of Eugenio de Jesus Marcano, at Universidad Autonoma de Santo Domingo, Santo Domingo, Dominican Republic. U.S.N.M. Type No. 70968.

Type locality.—Loma de Sicajagua, Janico, Dominican Republic, July 24, 1965, E. Marcano.

This species closely resembles *Galerucella bowditchi* Blackwelder (*G. conjuncta* Blake) which I described from Port-au-Prince, Haiti. In that species there are only 8 dark vittae in consequence of which the beetles appear paler. In both species the dark vittae have the same tendency towards cross branching, but it is even more developed in the Dominican Republic species. Also the elytra are longer in most specimens. This Dominican Republic species was collected in the northern part of the island in contrast to the type locality of *bowditchi*, in southwest Haiti. Large series of both of them are at hand and the differences are consistent in all the specimens.

Lactica xanthopus, n. sp.

(Fig. 13)

Between 2.8 and 3.4 mm in length, elongate oval, shining, head, prothorax, and legs pale yellow, elytra bright blue, antennae, breast and abdomen reddish brown.

Head pale yellow except for reddish brown mouthparts, smooth over occiput with a large puncture on each side near eye and a depression on front above antennal sockets, an interantennal carina that extends down front. Antennae with joints 3–5 longer than succeeding joints and becoming deeper brown towards apex. Prothorax approximately a third wider than long with only slightly curved, nearly straight sides, a well marked basal sulcus, entirely pale yellow, impunctate. Scutellum piceous. Elytra about four times as long as prothorax and except for a short intrahumeral sulcus smoothly convex, lustrous blue, sometimes faintly bluish green, impunctate. Body beneath with prosternum yellow, meso- and metasternum and abdomen reddish brown. Legs pale yellow. Length 2.8–3.4 mm; width 1.4–1.5 mm.

Type.—Male, U.S.N.M. Type No. 70970, and six paratypes.

Type locality.—Lucea, Jamaica, collected on *Tunera ulmifolia* by Niilo Virkki.

Other locality.—Montego Bay, Jamaica, April 1906, VanDuzee.

Lactica xanthotrachelus Blake from Jamaica also has a yellow head and dark blue or green elytra but the legs are dark and the hind legs usually have metallic lustre. *Lactica darlingtoni* Blake, *L. albiterminata* Blake, and *L. jamaicensis* Blake have the upper suface entirely dark metallic blue or green without any pale yellow coloring. The present species is a little smaller than most of these other ones.

Diabrotica marcanoi, n. sp.
(Fig. 12)

About 7.3 mm in length, elongate oblong oval, shiny, very finely and shallowly punctate, head, undersurface, except prosternum, tibiae and tarsi piceous black, antennae with three basal and three terminal joints pale, rest black; pronotum pale yellow brown with wide median dark vitta and a small dark spot on either side; elytra pale with wide dark humeral and wide dark scutellar area; two other large dark areas below and a smaller dark area near apex common to both elytra; femora pale.

Head with interocular space not quite half as wide as head, occiput and front shining, impunctate, piceous, with a small median depression over frontal tubercles, interantennal area slightly produced and this median projection extending down front, eyes large. Antennae not reaching middle of elytra, slender, 2nd joint very short, 3rd at least three times as long, 4th subequal to 3rd, 5th longer, remainder a little shorter and subequal, basal three joints pale yellow brown, terminal three joints reddish brown, rest black. Prothorax not much wider than long with slightly curved sides, not very convex and without depressions, shiny, yellowish brown with a broad piceous median area not quite reaching base and a small lateral spot on each side, surface finely punctate. Scutellum dark. Elytra wider than prothorax and not quite five times as long, wider in apical half; a slight costate elevation from humerus down side, very finely punctate; pale yellow brown with broad interrupted piceous black bands, one across at base, one above and one below middle, and a small one at apex. Body beneath with breast and abdomen piceous, femora yellow, tibiae and tarsi dark, claws with long tooth. Length 7.3 mm; width 3.4 mm.

Type.—Female, U.S.N.M. Type No. 70969.

Type locality.—Los Pablones, Jarabacoa, Dominican Republic, Aug. 9, 1964, E. Marcano.

This species is of the same size and shape as *Diabrotica pulchella* Jacq. du Val of Cuba. The pattern of dark markings on the elytra is the same as that of *Diabrotica hispaniolae* Blake, but *hispaniolae* is a smaller beetle and there are no pronotal dark spots on either *pulchella* or *hispaniolae.* In fact, this dark pronotal marking seems to be unusual in species of *Diabrotica.* I take pleasure in naming it after Professor Eugenio de Jesus Marcano of the University of Santo Domingo, who is an all-around naturalist and a superb collector.

Oedionychus punctipennis, n. sp.
(Fig. 6)

Approximately 5 mm in length, ovate, shining, pronotum finely and elytra more coarsely punctate, head, undersurface (except prosternum) and legs and wide vitta on elytra at suture and side piceous black; prothorax, narrow median vitta and narrow margin of elytra pale yellow brown.

Head with interocular space half width of head, occiput polished with a median depressed line running down front to tubercles and one or two punctures on each side near eye, tubercles distinctly marked, a short interantennal swelling and wide labrum. Antennae short, not extending far below humeri, 3rd joint longer than 4th or succeeding ones which are subequal, piceous with apical joints deep reddish brown. Prothorax more than twice as wide as long at base, narrowed anteriorly with explanate sides projecting near eyes and with small nodule; disc only a little convex with a slight linear depression near base, surface shining pale yellow brown and very finely punctate. Scutellum dark. Elytra wider than prothorax with wide, pale, explanate margin, a wide piceous sutural vitta common to both elytra, and on each elytron a wide lateral vitta joining with a narrow dark band at apex the wide sutural vitta, leaving only a very narrow pale yellow vitta between; surface shining and more distinctly and more coarsely punctate than pronotum. Body beneath lightly pubescent and except for pale prosternum and pale epipleura shining piceous black. Length 5.1 mm; width 3.1 mm.

Type.—Male, U.S.N.M. Type No. 70971.

Type locality.—St. Vincent, West Indies, Mt. St. Andrew, N. L. H. Krauss, 12 Oct. 1947.

The dark vittae in this species are wider than in *Oedionychus quadrilineatus* Harold from Mexico, and united narrowly at the apex. The elytral color pattern is similar to *Oedionychus amplivittatus* Blake but the beetle is smaller and with more distinctly punctate elytra and the prothorax lacks the dark spots of *amplivittatus.*

Oedionychus viridipennis, n. sp.

(Fig. 11)

Approximately 6 mm in length, ovate, lustrous, very finely punctate, head, antennae, prothorax, undersurface and legs yellowish or reddish brown, elytra dark green with rosy lights.

Head with interocular space more than half width of head, eyes small, occiput polished, minutely punctate, a median line down front, tubercles well defined, lower front short and like a shelf over labrum. Antennae extending a little beyond humeri, 3rd joint long, remainder subequal. Prothorax more than twice as broad as long with explanate sides narrowed anteriorly and with small tooth at apical angle, paler yellow brown than the reddish brown head, shining, very indistinctly punctate. Scutellum dark. Elytra broad, convex, wider in apical half with prominent humeri and short intrahumeral depression; lustrous dark green with rosy lights, indistinctly and very finely punctate. Body beneath pale yellow brown with abdomen deeper reddish brown. Femora paler yellow brown than tibiae and tarsi which are rufous. Length 6 mm; width 3.5 mm.

Type.—U.S.N.M. Type No. 70972.

Type locality.—Aceitillar, Perdenales, Dominican Republic, March 22, 1967, E. Marcano.

There are not many species of *Oedionychus* from the West Indies, and instead of green the color of the elytra is usually blue. This species has the same elytral coloration as *Disonycha laevigata* Jacoby, a species occurring in the West Indies which differs in having black antennae and dark tarsi. *Oedionychus dugesi* Jacoby from Mexico has green or blue elytra but has a spotted pronotum.

Xenochalepus cyanura, n. sp.

(Fig. 15)

About 7 mm in length, elongate, parallel-sided, bright reddish brown with black antennae, black legs except near base of femora, and dark bluish purple apical third of elytra; prothorax with a depression in middle of base over scutellum, coarsely and contingently punctate, elytra with two costate ridges between suture and humerus, and a narrower ridge nearer humerus, 10½ rows of punctures on each elytron.

Head deep reddish brown with piceous black quadrangular area between eyes and below antennal sockets somewhat protruding and roughly punctate, labrum dark and projecting at right angles from this, on vertex a longitudinal groove. Antennae filiform, black, joints 1 and 2 somewhat globular, 3rd joint longest, joints 7 to 11 wider. Prothorax not twice as wide as long with arcuate sides narrowing anteriorly, slightly convex, depressed in middle of base over scutellum, surface except along basal and anterior margins very coarsely and contingently punctate, entirely reddish brown. Scutellum reddish brown, alutaceous. Elytra nearly 5 times as long as prothorax with parallel sides, basal margin sinuate and on each side of scutellum rounded upwards over base of prothorax, one wide costa near suture, a second not so wide from within humerus and a third not reaching apex near margin, 10½ rows of deep, coarse, contingent punctures between these separating ridges; lateral edges finely serrate in anterior half, becoming more prominently spiny in apical third; in color bright reddish brown with apical third deep violet blue; apex not emarginate at sutural angle. Body beneath deep reddish brown with trochanters black and legs except reddish brown base of femora, black. Front tibiae with a triangular tooth a little before apex. Length 7 mm; width 2.6 mm.

Type.—U.S.N.M. Type No. 70973.

Type locality.—Corail, Haiti, Sept. 10, 1925, W. A. Hoffman.

The apical third of the elytra was originally deep purplish blue in color, but this coloration was changed to piceous when the specimen was put in boiling water to relax. The beetle was in coloring similar to two other hispids from the West Indies,—*Octhispa pulchella* Suffrian from Cuba and *Agathispa dimidiata* (Olivier) from the Dominican Republic. *Octhispa pulchella*, in fact, although slightly smaller has a similar color pattern, the coloring being bright reddish brown and deep blue, but the elytra lack the costate ridging of *X. cyanura*.

Hemisphaerota bimaculata, n. sp.

(Fig. 10)

From 4.3 to 4.8 mm in length, nearly round, convex, deep dark blue, on each elytron, not touching base or suture a large round bright reddish spot. Antennae and pubescence on under side of tarsal joints pale yellow; whole upper surface very densely and on elytra coarsely and striately punctate.

Head with rounded occiput, a cluster of punctures near eye, eyes large, separated by antennal sockets, below each of which is a small rounded prominence, mouth directly below with labrum, often pale, at an angle from plane of front. Antennae pale yellow brown. Prothorax with sides curving forward on each side beyond eye and basal margin dipping sinuously down above scutellum, a little convexity in middle, densely punctate over whole upper surface, more coarsely on sides. Scutellum squarish and with few punctures. Elytra with sides projecting forward, not flattened or explanate and smoothly, strongly convex, without much sign of humeral elevation, surface throughout very densely, deeply and coarsely punctate, lustrous deep blue with a large roundish red spot on each elytron not touching either suture or base, but extending to humeral prominences and a little down the side and not to middle of elytron, large, deep, mostly striate puntures almost contiguous over entire surface of elytra. Body beneath deep brown with legs piceous and thick long pubescence on tarsal joints pale yellowish brown. Length 4.3–4.8 mm; width 3.5–3.8 mm.

Type.—U.S.N.M. Type No. 70974, and 3 paratypes.

Type locality.—Baragua, Cuba, collected by L. C. Scaramuzza, Oct. 13, 1928.

This species is distinct from *Hemisphaerota gundlachi* Boheman and *H. fallax* Suffrian both from Cuba, in that the basal spot on each elytron is situated nearer the humeral prominence and a little down the side, and does not touch either the base or the scutellum and extends farther down the elytron. In addition, the elytral punctation is denser. In his description of *gundlachi* Boheman states that the abdomen is flavo-testaceous, which is not true of *bimaculata* in which the abdomen is piceous. The four specimens examined appear rounder and less ovate and more like *H. xanthocera* Boheman which has an all dark coloring without spots.

Hemisphaerota quadrimaculata, n. sp.

(Fig. 8)

From 7 to 8.2 mm in length, broadly ovate, convex, with an explanate margin, the anterior rounded explanate margin of prothorax extending forward beyond eyes and distinctly punctate; disc moderately convex with finer scattered punctures along basal and anterior margins; elytra with regular, well-spaced, coarse, striate punctures; deep violaceous blue (one specimen almost black) on elytra four large bright reddish spots covering most of disc and coalescing at suture and narrowly at middle; humeri, middle, and apex of disc deep blue, antennae yellow, tarsal joints with bright yellow pubescence.

Head dark blue, impunctate over occiput, a median line down front, eyes large, two small swollen humps under antennal bases, a small labrum below projecting at right angles, mouthparts directly below and on the same plane as front. Antennae short, filiform, with two basal and end joint longest, all except the dark basal joint pale yellow. Prothorax with lateral explanate margin protruding forward in a rounded area slightly beyond eyes and with a group of rather coarse punctures along margin, disc moderately convex, depressed over scutellum and with finer punctures along the very sinuate basal margin and anteriorly, deep violaceous blue. Scutellum dark, shining. Elytra about four times as long as prothorax, strongly convex with explanatemargin extending forward along sides of prothorax, coarse, quite regular, deep, striate punctures somewhat larger in middle of elytra and smaller along sides and at apex, margin also with rows of punctures, punctures not so close as in *Hemisphaerota erythrocera* Germ.; explanate margin, humeri and disc dark, a dark area in middle almost connecting with a median lateral dark area extending up side of disc, area between scutellum and explanate margin in basal portion bright reddish and another reddish area below median dark spot not extending quite to margin or apex, these bright reddish areas coalescing at middle and suture. Body beneath entirely dark except for the conspicuous bright yellow pubescence on the tarsal joints. Length 7–8.2 mm; width 6–6.3 mm.

Type.—Male and one female paratype, U.S.N.M. Type No. 70975.

Type locality.—Santiago de las Vegas, Cuba, Agricultural Station, July 21, 1920, S. C. Bruner.

This is one of the group of blue beetles of which *Hemisphaerota erythrocera* Germ. is the type. *H. gundlachi* Boheman and *H. fallax* Suffrian are also from Cuba but differ from this species in having only two spots near the base. In addition the elytral punctation is denser in *gundlachi*, and according to Suffrian the shape of the elytra is more sharply narrowed toward the apex in *fallax* than in *gundlachi*, which is similar in shape to the present species.

Cyrtonota cyanea insulae, n. subsp.

(Fig. 14)

Approximately 12.5 mm long and 9.5 mm wide, ovate, dark blue, not very shiny, prothorax rather flat, dull and finely alutaceous, with very fine, nearly imperceptible, punctation, elytra convex, densely reticulate even to margin, within each reticulation small punctures.

Head almost concealed under overlying edge of prothorax, occiput smooth, an interantennal cleft and area below densely and coarsely punctate, labrum and mouthparts black. Antennae with five basal joints glabrous and brownish with a bluish or purplish lustre, basal joint thick and round, 2nd joint small, joints 3, 4, and 5 slender and long, remainder wider, not shiny and with fine brown pubescence. Prothorax more than twice as broad as long, nearly flat, with a slight median convexity and a depressed line down it; surface finely alutaceous, smooth, deep blue, sides rounded, basal margin sinuate. Scutellum black. Elytra widening out below prothorax with wide explanate margin continuing downward except at apex and not at right angles with convexity of elytra; surface with close reticulate ridging irregular in shape, the centres being filled with punctures, these ridges, while not so high, still visible to lateral margin; humeri alone bare. Body beneath shining deep blue with fine light brown pubescence at end of tibiae and beneath tarsal joints.

Type.—Female, U.S.N.M. Type No. 70976.

Type locality.—St. Thomas Island, West Indies.

Cyrtonota cyanea (L.) is from Brazil and up to now only one species of the genus, (*tristigma* Boh. from Central America and Mexico) has been found north of South America. The single specimen collected on St. Thomas island is similar to the Brazilian specimens of *cyanea* in the U.S.N.M. collection in size, shape and coloring. The main difference is in the reticulations on the elytra. These are much smaller and more numerous than on the Brazilian specimens, and moreover, although reduced, are plainly distinct to the margin, which is not the case in the Brazilian specimens. The punctation on the pronotum in the Brazilian specimens although fine is more apparent than on the pronotum of the West Indian specimen.

Paratrikona rubescens Blake

(Fig. 16)

Paratrikona rubescens Blake, 1939, Proc. Ent. Soc. Wash. 41(8):238.

I described this species from two specimens that were collected by P. J. Darlington, Jr., who wrote that in life they were "rather deep red with conspicuous white blotches irregularly arranged. . ." On the dried specimens, however, only a slight trace of white marking remained, so that in my illustration the beetle appears entirely dark. Thirty years later several specimens have come to my attention from the collection of Dr. Eugenio de Jesus Marcano, of the University of Santo Domingo, Dominican Republic. These were collected in Arroya de Toro, Quebrada Honda, Dominican Republic. Darlington collected his specimens in Jarabacoa in a deep forest at 1400–4000 ft. elevation. These recent specimens show the white markings clearly and because my early illustration is misleading in that I gave no indication of the white blotches, I have made another figure to correct it.

KEY TO AMERICAN SPECIES OF THE GENUS MEZIRA (HEMIPTERA: ARADIDAE)

NICHOLAS A. KORMILEV, *102–34 93rd Ave., Richmond Hill, New York 11418*

ABSTRACT—The key separates all but two species, *horvathi* (Bergroth) and *novella* Blatchley, of the 89 species and two varieties from the Americas assigned to the genus *Mezira*.

During the last few years the number of American members of the genus *Mezira* Amyot and Serville has increased by 26 species and two varieties making obsolete my last key (1962, p. 260) to the American species of the genus. *Mezira* is the largest and commonest genus of American Mezirinae. To make identifications easier, I am offering a new, revised key to its 89 species and two varieties: *Mezira horvathi* (Bergroth), 1889, from Brazil and *Mezira novella* Blatchley, 1924, from southern U. S. A., are again omitted as unidentifiable (also omitted from my 1962 key).

KEY TO AMERICAN **Mezira** SPECIES

1. Membrane abbreviated, reaching to hind border of tergum IV; connexiva II and III fused together (Jamaica) .... **brachyptera** Kormilev, 1964c
   Membrane complete, always surpassing fore border of tergum VI; connexiva II and III separated 2

2(1). Basal angles of scutellum with yellow tubercles, often covered with yellow, curled hairs 3
   Basal angles of scutellum without such tubercles 7

3(2). Lateral borders of abdomen strongly convex; larger species, over 8.0 mm 4
   Lateral borders of abdomen only slightly convex; smaller species, less than 7.0 mm 5

4(3). Labium long, reaching beyond fore border of prosternum; antennae and legs with pale rings (Colombia) .... **bouvieri** (Bergroth), 1893
   Labium short, not reaching hind border of head; antennae and legs without pale rings (West Indies, Central America) .... **abdominalis** (Stål), 1873

5(3). Spiracles VII sublateral, or placed near border; lateral notch of pronotum without a projecting lobe 6
   Spiracles VII ventral, placed far from border; lateral notch of pronotum with a prominent, flattened lobe bearing radiating ridges (Argentina) .... **birabeni** Kormilev, 1953

6(5). Spiracles VIII lateral and visible from above; 4 (2 + 2) ridges of pronotum each with 2 tubercles; connexivum nearly unicolorous but with brown, round, calloused spots (Brasil) .... **gradata** (Bergroth), 1889
   Spiracles VIII dorso-lateral, not visible from below; 4 (2 + 2) ridges of pronotum without tubercles; connexival segments each pale brown with lateral margin blackened and apical margin yellow, but without round, brown spots (Brasil) .... **luteonotata** Kormilev, 1964a

7(2). Spiracles VII sublateral, or placed near border 8
   Spiracles VII ventral, placed far from border 22

8(7). Pronotum not, or scarcely sinuate laterally 9
   Pronotum distinctly constricted, or sinuate laterally 12

9(8). Body long and narrow, with parallel sides; paratergites (♀) as long as segment IX (Argentina) .... **formosa** Kormilev, 1953
   Body elongate ovate, with more or less convex sides; paratergites (♀) much shorter than segment IX 10

10(9). Antennal segment III as long as IV, or shorter 11
Antennal segment III longer than IV (9:7) (Brasil) .... **kjellanderi** Kormilev, 1962
11(10). Antennal segment III as long as IV (11:11) (Bolivia) .... **bridarollii** Kormilev, 1960a
Antennal segment III shorter than IV (5:6.5) (Brasil) .... **gracilis** Kormilev, 1968c
12(8). Anterior process of head reaching, or almost reaching, tip of antennal segment I 13
Anterior process not reaching tip of antennal segment I 17
13(12). Postocular tubercles produced beyond outer border of eyes 14
Postocular tubercles at most reaching outer border of eyes 15
14(13). Antennae shorter, less than 1.5 times as long as width of head across eyes; antennal segment III as long as IV (7:7) (Peru) .... **inca** Kormilev, 1960b
Antennae longer, more than 1.6 times as long as width of head across eyes; antennal segment III much longer than IV (15:10) (Peru) .... **armata** Kormilev, 1964b
15(13). Pronotum deeply sinuate laterally, antero-lateral angles subangular (Central America) .... **rugiventris** (Champion), 1898
Pronotum slightly sinuate laterally, antero-lateral angles rounded 16
16(15). Connexivum light brown, each segment with an elongate black dash basolaterally (Brasil) .... **flavicans** (Stål), 1860
Connexivum unicolorous brown (Mexico) .... **championi** Kormilev, 1964a
17(12). Postocular tubercles produced beyond outer border of eyes 18
Postocular tubercles at most reaching outer border of eyes 21
18(17). Antennae slender; postocular tubercles only slightly produced beyond outer border of eyes 19
Antennae stout; postocular tubercles distinctly produced beyond outer border of eyes 20
19(18). Larger species, over 5 mm; genae angular anteriorly; antennal segment I as long as III (10:10) (Central America) .... **angustata** (Champion), 1898
Smaller species, less than 4.5 mm; genae rounded anteriorly; antennal segment I shorter than III (8:9.5) (Guatemala) .... **pusilla** Kormilev, 1968
20(18). Pronotum deeply sinuate laterally, antennal segment I and III subequal in length; segment IX (♀) truncate posteriorly (Guatemala) .... **divisa** (Champion), 1898
Pronotum slightly sinuate laterally, antennal segment I shorter than III; segment IX (♀) notched posteriorly (Guatemala) .... **nana** (Champion), 1898
21(17). Larger species, over 7.5 mm; body incrustated from above and beneath (Central America, South America) .... **handlirschi** (Bergroth), 1898
Smaller species, less than 6.0 mm; body not incrustate (Mexico) .... **yucatana** (Champion), 1898

22(7). Spiracles VIII sublateral, lateral, or dorso-lateral, and visible from above 23
Spiracles VIII ventral, or sublateral, but not visible from above 49
23(22). Connexivum bicolored, or at least PE-angles of connexival segments are of different color than discs 24
Connexivum unicolored 30
24(23). Postocular tubercles at most reaching outer borders of eyes 25
Postocular tubercles produced beyond outer borders of eyes 27
25(24). Antero-lateral angles of pronotum forming rounded lobes produced beyond collar; lateral pronotal notch rectangular; segment IX (♀) incised posteriorly (Brasil) .... **hyperlobata** Kormilev, 1962
Antero-lateral angles or pronotum rounded, or angular, but not produced beyond collar as rounded lobes; lateral pronotal notch forming an obtuse angle, or rounded; segment IX (♀) truncate 26
26(25). Antero-lateral angles of pronotum expanded and rounded, lateral notch forming an obtuse angle; spiracles VIII sublateral and slightly visible from above (Peru) .... **halaszfyi** Kormilev, 1960b
Antero-lateral angles of pronotum forming a right angle, neither produced forward, nor sideways; lateral borders sinuate; spiracles VIII lateral and clearly visible from above (Peru) .... **amazonica** Kormilev, 1962
27(24). Hypopygium (♂) cordate (Venezuela) .... **barberi** Kormilev, 1964a
Hypopygium (♂) globose 28
28(27). Hypopygium wider than head across eyes (28:25) (Central America, South America) .... **regularis** (Champion), 1898
Hypopygium at most as wide as head across eyes (22:22) 29
29(28). Head relatively wider, ratio length: width across eyes as 27:32; hypopygium (♂) with a subtriangular, median ridge not reaching apex of disc (Brasil) .... **romani** Kormilev, 1962
Head relatively narrower, ratio length: width across eyes as 27.5:30; median ridge of hypopygium with parallel sides, reaching tip of disc (Mexico) .... **variegata** Kormilev, 1968b
30(23). Jugae very long, dentiform and bent downward as tusks (Cuba) .... **cubana** Kormilev, 1960c
Jugae normal, not bent downward 31
31(30). Spiracles VIII dorso-lateral (Guatemala) . **constricta** (Champion), 1898
Spiracles VIII lateral 32
32(31). Pronotum not sinuate laterally 33
Pronotum more or less sinuate laterally 40
33(32). Body with parallel sides 34
Body with more or less convex, rounded sides 36
34(33). Pronotum as wide as abdomen; paratergites (♀) reaching middle of segment IX (Brasil) .... **ligneola** (Bergroth), 1894
Pronotum slightly narrower than abdomen; paratergites (♀) almost reaching tip of segment IX 35
35(34). Larger species, over 7.5 mm; antennal segement I much shorter than III (11:15) (West. U. S. A.) .... **reducta** Van Duzee, 1927
Smaller species, less than 6.0 mm; antennal segment I slightly longer than III (Argentina) .... **vianai** Kormilev, 1953

36(33). All ridges on pronotum obsolete or absent; paratergites (♀) longer than segment IX (Brasil, Argentina) .... **reuteri** (Bergroth), 1886
Ridges on pronotum always prominent; paratergites (♀) shorter, or as long as segment IX 37
37(36). Larger species, over 7.0 mm (West. U. S. A.) .... **pacifica** Usinger, 1936
Smaller species, less than 6.5 mm 38
38(37). Apical angle of corium rounded; paratergites (♀) reaching tip of segment IX (Bolivia) .... **andina** Kormilev, 1965
Apical angle of corium angular, or subangular; paratergites (♀) reaching middle of segment IX 39
39(38). Anterior process of head short, reaching ⅔ of antennal segment I; antennal segment III only slightly longer than IV (8:7) (Peru) .... **peruviana** Kormilev, 1960b
Anterior process long, reaching tip of antennal segment I; antennal segment III much longer than IV (9.5:6.5) (Brasil) .... **timida** Kormilev, 1968c
40(32). Postocular tubercles produced far beyond outer borders of eyes 41
Postocular tubercles not produced, or only slightly produced beyond outer borders of eyes 43
41(40). Head distinctly shorter than width across eyes (18:22); pronotum slightly sinuate laterally; ridges of pronotum poorly developed; granulation fine (Brasil) .... **sangabrielensis** Kormilev, 1962
Head as long as width across eyes (17:17); pronotum strongly sinuate laterally; its ridges very prominent; granulation rough 42
42(41). Antennal segment I slightly longer than III (10:9); body covered with short, curled hairs (Argentina) .... **tartagalensis** Kormilev, 1953
Antennal segment I distinctly shorter than III (15:17.5); body covered with long, erect bristles as well as short, curled hairs (Mexico) .... **pilosa** Kormilev, 1968c
43(40). Postocular tubercles very small, not reaching outer borders of eyes 44
Postocular tubercles small, but slightly produced beyond outer borders of eyes 45
44(43). Antennal segment I longer than III (14:12); antennal segment II shorter than III (10:12); segment IX (♀) small, rounded or truncate posteriorly (Bolivia, Venezuela) .... **boliviana** Kormilev, 1962
Antennal segment I only slightly shorter than III (15:16); antennal segment II much shorter than III (11:16); segment IX (♀) notched posteriorly (Argentina) .... **proseni** Kormilev, 1953
45(43). Larger species, over 7.0 mm; anterior process of head almost reaching tip of antennal segment I (U. S. A., Mexico) .... **emarginata** (Say), 1832
Smaller species, less than 6.5 mm; anterior process of head reaching at most ¾ of antennal segment I 46
46(45). Lateral borders of pronotum slightly sinuate; anterolateral angles rounded, but not lobate (Mexico) .... **dybasi** Kormilev, 1968b
Lateral borders of pronotum strongly constricted laterally; anterolateral angles of pronotum forming rounded lobes 47
47(46). Connexivum incrustate above and beneath; anterior lobe of pronotum narrower than hind lobe (43:50); all carinae on pronotum

very sharp, covered with curled, incrustate, yellow hairs (Venezuela) .... **sanmartini** Kormilev, 1968a

Connexivum without incrustation; fore lobe of pronotum much narrower than hind lobe (43:53); all carinae less sharp, curled hairs without incrustation 48

48(47). Antennal segment I distinctly shorter than III (10:12.5); paratergites (♀) shorter, reaching at most middle of segment IX; median ridge of hypopygium (♂) reaching, or almost reaching tip of disc (Mexico) .... **paraangustata** Kormilev, 1968b

Antennal segment I only slightly shorter than III (12:13); paratergites (♀) longer, reaching ¾ of segment IX; median ridge of hypopygium (♂) reaching ¾ of disc (Brasil) .... **pauperula** Kormilev, 1962

49(22). Anterior process of head reaching, almost reaching, or produced beyond tip of antennal segment I 50

Anterior process reaching at most ¾ of antennal segment I 61

50(49). Postocular tubercles very small, by far not reaching outer borders of eyes; venter smooth and shiny (Panama, South America) .... **laeviventris** (Champion), 1898

Postocular tubercles larger, almost reaching, reaching or produced beyond outer borders of eyes; venter normal, scabrous 51

51(50). Connexivum and venter with round, redbrown, or yellowbrown, calloused spots 52

Connexivum and venter without such spots 53

52(51). Larger species, over 10 mm; black, base of membrane with a V-form, white spot; connexivum with PE-angles and round, callous spots redbrown, or yellowbrown (Colombia, Bolivia) .... **punctiventris** (Stål), 1873

Smaller species, less than 7.0 mm; brown, base of membrane without V-form, white spot; connexivum tricolored: redbrown, outer border black, and PE-angles and round, callous spots, yellowbrown (Paraguay) .... **paraguayensis** Kormilev, 1968a

53(51). Connexivum bicolor 54

Connexivum unicolor 55

54(53). Postocular tubercles reaching outer border of eyes; paratergites (♀) large, as long as segment IX (Chile, Patagonia) .... **americana** (Spinola), 1852

Postocular tubercles produced beyond outer borders of eyes; paratergites (♀) reaching only middle of segment IX (Brasil) .... **plaumanni** Kormilev, 1966

55(53). Median ridge of hypopygium (♂) evenly raised backward 56

Median ridge of hypopygium, if any, horizontal 57

56(55). Larger species, over 5.5 mm; antennae relatively shorter, ratio between length of antennae and width of head across eyes as 1.22:1 (Argentina) .... **argentinensis** Kormilev, 1953

Smaller species, less than 5.25 mm; ratio between length of antennae and width of head across eyes as 1.35:1 (Brasil, Uruguay) .... **minor** Kormilev, 1960c

57(55). Paratergites (♀) very short, reaching ⅓ of segment IX 58
Paratergites larger, reaching at least ½ of segment IX 59
58(57). Head short, ratio between length and width across eyes as 1:1.18 (British Guiana) .... **guianensis** Kormilev, 1964a
Head almost as long as width across eyes 1:1.07 (Argentina) .... **saltensis** Kormilev, 1953
59(57). Anterior process of head reaching, or almost reaching, tip of antennal segment I; hind lobe of pronotum not dilated anteriorly 60
Anterior process produced beyond tip of antennal segment I; hind lobe of pronotum dilated anteriorly (Guatemala) .... **maculiventria** (Champion), 1898
60(59). Larger species, over 7.5 mm (♀); head wide, ratio between length and width across eyes as 1:1.17; pronotum short and wide, ratio length:width as 1:2 (Brasil) .... **eurycephala** Kormilev, 1960a
Smaller species, less than 6.5 mm (♀); head narrow, ratio between length and width across eyes as 1:1.14; pronotum longer and narrower, ratio length:width as 1:1.18 (Brasil) .... **carioca** Kormilev, 1964a
61(49). Postocular tubercles slightly produced beyond outer border of eyes 62
Postocular tubercles at most reaching outer borders of eyes 66
62(61). Connexivum bicolored 63
Connexivum unicolored 64
63(62). Larger species, over 7.5 mm; granulations of the body very coarse, forming rows, or groups; head as long as width across eyes (Brasil, Uruguay, Paraguay, Argentina) .... **granuligera** (Stål), 1860
Smaller species, less than 6.0 mm; granulations fine and evenly distributed; head much shorter than width across eyes (24:27) (Brasil) .... **costalimai** Kormilev, 1964a
64(62). Large species, length over 6.5 mm; antennal segment I shorter, ratio between length of segments I and III as 1:1.3 65
Small species, length less than 6.0 mm; antennal segment I longer, ratio between length of segments I and III as 1:1.15 (Argentina) .... **spissigrada** Kormilev, 1960a
65(65). Lateral borders of pronotum distinctly constricted in the middle; paratergites (♀) large, rounded, reaching ½ of a small segment IX (Central America) .... **neotropicalis** (Champion), 1898
Lateral borders of pronotum only slightly sinuate; paratergites (♀) shorter, reaching basal ⅓ of segment IX (Mexico) .... **nasalis** Kormilev, 1968b
66(61). Connexivum bicolored or tricolored 67
Connexivum unicolor 68
67(66). Larger species, over 8.0 mm; segment IX (♀) truncate posteriorly (Argentina, Brasil) .... **paragranuligera** Kormilev, 1953
Smaller species, less than 7.0 mm; segment IX (♀) small, subtriangular (Jamaica) .... **jamaicensis** (Bergroth), 1906
68(66). Body covered with long, erect bristles (Mexico) .... **longipilis** (Champion), 1898
Body with short, curled or erect hairs 69
69(68). Spiracles VIII sublateral, but not visible from above 70
Spiracles VIII ventral, placed further from margin 79

70(69). Anterior process of head very short, reaching at most ⅓ of antennal segment I 71
Anterior process of head longer, reaching at least ½ of antennal segment I 72

71(70). Antennal segment I much shorter than III (11.5:15) (Ecuador) .... **obscura** (Distant), 1893
Antennal segment I as long as III (Guatemala) .. **lata** (Champion), 1898

72(70). Anterior process of head longer, reaching ⅔ of antennal segment I .. 73
Anterior process reaching only ½ of antennal segment I 77

73(72). Head as long as width across eyes 74
Head distinctly shorter than width across eyes 75

74(73). Larger species, over 8.0 mm; antennal segment I much longer than III (20:15.5) (Venezuela) .... **crenulata** Kormilev, 1968a
Smaller species, less than 7.5 mm; antennal segment I shorter than III (12.5:15) (Mexico) .... **occidentalis** Kormilev, 1968b
a. Second valvifer normal .... **occidentalis** s.str.
Second valvifer with a finger-shaped appendix .... var. **appendiculata** Kormilev, 1968b

75(74). Antennal segment I distinctly shorter than III (12:15) 76
Antennal segment I only slightly shorter than III (10:11) (Puerto Rico, Haiti) .... **placida** Kormilev, 1968a
a. Median ridge of hypopygium reaching ¾ of disc (Puerto Rico) .... **placida** s.str.
Median ridge of hypopygium almost reaching tip of disc (Haiti) .... var. **haitiensis** Kormilev, 1968a

76(75). Antennal segment I distinctly longer than IV (12:10) (Mexico) .... **mexicana** Kormilev, 1964a
Antennal segment I as long as IV (8:8) (U. S. A.) .... **granulata** (Say), 1832

77(72). Lateral borders of pronotum only slightly sinuate; 4 (2 + 2) ridges of pronotum weak; postocular tubercles reaching outer borders of eyes (Mexico) .... **moesta** (Stål), 1862
Lateral borders of pronotum distinctly constricted; 4 (2 + 2) ridges of pronotum sharp; postocular tubercles not reaching outer borders of eyes 78

78(77). Antennal segment I shorter than III (10:11.5); paratergites (♀) very short, reaching basal ¼ of segment IX (Costa Rica) .... **paralata** Kormilev, 1964a
Antennal segment I longer than III (15:13); paratergites (♀) subtriangular, reaching ½ of segment IX (Trinidad) .... **trinidadensis** Kormilev, 1956

79(69). Large species, length over 7.0 mm 80
Small species, length less than 7.0 mm 84

80(79). Antennae longer, almost twice as long as head wide across eyes (64:34) 81
Antennae shorter, ratio length of antennae: width of head across eyes as 5:3 82

81(80). Head as long as width across eyes; antennal segment I much longer than II (18:12.5) (U. S. A., Canada) .... **lobata** (Say), 1832

Head distinctly shorter than width across eyes (32.5:35); antennal segment I moderately longer than II (17.5:14) (Mexico) .... **carinata** Usinger, 1936

82(80). Anterior process of head short, reaching at most ⅔ of antennal segment I; antero-lateral angles of pronotum produced forward as far as collar; tergum VIII (♀) deeply sinuate posteriorly, segment IX truncate (Mexico) .... **rugicornis** (Champion), 1898

Anterior process long, reaching at least ¾ of antennal segment I; antero-lateral angles of pronotum produced beyond collar; tergum VIII (♀) weakly, if any, sinuate posteriorly, segment IX rounded posteriorly 83

83(82). Wide species, ratio length:width of the body as 2.33:1; anterior process of head reaching at least ¾ of antennal segment I; antenniferous tubercles very wide at base; antero-lateral angles of pronotum evenly rounded, crenulate (Bolivia, Colombia, Brasil) .... **neonigripennis** Kormilev, 1953

Narrow species, ratio length: width of the body as 2.44:1; anterior process reaching at most ¾ of antennal segment I; antenniferous tubercles narrow at base; antero-lateral angles of pronotum more produced forward than sideways (Argentina, Bolivia, Brasil) .... **misionensis** Kormilev, 1953

84(79). Head at least as long as width across eyes 85

Head distinctly shorter than width across eyes 87

85(84). Head longer than width across eyes (30:27.5); antennal segments I and III equal in length (Ecuador) .... **ecuatoriana** Kormilev, 1968a

Head as long as width across eyes; antennal segment I shorter than III 86

86(85). Larger species, over 7.0 mm; antennal segment I distinctly shorter than III (8:13); body not incrustate (West. U. S. A.) .... **vanduzeei** Usinger, 1936

Smaller species, less than 7.0 mm; antennal segment I only slightly shorter than III (9:10); body incrustate above and beneath (Paraguay, Argentina, Brasil) .... **nigripennis** Usinger, 1936

87(84). Antennal segment I as long as III, II longer than IV (9.5:8); inner ridges of pronotum flattened, less prominent than outer ridges (Mexico) .... **veracruzensis** Kormilev, 1968b

Antennal segment I slightly shorter than III (8:9), II at most as long as IV; all 4 ridges of pronotum equal in height 88

88(87). Large species, over 6.5 mm; anterior process of head reaching ⅔ of antennal segment I; postocular tubercles reaching outer borders of eyes (Argentina) .... **bruchi** Kormilev, 1953

Small species, less than 6.0 mm; anterior process reaching ¾ of antennal segment I; postocular tubercles reaching, or mostly produced beyond outer borders of eyes (Argentina) .... **bonaerensis** Kormilev, 1960a

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NORTH AMERICAN GRASSHOPPERS OF THE GENUS ARGIACRIS, INCLUDING TWO NEW SPECIES FROM IDAHO

(ORTHOPTERA: ACRIDIDAE: CATANTOPINAE)

ASHLEY B. GURNEY, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—The genus *Argiacris* comprises four species and one additional subspecies of brachypterous catantopine grasshoppers superficially resembling certain species of *Melanoplus*. They are as follows: *A. rehni* Hebard, southcentral Montana; *A. militaris militaris* (Scudder), *militaris* **laticerca**, n. subsp., **keithi**, n. sp., and **amissuli**, n. sp., from central Idaho. Except for *amissuli*, the Idaho species all occur above 8,000 feet in habitats of scant vegetation. *A. amissuli* and *rehni* occur at about 5,000 feet elevation, in a zone which includes some sagebrush.

In comprehensive ecological and systematic surveys of Idaho grasshoppers during recent years by Merlyn A. Brusven, Department of Entomology, University of Idaho, Moscow, and Keith Evans, Plant Protection Division, U.S. Department of Agriculture, Twin Falls, Idaho, and their associates, several collections of the poorly known genus *Argiacris* have been made. In August 1969 I was privileged to spend a week with them in a variety of Idaho habitats, and additional collections of the genus were made. Then, in August 1970, Brusven, Evans and Allen C. Scoggan spent several days on a pack trip in the area about 25 miles northwest of Stanley, Idaho, and collected a large number of *A. militaris* at numerous points, so it is now possible to provide a synopsis of the several known species.

Argiacris was established by Hebard (1918), and its relationships were discussed briefly by Rehn and Randell (1963) and Gurney and Rentz (1964). The species resemble superficially some brachypterous species of *Melanoplus*, but especially when compared with the type

[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

species of *Melanoplus*, *M. femurrubrum* (De Geer), *Argiacris* differs in the width of the mesosternal interspace, patterns of epiphallus and aedeagus, and the amount of body pubescence. Several species-groups now assigned to *Melanoplus* do not belong there in a strict sense, but removal must await further revisionary studies.

Material of *Argiacris* is now sufficient to show that two well defined species-groups are represented. One consists of the type species, *A. rehni* Hebard, and *amissuli*, n. sp.; they have short nearly attingent or sometimes overlapping tegmina, moderately robust form, and inhabit rocky gravelly soils likely to support some sagebrush at about 5,000 feet elevation. The other group includes *militaris militaris* (Scudder), *militaris liticerca*, n. subsp., and *keithi*, n. sp.; they have short lateral tegmina, smaller build, and inhabit rocky areas usually with scant vegetation and above 8,000 feet. The latter group is closely related to the genus *Agnostokasia* of Mono Co., Calif., but the general shape of the male cerci suggests that two genera are represented.

I would like to express appreciation to the Idaho entomologists mentioned here and those cited in collecting records for their contribution toward this review of *Argiacris*, also to Kenneth J. Goeden, Oregon Department of Agriculture, Salem, Oreg., who participated in our 1969 collecting trip and contributed numerous chill-dried specimens. My colleague Arthur D. Cushman has assisted with the illustrations.

Key to Species of **Argiacris** Based Chiefly on Males

1. Tegmina attingent or nearly so, sometimes overlapping; larger, hind femur 10 mm long or more 2
   Tegmina widely separated, lateral; smaller, hind femur usually not longer than 9 mm 3
2. Tegmen tapering sharply in apical third (fig. 10); aedeagus with ventral valves unspecialized apically (fig. 16). (South-Central Montana) .... **rehni** Hebard
   Tegmen more broadly rounded in apical third (fig. 9); aedeagus with ventral valves specialized apically (fig. 17). (East-Central Idaho) .... **amissuli**, n. sp.
3. Arms of furcula very short (fig. 2); pronotum with dark color pattern, blackish on lateral lobes and extending as an indefinite band across pronotal disk (fig. 15); aedeagus as in fig. 20. (Central Idaho, chiefly area of Middle Fork of Salmon River and nearby) .... **keithi**, n. sp.
   Arms of furcula longer (fig. 3); disk of pronotum without a dark transverse band (fig. 14); aedeagus with dorsal valve very different from above 4
4. Cercus slender (fig. 6); tegmen narrow (fig. 11); specialized lateral piece of aedeagus with sclerotized dark vertical support (fig. 18, *svs*) extending dorsally a short distance beyond portion of main stem (*msa*) which surrounds its base. (Central Idaho, chiefly Sawtooth and Challis National Forests) .... **militaris militaris** (Scudder)

Cercus wider, usually as in fig. 8; tegmen averaging wider, as in fig. 12 or nearly as broad; lateral piece of aedeagus with sclerotized dark vertical support (fig. 19, *svs*) longer, extending further dorsally beyond surrounding base of main stem (*msa*). (East-Central Idaho, chiefly Lemhi Range) .... **militaris laticerca**, n. subsp.

Argiacris rehni Hebard
(Figs. 1, 5, 10, 16, 21)

Argiacris rehni Hebard, 1918: 167, pl. 8, fig. 18.

The type locality is Livingston, Park County, Montana, elevation 5,000 feet; the holotype male is at the Academy of Natural Sciences, Philadelphia. The original material consisted of 10 specimens collected July 29, 1909, "on the ridge of a slope of a bare hogback showing numerous cherty exposures. The ground there showed rather scant vegetation with tufts of a peculiar woolly plant all about." Later, Hebard (1928:291) recorded additional specimens (17 males, 9 females) collected at Livingston in 1905 and 1906. I have seen more recently collected specimens from Olaf (near Twodot), Wheatland County, and 12.5 miles north of Big Timber, Sweet Grass County, Montana, as noted by Gurney and Rentz (1964).

The aedeagus of *rehni* is characterized by an elongate dorsal valve (fig. 16, *dv*) fused apically to a specialized apex of a dark sclerotized mesal portion of the main stem of the aedeagus. The apex of the dorsal valve is prominent as illustrated by Gurney and Rentz (1964, fig. 15) when exposed, but in KOH treatment the less sclerotized extreme apex sometimes is reduced, so that it extends only a short way above the associated apex of the main stem, shown in fig. 16. The arms of the furcula are short, comparable to fig. 2 of *keithi*. Hebard's original habitus illustration is a good representation of general appearance, including attingent tegmina.

Argiacris amissuli, n. sp.
(Figs. 1, 4, 9, 17, 22)

Holotype.—Male. Head in dorsal view with ratio of interocular distance to width of a compound eye 8:14; lateral margins of shallow fastigial sulcation nearly

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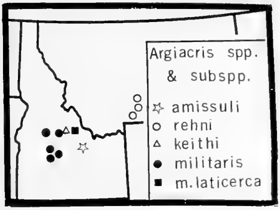
Fig. 1, Map showing distribution of *Argiacris* spp. Figs. 2–13, Structures of *Argiacris* spp.: 2, *keithi*, n. sp., furcula and supra-anal plate, holotype; 3, *militaris laticerca*, n. subsp., furcula and supra-anal plate, holotype; 4, *amissuli*, n. sp., left cercus, holotype; 5, *rehni* Hebard, left cercus, near Big Timber; 6, *militaris militaris* (Scudder), left cercus, Twin Peaks; 7, *keithi*, left cercus, holotype; 8, *militaris laticerca*, left holotype; 9, *amissuli*, left tegmen, holotype; 10, *rehni*, left tegmen, near Big Timber; 11, *militaris militaris*, left tegmen, ♂, Twin Peaks; 12, *militaris laticerca*, left tegmen, ♂ paratype; 13, *keithi*, left tegmen, ♂ paratype, Twin Peaks. Fig. 14, *militaris militaris*, general view, ♀, Twin Peaks. Fig. 15, *keithi*, general view, ♀ paratype, Twin Peaks. (Figs. 2–15 by Arthur D. Cushman)



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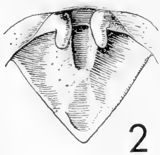
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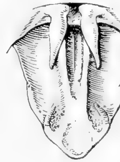
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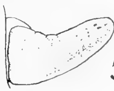
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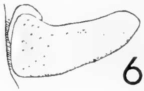
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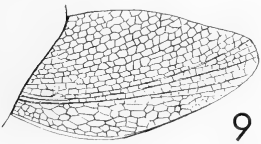
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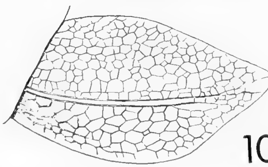
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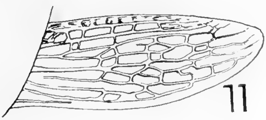
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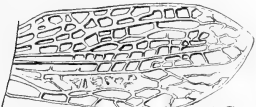
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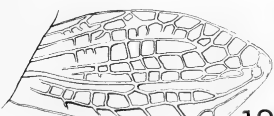
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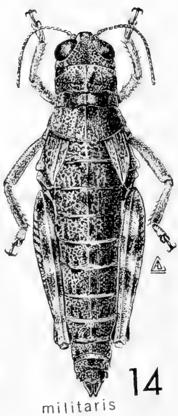
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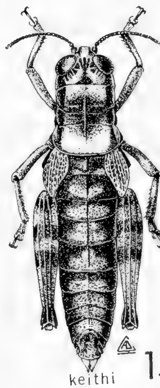
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keithi

parallel, more so than in *rehni* males; frontal costa with trace of sulcation, not narrowed; antennal flagellum with 21 articles.

Median carina of pronotum indistinct but evident on prozona, distinct on metazona, cut by 3 sulci; posterior margin enclosing about 130° of angulation, the point bluntly rounded; tegmina extending to posterior margin of tergum 2, overlapping slightly; individual tegmen as in fig. 9; hind wing rudimentary; legs as in *rehni*, hind tibial spines 11 mesal, 9 and 10 external.

Supra-anal plate a little narrower than in *keithi* (fig. 2), arms of furcula of similar length but directed straight posteriorly instead of curving laterally; cercus (fig. 4) with ventral margin thin, flangelike; subgenital plate bluntly conelike at apex.

Concealed genitalia (KOH preparation in glycerine contained in microvial) with aedeagus (figs. 17, 22) very distinct from *rehni*; ventral valves erect, twisted near apex to display earlike apical lobes posteriorly; dorsal valves closely appressed apically to ventral valves, more heavily sclerotized; specialized lateral piece (*slp*) of main stem a membranous flangelike strip attached mesally to dorsal valves; epiphallus almost like *rehni*, but lophi in anterior view show more constriction of mesal margins than *rehni*.

Coloration: General ground color grayish brown; eyes, metazona of pronotum, and tegmina brown; head and prozona light gray; front and middle legs and antennae tinged with orange white; abdomen same, with some dark dorsal blotches; hind femora with 2 dark transverse bars, also at base and apex, ventral surface livid red; hind tibiae pale orange white, tinged mesally with pinkish.

Measurements (in millimeters): Length of body, 18.0; pronotum, 5.3; hind femur, 10.4; front femur, 3.8; greatest width of pronotum, 4.5; hind femur, 3.1; front femur, 1.1.

Specimens examined: Holotype. IDAHO: 13.2 mi. n.w. Howe, Butte County, on [along] Little Lost River, about 5,000 ft., [among] dry, sparse sage, Aug. 18, 1965 (Gary Forsyth) (U.S. National Museum, Type no. 71048).

Keith Evans, who has been associated with the collector, reports that repeated attempts to collect specimens additional to the unique type have been unsuccessful. The name *amissuli* is from the Latin meaning "of something small which is lost," in allusion to the Little Lost River.

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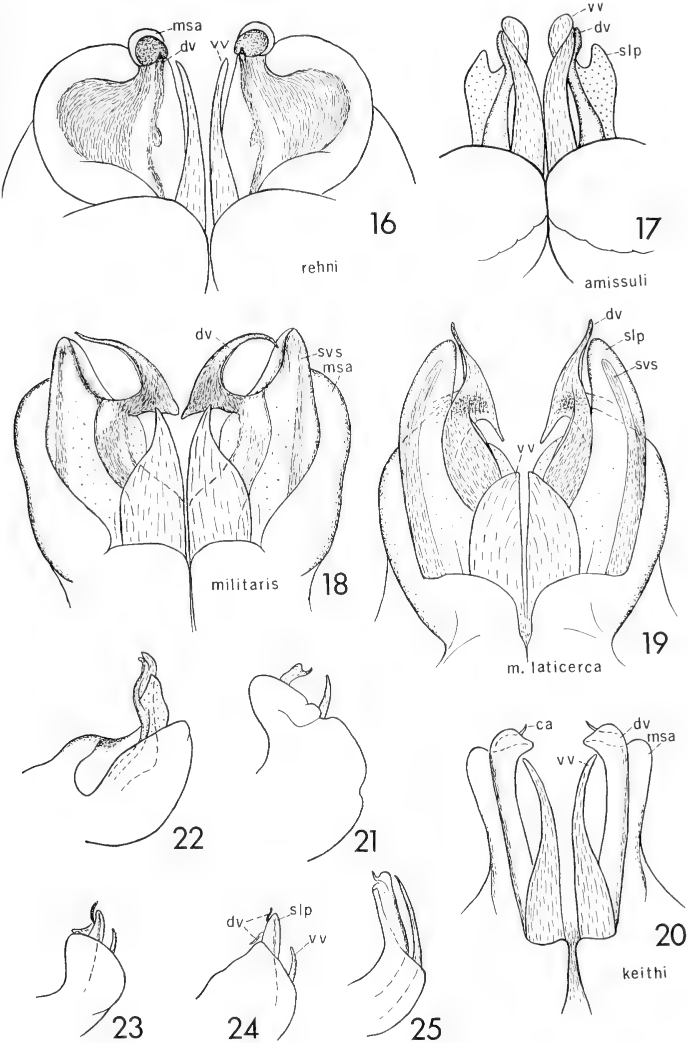
Figs. 16–25, Aedeagi of *Argiacris* spp.: 16, *rehni* Hebard, dorso-posterior view, near Big Timber; 17, *amissuli*, n. sp., dorso-posterior view, holotype; 18, *militaris militaris* (Scudder), dorso-posterior view, Imogene Pass; 19, *militaris laticerca*, n. subsp., dorso-posterior view, paratype; 20, *keithi*, n. sp., dorso-posterior view, paratype, Twin Peaks; 21, *rehni*, lateral view, anterior surface to left, near Big Timber; 22, *amissuli*, lateral view, anterior surface to left, holotype; 23, *militaris militaris*, lateral view, anterior surface to left, Imogene Pass; 24, *militaris laticerca*, lateral view, anterior surface to left, paratype; 25, *keithi*, lateral view, anterior surface to left, paratype, Twin Peaks. Abbreviations: ca, curved appendage at apex of dorsal valve; dv, dorsal valve of aedeagus; msa, main stem of aedeagus; slp, specialized lateral piece of main stem; svs, sclerotized vertical support of specialized lateral piece; vv, ventral valve of aedeagus.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Argiacris keithi, n. sp.
(Figs. 1, 7, 13, 15, 20, 25)

Holotype.—Male. Head in dorsal view with interocular distance in comparison to width of a compound eye as 5:14; fastigium shallowly sulcate; frontal costa almost flat, not narrowed at median ocellus or union with fastigium; compound eyes more bulging than as shown in fig. 15 for female; antennae filiform, flagellum of 22 articles.

Median carina of pronotum on pronotum evanescent but evident, distinct on metazona, cut by principal sulcus only; posterior margin of pronotum a little more rounded than figured for female; tegmen as in fig. 13; hind wing rudimentary; front and middle femora more robust than in female; apex of hind femur even in length with apex of abdomen.

Supra-anal plate (fig. 2) slightly acute at apex; furcula present as short arms with rounded apices; cercus (fig. 7) with broad shallow sulcation of exterior surface; subgenital plate bluntly, inconspicuously conelike dorsally at apex.

Concealed genitalia (KOH preparation in glycerine contained in microvial) with distinctive aedeagus (figs. 20, 25); ventral valves (*vv*) slender, curving broadly laterally and anteriorly in apical halves; principal appendage of each half consisting of weakly sclerotized portion of main stem of aedeagus (*msa*) fused to dorsal valve (*dv*); latter well sclerotized, specialized at apex with slender curved appendage (*ca*) dorso-anteriorly; epiphallus with slender ancorae; lophi erect, broadly rounded apically.

Coloration: Dorsal portion of occiput anteriorly to narrow point between eyes solidly blackish; fastigium dirty gray; remainder of head pale yellowish mottled with varying shades of gray; eyes orange-brown; pronotum orange-brown, grayish on ventral part of lateral lobes, dorsal two-thirds blackish, shiny on lobes of prozona, dull dark brown across disk dorsally; tegmen brown, veins yellowish, most noticeably so in anal area; dorsum of abdomen blackish, marked with pale gray as in fig. 15; supra-anal plate grayish brown, margins pale; ventral surfaces mainly pale yellowish; hind femur pale yellow with 2 dark transverse bands visible dorsally and laterally; basal and knee areas dark brown, some pinkish mesally and ventrally; hind tibiae pinkish-red; other legs pale orange; surface of body with conspicuous light gray pubescence, especially on pronotum and dorsum of abdomen.

Measurements (in millimeters): Length of body, 17.0; pronotum, 4.2; hind femur, 8.7; front femur, 3.2; greatest width of pronotum, (including lateral lobes viewed from above), 3.3; hind femur, 2.3; front femur, 1.0.

Allotype.—Female. General appearance (fig. 15) larger and more robust than male. Ratio of interocular distance to width of an eye as 8:14; cercus bluntly triangular; "scoop" of dorsal valve of ovipositor shallowly concave.

Coloration: Differing from male in smaller blackish area on occiput and grayish instead of orange-brown general color of pronotum.

Measurements: Length of body, 24.0; pronotum, 4.9; hind femur, 10.1; front femur, 3.3; greatest width of pronotum, 4.9; hind femur, 2.7; front femur, 0.8.

Variation: Paratypes agree essentially with the holotype and allotype. Dark markings on the dorsum of the head vary between the approximate extremes described for type and allotype; variation is not correlated with sex. The blackish transverse mark on the pronotal disk and the pale dorsal areas of the abdomen vary in intensity, probably due in large part to post-mortem changes. Eight male and 6 female paratypes have measurements as follows: Length of body of males, 14.6–17.0, average, 15.9; of females, 19.0–22.5, average, 20.9; of pronotum of males, 3.4–4.2, average, 3.8; of females, 4.2–4.9, average, 4.4; of hind femur of males, 8.0–9.1, average, 8.5; of females, 9.0–9.7, average, 9.4.

Specimens examined: 31 males, 20 females. IDAHO: Flume Creek Point, 7 mi. s.w. Meyer's Cove, Lemhi Co., 9,200 ft., Sept. 2, 1967 (Brusven), 2 males; Sleeping Deer Mtn., about 4 mi. s. Woodtick Divide, about 16 mi. s.w. Meyer's Cove, 8,400–9,500 ft., Sept. 9, 1968 (Brusven), 1 male, 2 females; Twin Peaks, 14 mi. n.w. Challis, Custer Co., about 10,000 ft., Aug. 26, 1969 (Brusven, Goeden, Scoggan), 28 males, 18 females (includes holotype and allotype).

The type and allotype and a portion of the 30 male and 19 female paratypes are deposited in the U.S. National Museum (No. 70906); other paratypes are deposited at the University of Idaho, California Academy of Sciences, the Twin Falls Laboratory, U.S. Department of Agriculture, Twin Falls, Idaho, and Oregon Department of Agriculture, Salem, Oregon.

The habitat at Twin Peaks extended from just a few hundred feet below and south of the Lookout building at the summit near the road along a ridge running mainly southward. Specimens were found chiefly on barren rocky gravelly ridges and talus slopes showing very little soil development; vegetation consisted of clumps of fescue grass and forbs, along with occasional conifers.

The 3 localities at which *keithi* has been collected are within about 20 air miles from each other in a rugged mountainous section near the Idaho Primitive Area.

The species is named as a tribute to Mr. Keith E. Evans in recognition of his energetic and dedicated efforts, over a period of many years, to assemble comprehensive series of Idaho grasshoppers.

Argiacris militaris militaris (Scudder)

(Figs. 1, 6, 11, 14, 18, 23)

Melanoplus militaris Scudder, 1897a: 9, 33; 1897b: 126, 224, pl. 15, fig. 3.

Scudder gave the original material and type locality as "One male, 1 female. Soldier, Logan County, Idaho (L. Bruner)." The male lectotype, designated by Rehn and Hebard (1912:82), was originally in the Bruner Collection, is now at the Academy of Natural Sciences, Philadelphia. Today Soldier is a very small place, not on many maps, which is just north of Fairfield, Camas County. Currently, no Idaho county is named Logan. In an atlas dated 1900, the vicinity of Soldier was Elmore County, and an 1888–89 atlas called it Alturas County; it may have been called Logan County at some other time.

The probable source of the type is the high mountains near the present Soldier Mountain skiing area or northeast of there in the Camas Prairie section. Bruner (1890) visited Soldier and mentioned particularly "Camas Prairie of Logan County, Idaho." He revisited the area in 1891 (Bruner, 1891) and reported that he "found specimens of at least three species that I believe are new hoppers. These were all taken at about 9,000 feet elevation." Then or soon afterward, Scudder was working on his time-consuming Revision of the Melanopli, which apparently was completed by December 1895, so it is logical to believe the Bruner specimens were loaned to Scudder soon after their capture.

I have examined the following material, none of which has been recorded previously except the type and that from Galena Summit. IDAHO: Twin Peaks, 14 mi. n.w. Challis, Custer Co., about 8,500 ft., Aug. 26, 1969 (Gurney), 3 males, 2 females; 16 mi. n.w. Challis, Custer Co., July 29, 1963 (O. O. Fillmore), 2 males, 1 female; 1 to 3 mi. e. Soldier Lookout, 8,400–8,800 ft., Aug. 25, 1970, 27 males, 9 females; 2 mi. w. Cutthroat Lake, 9,000 ft., Aug. 24, 1970, 5 males, 4 females; 1½ mi. s. Cutthroat Lake, 8,500 ft., Aug. 24, 1970, 17 males, 10 females; Soldier Lake Pass, 1 mi. w. Soldier Lakes, 8,400 ft., Aug. 24, 1970, 18 males, 7 females; Upper Helldiver Lake, 8,200 ft., Aug. 23, 1970, 13 males, 9 females; 1 mi. n. Roughneck Lookout, 8,600 ft., Aug. 23, 1970, 16 males, 9 females; Roughneck Peak, 9,100 ft., Aug. 27, 1970, 9 males, 8 females; Edith Lake, 10 mi. s.w. Obsidian, 8,600 ft., Aug. 10, 1966 (Brusven & Evans) 2 males, 1 female; Imogene Pass, 10 mi. s.w. Obsidian, about 8,500 ft., Aug. 9, 1966 (Brusven & Evans) 1 male, 1 female; Edith Lake, 10 mi. s.w. Obsidian, 8,600 ft., Aug. 10, 1966 (Brusven & Evans) 2 males, 1 female; Imogene Pass, 10 mi. s.w. Obsidian, about 8,500 ft., Aug. 9, 1966 (Brusven & Evans) 1 male, 1 female; Galena Summit, Sawtooth Range, 8,750–9,225 ft., Aug. 17, 1928), (Rehn & Hebard) 2 males, 1 female; Bald Mtn., 6 mi. w. Ketchum, Blaine Co., 9,230 ft., Aug. 27, 1969 (Brusven, Evans, Goeden, Gurney, Scoggan) 15 males, 4 females; "Soldier, Logan County, Idaho. L. Bruner," 1 male (lectotype).

The 7 localities from Soldier Lookout to Roughneck Peak are in the Challis National Forest, Custer County, and average about 25 miles northwest of Stanley. Collections at these localities were made by Brusven, Evans, and Scoggan. Edith Lake and Imogene Pass are adjacent to the Sawtooth Primitive Area, about 8 miles directly south of the southern end of Redfish Lake. Obsidian is about 1½ miles east of Highway 93, about 18 miles southeast of Stanley.

Only a little variation in shape of cercus (fig. 6) has been noted.

The apical third of tegmen in a few specimens is not narrowed as noticeably as in fig. 11, which is the usual shape. The dorsal lobe of the dorsal valve usually is recurved as shown in the right side of fig. 18, but sometimes extends dorso-laterally as shown at the left of the same figure. The Imogene Pass specimen illustrated in fig. 18 is asymmetrical, as drawn.

At Twin Peaks most of the specimens were found on boulders of a talus slope with only scattered vegetation present, in a place about 2 miles from the *keithi* site and at least 1,000 feet lower. At Bald Mountain they occurred in a nearly level area on the coarse stony ground surface at the summit.

Argiacris militaris laticerca, n. subsp.
(Figs. 1, 3, 8, 12, 19, 24)

Holotype.—Male. Externally agreeing with *keithi* and *militaris militaris* in most characters except as mentioned in key: Head in dorsal view with interocular distance in relation to width of a compound eye as 5:11; flagellum of antenna with 20 articles.

Median carina of pronotum on prozona evident only on anterior half; tegmen a little more slender than drawn from paratype (fig. 12), ratio of maximum width to length 11:26.

Supra-anal plate (fig. 3) without distinct lateral specialization; furcula extending about one-third length of plate; cercus as in Fig. 8.

Concealed genitalia (KOH preparation in glycerine) with ventral valves (*vv*) prominent, broadly tapered apically, with striated surface structure conspicuous; specialized lateral piece of aedeagus (fig. 19, *slp*) on each side extending dorsally more than in *militaris militaris*, the vertical supporting rod (*svs*) prominent; each dorsal valve with specialized apical portion borne mesoanteriorly, the area of attachment heavily sclerotized and dark, the basal lobe short, somewhat twisted and with a broad face directed anteriorly, the dorsal lobe long and very slender; epiphallus similar to that of *keithi*, an individual lophus seen dorsally more elongate than in *keithi*.

Coloration: Whole dorsum of head blackish generally, with some small gray streaks, remainder of head whitish gray; eyes orange-brown; ventral third of lateral lobes of pronotum dirty gray, remainder of pronotum black, duller and with very few gray streaks on disk; tegmen brown, a little paler in anal area; dorsum of abdomen blackish, spotted with pale chiefly toward apex; supra-anal plate yellow-gray, furcula very pale orange; ventral surface and legs as in *keithi*.

Measurements (in millimeters): Length of body, 16.0; pronotum, 3.7; hind femur, 8.8; front femur, 2.9; greatest width of pronotum, 3.3; hind femur, 2.3; front femur, 1.0.

Allotype.—Female. General appearance much as shown in fig. 14 for *militaris militaris*, but tegmina broadly rounded apically. Ratio of interocular distance to width of an eye from above 8:13; cercus very broadly triangular; apex of dorsal valve of ovipositor more sharply upturned posterior to "scoop" than in allotype of *keithi*.

Coloration: General color a speckled brownish-gray, the pattern essentially as illustrated for typical *militaris*; pronotum dull, black area on lateral lobes not sharply defined; tegmina reddish brown.

Measurements: Length of body, 20.5; pronotum, 4.5; hind femur, 9.5; front femur, 2.6; greatest width of pronotum, 4.5; hind femur, 2.6; front femur, 0.7.

Variation: The cerci of about half of the 19 male paratypes are not quite so broad proportionally as in fig. 8, though broader than in typical *militaris* (fig. 6). Tegmina of several paratypes of both sexes are intermediate between figs. 6 and 8. Several paratypes are reddish brown in general color instead of blackish gray as in the majority of specimens. Reddish hind tibiae and dark banding of hind femora are uniform. Nine male and 5 female paratypes have measurements as follows: Length of body of males, 15.0–17.0, average, 16.1; of females, 21.0–24.5, average, 22.7; of pronotum of males, 3.5–3.7, average, 3.6; of females, 4.4–4.7, average, 4.5; of hind femur of males, 8.2–9.4, average, 8.7; of females, 10.0–10.5, average, 10.1. Body length of males is very variable, depending on the degree of curvature anterior of the posterior segments, so it is hardly a dependable indication of size.

Specimens examined: 20 males, 12 females. IDAHO: Meadow Lake, 6 mi. (by road) s.w. Gilmore, Lemhi Co., 9,000 ft., Aug. 24, 1969 (Brusven, Goeden, Gurney, Scoggan), 16 males, 5 females (including type and allotype); same, July 27, 1961 (W. F. Barr), 2 males, 1 female); Aug. 30, 1962 (G. B. Hewitt) 1 female; same, (W. F. Barr), 1 female; Aug. 17, 1966 (Brusven, F. Nonini) 2 males, 4 females.

The holotype, allotype, and a portion of the 19 male and 11 female paratypes are deposited in the U.S. National Museum (No. 70907); other paratypes are at the University of Idaho, California Academy of Sciences, and Oregon Department of Agriculture, Salem, Oregon.

The only locality at which *militaris laticerca* has been collected is a rocky talus slope, west exposure, at about 9,000 feet altitude, some 300 yards north of Meadow Lake, near a park and picnic area, which in turn is 6 miles s.w. from the deserted old mining town of Gilmore. The habitat is sparsely vegetated with fescue grasses, sedges and scattered forbs.

Because of variation in comparative width of tegmina and of male cerci, some specimens are not readily distinguished from typical *militaris* by those characters. It has been possible to distinguish all males by the aedeagus, but there is some variation. Also, there is such a close similarity of aedeagus in the 2 entities, in contrast to quite different aedeagal details of *militaris militaris* and *keithi*, that it is unlikely that *laticerca* is more than a subspecies of *militaris*. Although the population of *laticerca* may be isolated, it probably is in the process of evolving from *militaris*-like stock, and regarding it as a subspecies is the best interpretation of its relationship. The name *laticerca* refers to the wide cercus.

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A NEW SPECIES IN THE GENUS URSIA BARNES & McDUNNOUGH
(LEPIDOPTERA: NOTODONTIDAE)

ANDRÉ BLANCHARD, *P. O. Box 20304, Houston, Texas 77025*

ABSTRACT—The adult male of *Ursia* **furtiva**, n. sp., is described from the Big Bend area of Texas.

Ursia furtiva, n. sp.

Male.—Head hirsute, clothed with mixture of long, narrow, blackish and whitish scales. Antennae bipectinate, of about 45 segments; pectinations extending almost to apex of shaft; each pectination with two rows of numerous setae. Eyes round, diameter about 0.75 mm. Front wedgeshaped, 0.40 mm wide below, 0.90 mm wide at top. Palps filiform, porrect, minute, shaggy.

Thorax hirsute all over, gray above and beneath. Scales of the collar back row black.

Legs with long, narrow, loose, grayish scales on top side of all three tibiae. Tarsi smoothly scaled, black, narrowly white distally.

Abdomen: no notes made before dissection.

Wings above: pattern of maculation clearly shown by fig. 1. The color varies in saturation but not in hue from white to browish black, except narrowly around discal bar at end of cell, where it tends to become a little yellowish.

Fig. 1, *Ursia furtiva*, n. sp., holotype male, Big Bend National Park, Pine Canyon, 2 September 1964, 5200 feet.

Wings beneath: forewings gray, darker along veins in outer half. Basal two third of costa dark brownish gray, outer third white with three black spots corresponding to similar spots above. Disc of wings covered with thinly-scattered long thin hairs. Hindwings white except along dark brownish costa.

Wing expanse: 22 mm.

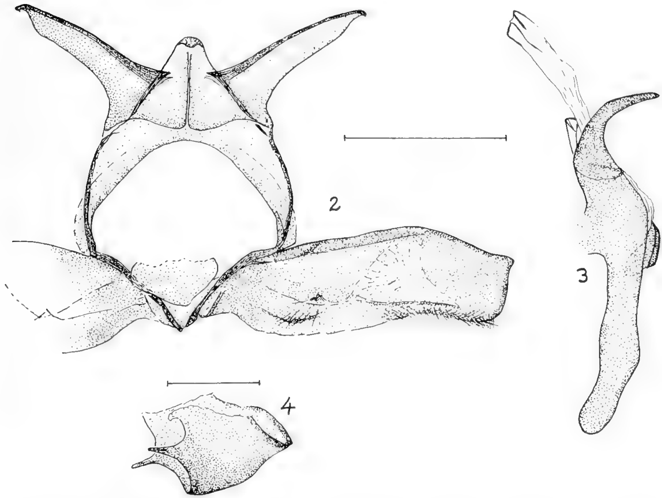
Genitalia: as in figs. 2 to 4. The upper part of broken juxta is attached to aedeagus, while lower part remained attached to valves.

Female.—unknown.

Holotype: male, Big Bend National Park, Pine Canyon, 2 Sept. 1964 (5200 feet), deposited in the U.S. National Museum, type number 64648.

The new species is known only from the holotype. The most prominent features of the pattern of maculation—the dark spots beyond the lower part of the post-median line, the intervenular dark dashes in cells M_1 and M_2, and the crescent shaped spot on costa near apex—are similar to those of *U. noctuiformis* B. & McD., the only other species known in the same genus, but they are much more heavily marked in *furtiva*.

The genitalia are quite distinctive: the uncus of *furtiva* is much narrower and triangular; the socii are straight instead of angled or bent; but perhaps the most striking difference is the presence of two acute sclerotized projections on the posterior margin of the sternal plate of the eighth abdominal segment instead of only a rounded one.



Figs. 2–4, *Ursia furtiva*, n. sp.: 2, male genitalia, aedeagus omitted; 3, aedeagus; 4, sternal plate of the eighth abdominal segment. The linear segments represent 1 mm.

ACKNOWLEDGMENT

I offer my sincere appreciation to Dr. John G. Franclemont for his assistance in describing this new species.

NEW RECORDS OF STAPHYLINIDAE FROM NORTH CAROLINA
(COLEOPTERA)

The Coleoptera fauna of North Carolina is relatively well known, but, to my knowledge, no specific collection records for members of the staphylinid subfamilies Piestinae and Hypocypthtinae have been published. The following material representing these taxa has been collected and identified by the writer:

Piestinae—*Siagonium americanum* Melsh. Seven specimens from ultraviolet light trap. North Carolina, Mecklenburg County, Charlotte. August 7–8, 1970 (5), August 10, 1970 (1), September 3, 1970 (1). J. F. Cornell.

Hypocyphtinae—*Anacyptus testaceus* (Lec.). One specimen berlesed from termite nest (*Reticulitermes* sp.) in fallen oak log. North Carolina, Duplin County, near Calypso. February 5, 1965. J. F. Cornell.

Specimens are deposited in the collection of the writer and that of the Dept. of Entomology, North Carolina State University, Raleigh, North Carolina.—J. F. CORNELL, *Department of Biology, Appalachian State University, Boone, North Carolina 28607.*

FAMILY PLACEMENT OF THE AFRICAN GENUS MEGANOMIA COCKERELL WITH A REVIEW OF THE INCLUDED SPECIES
(HYMENOPTERA: APOIDEA)

GERALD I. STAGE, *Systematic and Evolutionary Biology, Biological Sciences Group, University of Connecticut, Storrs, Connecticut 06268.*

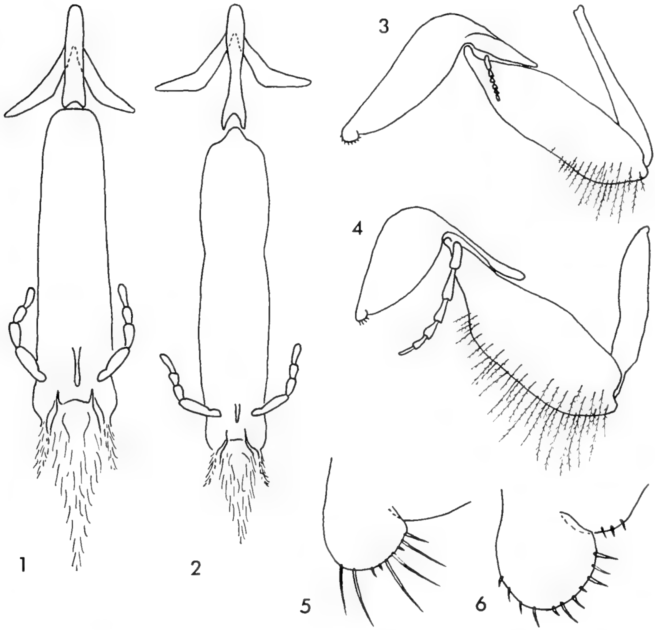
ABSTRACT—*Meganomia* Cockerell is transferred from the subfamily Nomiinae in the Halictidae to the subfamily Melittinae in the Melittidae. The species in the genus are reviewed and a key provided.

Meganomia is a small genus of medium sized bees from several localities in the arid parts of Africa south and east of the tropical regions. No doubt impressed by a habitus suggestive of certain African species of *Nomia*, Cockerell originally described the taxon in 1909 as a monobasic new subgenus of *Nomia* to contain the new species, *N.* (*M.*) *binghami.* Since that time there appeared at least ten pertinent publications by seven different authors (Arnold, 1947; Cockerell, 1931, 1933, and 1934; Friese, 1909, and 1930; Hedicke, 1931; Meade-Waldo, 1916; Michener, 1944; and Strand, 1920). In all these publications the authors either treated the bees as species of *Nomia* without knowing of Cockerell's previous work or they more or less followed Cockerell's lead and treated them as species of *Meganomia.* In the latter case *Meganomia* was considered either a subgenus of *Nomia*, or a closely related but distinct genus, or a distinct genus within the halictid subfamily Nomiinae whose affinity with *Nomia* is not specified.

I have recently studied authoritatively identified specimens in the collection of the U.S. National Museum, Smithsonian Institution, Washington, D.C., representing both sexes of the type species as well as the female of a second species. In my opinion these bees are not closely related to *Nomia* and should not even be included in the family Halictidae. Indeed, they belong in the family Melittidae where they fit nicely into the typical subfamily in spite of several bizarre (for melittids) characters and a habitus suggestive of certain nomiines or even more of many anthidiines.

Since the original description of *Meganomia* and those of its included species are inadequate, the following redescription of *Meganomia* is presented to document the necessity of its interfamilial transfer as well as to permit a more adequate understanding of its relationship to other melittine genera. Significant family characters are printed in italics.

The form of the mouthparts (maxillae and labium) alone are sufficient to preclude the possibility of *Meganomia* belonging in any family other than Melittidae or Andrenidae. Since the single subantennal sutures, the lack of facial foveae, the limited scopae, and the form of



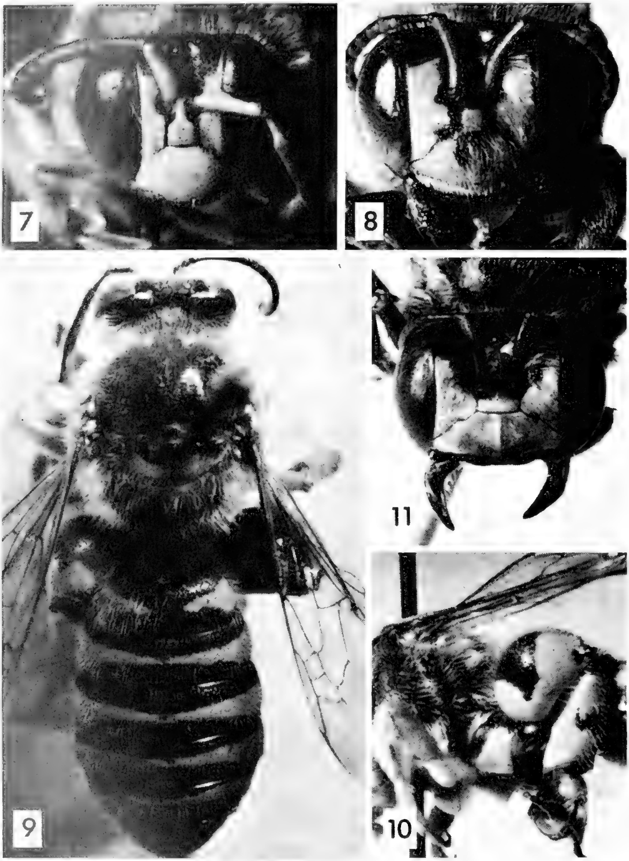
Figs. 1, 3, 6, *Meganomia tavetensis* Ckll.: 1, ♀ labium; 3, ♀ maxilla; 6, apex of galea. Figs. 2, 4, 5, *M. binghami* (Ckll.): 2, ♀ labium; 4, ♀ maxilla; 5, apex of galea.

the male genital capsule are all contraindicative of the latter but compatible with the former, *Meganomia* must be a melittid and is hereby transferred to that family.

Meganomia Cockerell
(Melittidae: Melittinae, new family and subfamily placement)
(Figs. 1–11)

Nomia (*Meganomia*) Cockerell, 1909, p. 402 (as a monobasic subgenus for *N.* (*M.*) *binghami*); Arnold, 1947, p. 208 (characterized as a subgenus of *Nomia*).
Meganomia Cockerell, 1931, p. 201 (raised to generic rank); Michener, 1944, p. 251 (cited as a genus in the Nomiinae).

Diagnosis: The species of *Meganomia* can be easily distinguished from all other melittid genera by their extensive yellow integumental markings and generally sparse vestiture which gives them a habitus



Figs. 7–10, *Meganomia binghami* (Ckll.): 7, ♂ head; 8, ♀ head; 9, ♂ dorsal view; 10, ♂ mid and hind legs. Fig. 11, *M. tavetensis* Ckll., ♀ head.

suggestive of anthidiines. In addition, the transversely hollowed labrum, the apically modified galea and the conspicuously developed, carinate gradulae are unique among melittids. Likewise, in males the apically hooked antennae, the inflated hind legs and the reduced, linear volsellae are unique among melittids.

Description: Integument contrastingly black and yellow with yellow areas particularly extensive on front of head, on legs, and on metasoma. Vestiture generally sparse and short, particularly on metasoma. *Subantennal sutures directed more toward outer edge of scrobes than inner; subantennal plates absent*; apex of flagellum flattened and forming a hook in male; *facial foveae absent*; *labrum much broader than long*, medially deeply hollowed transversely to receive closed mandibles; *galeae distinctly longer postpalpally than prepalpally*; galeae with fringed apical lobe formed by deep subapical emargination on outer edge; *stipes lacking comb; glossa acute*; *labial palpi subequal and subcylindrical*; *mentum long, parallel sided or tapering basally; submentum large, V-shaped. Pre-episternal suture absent*; *scrobal suture absent anterior to episternal scrobe*; metanotum subhorizontal. Wings with marginal cell long, narrow and apically narrowly rounded near costal margin, 3 submarginal cells; 1st submarginal cell longest and subequal to 2nd and 3rd combined; 2nd and 3rd submarginals subequal or 2nd slightly shorter; prestigma longer and wider than stigma; jugal lobe ½ to ⅔ length of vannal lobe. Basitibial plate absent in males, if present in females than plate obscured by velvet-like patch of short, dense, hairs; mid leg with femora longitudinally carinate below in female; *scopa confined to hind tibia and basitarsi* and composed primarily of long, simple hairs; hind leg of male with femora grossly inflated, tibia inflated less, and basitarsi inflated but strongly excavated on inner edge. Metasomal terga 2 to 5 in female and 2 to 6 in male with gradulae well developed, conspicuously carinate and extending to posterior margin of terga; terga 1 to 4 in female and 1 to 7 in male with posterior part shallowly depressed and conspicuously less densely punctate than anterior part; tergum 5 in female with dense subapical fimbria; *pygidial plate present and well developed in both sexes. Male genital capsule with gonobase large*; *gonostyli not distinguishable from gonocoxites*; *penis valves unfused except dorsally near base*; *volsellae present* but small, linear and lacking lateral cuspis.

The four species currently assigned to this genus can be separated by the following key.

Provisional Key to the Species of **Meganomia**

1. Females 2
   Males 4

2(1). Lateral ocelli well below top of vertex in frontal view; scape unicolorous, dark 3
   Lateral ocelli nearly tangent to top of vertex in frontal view; scape bicolorous, yellow beneath, dark above .... **M. binghami**

3(2). Clypeus with distinct longitudinal median ridge (fig. 11); terga 2 to 5 with transverse yellow bands broad and entire .... **M. tavetensis**
   Clypeus lacking median ridge; terga 2 to 5 with transverse yellow bands narrow and interrupted broadly at meson .... **M. tsavoensis**

4(1). Median flagellar segments subcylindrical; hind trochanters pointed posteriorly (fig. 10) .... **M. binghami**
   Median flagellar segments subtuberculate beneath making flagellum serrate; hind trochanters not pointed .... **M. andersoni**

Meganomia binghami (Cockerell)
(Figs. 2, 4, 5, 7–10)

Nomia (*Meganomia*) *binghami* Cockerell, 1909, pp. 402–403 (Male and female described); Hedicke, 1931, p. 35 (Synonymy of *N. flavofasciata* Friese).

Nomia flavofasciata Friese, 1909, p. 170 (Female described); Friese, 1930, p. 14 (Male described); Hedicke, 1931, p. 35 (Synonymized with *N.* (*M.*) *binghami*).

Meganomia binghami: Cockerell, 1931, p. 202; Cockerell, 1933, p. 376 (New locality record).

Female: Length 17.5 mm. Vertex flat in frontal view; compound eyes very large with inner orbits subparallel most of length; summit of eyes reaching top of vertex in frontal view; lateral ocelli nearly tangent to top of vertex; clypeus broadly uniformly convex, and with surface partly obscured by short white oblique hairs; supraclypeal area with median maculation; scape bicolorous, yellow beneath, dark above; mandibles with subapical inner tooth; maxillary palpi exceeding post-palpal portion of galea in length; longest seta on apical lobe of galea subequal to width of that lobe; labial palpi with first segment subcylindrical. Notauli and parapsidal lines well developed and long, with the latter extending from hind margin of mesoscutum anteriorly to tegulae; marginal cell not apically appendiculate; 2nd and 3rd submarginal cells subequal along posterior side and sides of 2nd submarginal strongly converging anteriorly; hind femora longitudinally carinate below; basitibial plate discernible under velvet-like patch of short, dense pubescences; scopa dense, composed of long, silvery hairs; hind tibial spurs obscured by long hairs. Metasomal tergum 1 with lateral arms of gradulus present, median transverse section absent; terga 4 and 5 with a small, oval, uniformly fine aciculate spot mesad of each spiracle and anterior to gradulus (may be hidden under margin of preceding tergum); sterna with vestiture short, sparse, and pale.

Male: Length 18.0 mm. Vertex flat in frontal view; compound eyes extremely large with maximum width seen from in front subequal to interorbital distance and with inner orbits convex and diverging at both ends; summit of eyes reaching top of vertex in frontal view; lateral ocelli tangent to top of vertex in frontal view; clypeus broadly, uniformly convex with truncately produced median part of anterior margin wider than ⅓ maximum clypeal width; clypeus not at all obscured by sparse, short vestiture; supraclypeal area yellow except for small dark spot below each scrobe; scape, pedicel and first flagellar segment bicolorous, yellow beneath, dark above; flagellum with segment 2 subcylindrical but with subsequent segments becoming progressively flattened beneath; terminal flagellar segment abruptly recurved forming a lamelliform hook; mandible bidentate with both minute denticles terminal. Fore legs yellow except for dark spot on femora above and on coxae above and with all vestiture pale; mid legs yellow except for dark spot on inner side of tibiae and dark spot on coxae above; mid coxa with prominent yellow ventrally projecting lobe; mid basitarsus with hollow channel along entire outer edge; hind legs yellow but with dark patches on coxa above, on femur above, on inner apex of tibia, on outer side of tibia and outer apex of basitarsus; hind coxae produced ventrally into a strongly arched transverse ridge; hind trochanter greatly produced posteriorly and longitudinally ridged along inner edge; hind femur grossly inflated with a short longitudinal carina along inner edge approaching apex; hind tibiae less strongly inflated, strongly convex in front, nearly flat behind and with outer edge longitudinally ridged but not carinate; hind tibia with inner edge angulate in outline near midpoint; hind basitarsi conspicuously excised on inner side; hind tarsi with golden vestiture on inner side. Metasomal tergum 1 with lateral arms of gradulus present, median transverse section absent; metasoma with yellow transverse band narrowly interrupted medially on tergum 1, entire on all other terga; tergum 4 and 5 with small, oval uniformly finely aciculate spot mesad of each spiracle and anterior but nearly tangent to gradulus.

Distribution: This species has been recorded from three locations in South West Africa, Damara Land (Type locality—Cockerell, 1909, p. 413), Grotfontein (Friese, 1909, p. 170) and Otjiverongo (sic) (Friese, 1930 p. 14) and one locality in Southern Rhodesia, Beit Bridge (Cockerell, 1933, p. 376). Although the records are too few to permit an accurate estimate of its distribution, the presence of populations on opposite sides of the southern part of the African continent and more than 700 miles removed from each other suggest it may be extensive. The species is apparently a summer flying species since the only specimens with collection dates were taken in February (Otjiverongo) and April (Beit Bridge).

I have examined a pair of specimens from Beit Bridge (labeled in Cockerell's handwriting as *M. binghami*) and a single female from Grotfontein (labeled in Friese's handwriting as *Nomia flavofasciata*). Though the females differ in several minor details such as extent of yellow markings, density and color of vestiture, they are so similar otherwise that I concur with Hedicke (1931) that they are conspecific.

Meganomia tavetensis Cockerell
(Fig. 1, 3, 6, 11)

Meganomia tavetensis Cockerell, 1934, pp. 444–445 (Female described).

Female: Length 15 mm. Vertex convex in frontal view; compound eyes not conspicuously large, inner orbits diverging along lower ⅓, gently, weakly emarginate along upper ⅓; summit of eyes not approaching top of vertex in frontal view; lateral ocelli removed by more than one diameter distance from top of vertex in frontal view; clypeus with pronounced median longitudinal ridge, otherwise flat; vestiture of clypeus obscure, composed of very short, sparse erect golden hairs; supraclypeal area yellow across entire lower end; scape unicolorous, dark; mandibles (worn) apparently lacking subapical tooth; maxillary palpi with length less than half that of post palpal portion of galea; longest setae on apical lobe of galea less than one third width of that lobe; labial palpi with first segment flattened slightly and with one edge medially, weakly angulate in outline. Notauli obscure; parapsidal lines short, not reaching hind margin of mesoscutum; marginal cell apically appendiculate; 2nd submarginal cell shorter than 3rd along posterior edge; sides of 2nd submarginal subparallel or only very slightly converging anteriorly; hind femora lacking ventral longitudinal carinae; basitibial plate, if present, totally obscured under dense velvet-like pubescent patch; scopa sparse, composed of short dark hairs; hind tibial spurs conspicuous, extending beyond adjacent hairs. Metasomal tergum 1 lacking gradulus laterally as well as medially; terga 4 and 5 lacking small, aciculate spots mesad of spiracles and anterior to gradulus; sterna with long, oblique, dense, dark vestiture suggestive of scopa in some megachilids.

Male: Unknown.

Distribution: This species is only known from the southern part of Kenya where the type series, two females, was collected at Taveta on the Lumi River in December of 1912.

I have examined one of these two specimens. In addition to an identification label in Cockerell's handwriting and the appropriate collection data label, it has a red U.S.N.M. paratype label bearing the number 58073.

Meganomia tsavoensis (Strand)

Nomia tsavoensis Strand, 1920, p. 93–94 (Female described); Cockerell, 1931, p. 201 (Transfer to *Meganomia*).

Meganomia tsavoensis: Cockerell, 1931, pp. 201–202 (Transfer from *Nomia*; redescription of female); Cockerell, 1934, pp. 444–445 (Compared with *M. tavetensis*).

Female: The female of this species is very similar to that of *M. tavetensis* and may prove to be synonymous with it. Cockerell (1934) found only one structural character by which they differed: *M. tsavoensis* apparently lacks the median longitudinal ridge found on the clypeus of *M. tavetensis*. All other contrasting characters described by him are minor color differences which could easily represent intraspecific variation.

Male: Unknown.

Distribution: This species is only know from a single female collected in April of 1913 in the southern part of Kenya. The locality published by Strand, Tsavo River, could be near Taveta since the eastern end of that river approaches within about 25 miles of that town, the type locality of the preceding species.

Meganomia andersoni (Meade-Waldo)

Nomia (Meganomia) andersoni Meade-Waldo, 1916, p. 457–458 (Male described).

Meganomia andersoni: Cockerell, 1931, p. 201 (Cited in *Meganomia*).

Female: Unknown.

Male: Length 18 mm. Judging from Meade-Waldo's description and comments the male of this species differs from that of *M. binghami* in at least the following characters; clypeus with truncately produced part of anterior margin much narrower than ⅓ maximum clypeal width; flagellar segments 4 to 10 subtuberculate beneath making flagellum serrate; terminal flagellar hook formed from 3 last segments instead of one. Fore legs with coxae, trochanters and femora mostly black with tibiae and tarsi yellow; fore tarsi with conspicuous fringe of black hairs on inner side; mid legs yellow; hind legs with tarsi almost entirely black and with black pubescence on inner side; hind trochanter not pointed behind. Metasomal terga 1–7 black, with yellow bands widely interrupted in middle and widening abruptly towards sides.

Distribution: *M. andersoni* is only known from its type locality, Masai Reserve in the southern part of Kenya, where a single male was collected on April 14, 1913.

Although being clearly distinct from *M. binghami* this species could easily represent the unknown male of either *M. tsavoensis* or *M. tavetensis* which have been collected at the same season of the year in the same general part of eastern Africa.

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PUPAE OF EMPIDIDAE IN PUPAL COCOONS OF RHYACOPHILIDAE AND GLOSSOSOMATIDAE (DIPTERA—TRICHOPTERA)

L. V. KNUTSON, *Systematic Entomology Laboratory, Agriculture Research Service, U. S. Department of Agriculture*[1]

and

OLIVER S. FLINT, JR., *Department of Entomology, Smithsonian Institution, Washington, D. C. 20560*

ABSTRACT—Predation of pupae of Trichoptera by larvae of Empididae is reported for the first time, and the first descriptions of pupae of *Neoplasta* are presented. Intact pupal cocoons of *Cailloma* sp. (Trichoptera: Rhyacophilidae: Hydrobiosinae), collected near Santiago, Chile, each contained a pupa of *Neoplasta* sp. near *brevicornis* Collin (Diptera: Empididae: Hemerodromiinae), as well as the cast larval skin and remnants of the pupa of the trichopteran. Pupae of an undetermined species and genus of Hemerodromiinae were found in pupal cocoons of *Mortoniella apiculata* Flint (Trichoptera: Glossosomatidae) in Ecuador. Similar to pupae of *Chelifera* and *Hemerodromia*, but unlike other Empididae, pupae of both species have 1 pair of elongate spiracular gills on the prothorax and on each of the first 7 abdominal segments. Unlike other Hemerodromiinae, the paired integumentary horns on the anterior end are elongate and heavily sclerotized.

The important family Empididae includes over 2,000 described species throughout the world, but there are data on the biology and immature stages of only about 50 species. Larvae of some species are strictly terrestrial, others live in various intermediate kinds of wet habitats, and a few are truly aquatic and live beneath the water surface.

Discovery of pupae of *Neoplasta* Coquillett (Diptera: Empididae: Hemerodromiinae) in pupal cocoons of *Cailloma* Ross (Trichoptera: Rhyacophilidae: Hydrobiosinae) and of pupae of a different but undetermined species of Hemerodromiinae in pupal cocoons of *Mortoniella apiculata* Flint (Trichoptera: Glossosomatidae) provides the first records of Empididae feeding on Trichoptera in nature. This report also presents the first information on the biology and morphology of the immature stages of any species of the genus *Neoplasta*.

Rhyacophilid host larvae and pupae were collected in a small tributary of the Rio Blanco at the fish hatchery near the town of Rio Blanco, Aconcagua Province, Chile, on March 10, 1968, by O. S. Flint, Jr. and L. E. Peña G. The collections were made at 2 sites, but unfortunately they were combined in the field, thereby making discovery of any ecological preferences impossible. The main stream was 3 to 5

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[1] Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

yards wide, with boulders and bedrock over which the water cascaded with great turbulence. A few rhyacophilids were taken from underneath the few rocks that could be moved. However, several hundred yards upstream a portion of the flow was diverted into a small irrigation ditch only a foot wide and a few inches deep. Pupal shelters were found in great profusion under rocks in this ditch. The surrounding hillsides are arid and, where unwatered, support only a sparse growth of cactus and other xeritic plants. The junior author has studied hundreds of other collections of rhyacophilid pupae from all over Chile, Central America, and the United States, but none has been found to contain empidids.

Three genera of rhyacophilids were represented in these collections: *Rheochorema* (?) Schmid, *Neoatopsyche* Schmid, and *Cailloma* (all determined by O. S. Flint, Jr.). Four pupal cocoons believed to be those of a species of *Rheochorema* were not infested; larvae of this genus produce a very tough, hard, silken cocoon apparently not enclosed in an outer shelter of pebbles. Two larvae and 11 pupal cocoons of *Cailloma* were collected, of which 10 cocoons contained empidids. Adults of 3 species of *Cailloma* (*C. pumida* Ross, *C. angustipennis* Schmid, and *C. rotunda* Flint), were taken at an ultraviolet light operated beside the stream the same night. Nine larvae and 73 pupal cocoons of *Neoatopsyche obliqua* Flint were taken, but only 1 cocoon was infested. The pupae of both *Cailloma* and *Neoatopsyche* are sheltered in a silken cocoon enclosed in an outer shelter of silk and small pebbles. Thus, 10 rhyacophilid pupal cocoons contained moderately well developed pupae of *Neoplasta* sp. near *brevicornis* Collin (determined L. V. Knutson and G. C. Steyskal) (figs. 3, 4), and 1 contained a poorly preserved mature larva, probably of the same species. One male and 1 female *Neoplasta* were dissected from their pupal skins and slides were prepared of the partially pigmented wings.

In addition to an empidid pupa or larva, each pupal cocoon contained the cast larval skin and remnants of the pupa of the trichopteran. Most surprisingly, the tough, inner pupal cocoons of the trichopteran host appeared to be completely intact and without any breaks or holes through which the empidid larvae could have entered. The mode of attack of the empidid larva may be explained in several ways.

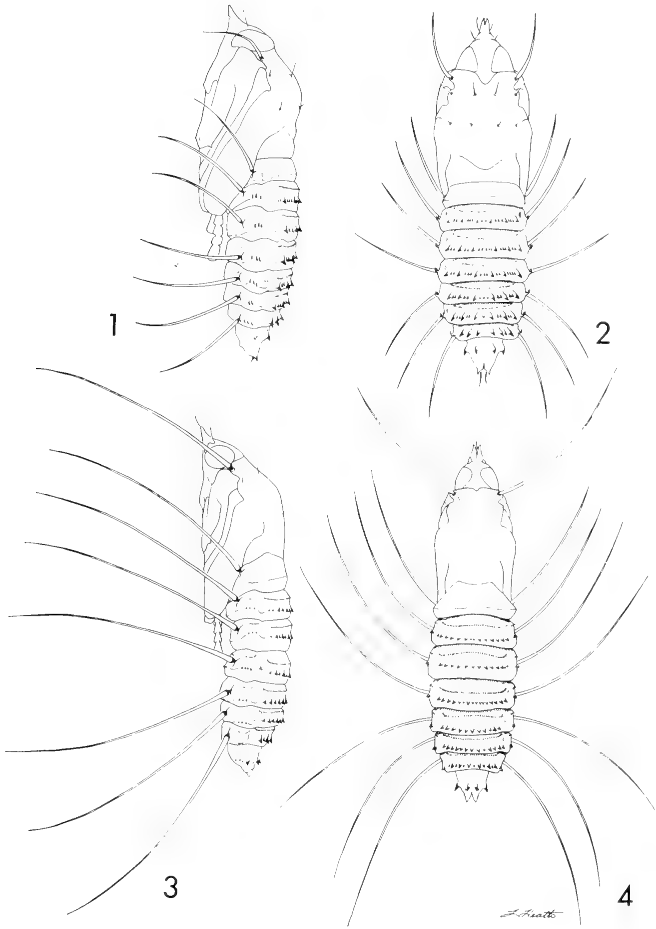
1. The newly hatched empidid larva seeks out and attaches to or penetrates the trichopteran larva but does not begin to feed until the trichopteran pupates.
2. The very small, newly hatched empidid larva seeks out and penetrates the pupal cocoon, making an entrance hole so small that it is not apparent.

3. The adult fly oviposits onto or into the cocoon of the trichopteran. The ovipositor of *Neoplasta* is in fact rather long and strongly sclerotized. Its unusual structure indicates that it is specially adapted for laying eggs in crevices, but there are no direct observations of egg laying by any species of this genus. It is possible that the females had direct access to the pupal shelters. The small irrigation ditch in which the majority of specimens were collected might have been stopped, thereby stranding the pupal cases in a damp situation and exposing them to direct attack.

Many larval and pupal cocoons of *Mortoniella apiculata* Flint (Glossosomatidae) (determined O. S. Flint, Jr.) were collected in the Rio Papallacta, 1 mile east of Papallacta, Ecuador, on January 30, 1958 by R. W. Hodges. Several pupal cocoons, which are identical in structure to those of *Cailloma*, but much smaller, each contained a lightly pigmented pupa of an undetermined species and genus of Hemerodromiinae (figs. 1, 2).

Larvae and/or pupae of 23 species in the subfamilies Empidinae (*Oreogeton* Schiner), Clinocerinae (*Clinocera* Meigen, *Dolichocephala* Macquart, *Roederoides* Coquillett, *Wiedemannia* Zetterstedt), and Hemerodromiinae (*Chelifera* Macquart and *Hemerodromia* Meigen) are known to be aquatic, but the prey of only 5 of these are known. Larvae of *Hemerodromia seguyi* Vaillant and *Wiedemannia oedorum* Vaillant are overt predators of larvae of Simuliidae in swift mountain streams in Algeria, and those of *H. seguyi* pupate in crevices among immerged rocks at the water's edge (Vaillant, 1952, 1953). Larvae and pupae of *Roederoides juncta* Coquillett were found in pupal cases of Simuliidae in New York, but the larvae were not observed to kill the black-fly larvae or pupae (Needham and Betten, 1901). Larvae of *Oreogeton cymballista* Melander and "*O.* sp. possibly *basalis* Loew" are overt predators of larvae of several species of Simuliidae in Alaska, and they also attacked larvae of Trichoptera during laboratory rearings (Sommerman, 1962). Pupae of "*O.* sp. possibly *basalis* Loew" were found, ". . .along the margin of the streams, above the present water level, but probably not above the springtime high water mark, in wet leaves, moss, decaying wood, and soil."

The pupae of only 3 other genera of Hemerodromiinae have been described: *Phyllodromia melanocephala* Fabricius (Trehen, 1969); *Chelifera trapezina* (Zetterstedt) (Brindle, 1969) and *C. praecatoria* (Fallén) (Brocher, 1909); and *Hemerodromia* sp. (*rogatoris* ? Coquillett) (Johannsen, 1935), *H. unilineata* Zetterstedt (Hinton, 1953; Brindle, 1969), *H. seguyi* Vaillant (Vaillant, 1953), and *Hemerodromia* sp. (Smith, 1969). Dyte (1967) discussed some diagnostic features of Hemerodromiinae and other subfamilies of Empididae.



Figs. 1, 2, Hemerodromiinae sp., Rio Papallacta, Ecuador, pupa. Figs. 3, 4, *Neoplasta* sp. near *brevicornis* Collin, Rio Blanco, Chile, pupa.

As *Chelifera* and *Hemerodromia*, but not as *Phyllodromia* and other Empididae, the pupae of *Neoplasta* sp. near *brevicornis* and of the undetermined species of Hemerodromiinae have pairs of long, slender spiracular gills on the prothorax and on abdominal segments 1–7. The functional morphology of the spiracular gills of *Chelifera*, *Hemerodromia*, and certain other insects that live in situations that are alternately dry and flooded has been studied by Hinton (1950, 1953, 1956). The structures have a dual function: they provide an enormous surface area for diffusion of oxygen from the water when the pupa is flooded, and they permit entrance of oxygen into the tracheal system without water loss when the pupa is exposed to the ambient air. The paired integumentary horns at the anterior end of both species are long and heavily sclerotized; those of *Chelifera* and *Hemerodromia* are weakly developed. These structures most likely aid the pupa in emerging from the trichopteran pupal cocoons.

Description of Pupal Skin of **Neoplasta** sp. near **brevicornis** Collin
(Figs. 3, 4)

Straw-yellow except darkened apices of anterior horns, bases of spiracular gills, and thorn-like integumentary processes on abdominal terga, pleura, and sterna. Elongate, fusiform, straight in lateral outline. Length, 6.3 to 7.6 mm, abdominal segments strongly retractile; greatest width of thorax, 1.5 mm; greatest width of abdomen, 1.8 mm. In dorsal view, extended abdomen twice as long as head and thorax combined; abdomen only slightly longer than head and thorax combined when retracted. In ventral view, apices of hind tarsi reaching abdominal segment 5 when abdomen is retracted, reaching segment 4 when extended. Anterior end with a pair of elongate, triangular, heavily sclerotized horns that are fused mesally on basal half. Distance from anterior margin of eye to apex of horn about equal to longitudinal diameter of eye. A short, fine bristle arising from tiny, cylindrical, mesal process at apex of horn, and a bristle dorsolaterally at base of horn. Four pairs of very weak, widely-spaced bristles on mesonotum. Eight pairs of elongate (about 4.0 mm), whitish, tapering spiracular gills, 1 prothoracic pair arising about 0.10 mm behind anterior margin of prothorax and 1 pair on each of the first 7 abdominal segments arising laterally below and between transverse rows of integumentary processes. Gills abruptly constricted and darkened for about 0.02 mm at attachment to body. Abdominal segment 1 on dorsum with a thickened transverse ridge separating smooth, sclerotized anterior ⅔ from membranous posterior ⅓. Segments 2–7 similar: dorsally divided into 3 portions by 2 transverse rows of darkened, thorn-like integumentary processes; anterior and middle portions strongly sclerotized; posterior portion membranous; anterior row composed of many minute, subequal, closely-spaced processes; posterior row composed of 15–20 much larger and irregularly-sized processes. Segments 2–7 laterally with a short anterior row of minute processes and 2 or 3 larger processes posteriorly. Segments 2–7 ventrally with a single transverse row of very small processes at posterior margin of sclerotized anterior ⅔, posterior ⅓ membranous. Terminal segment (abdominal segment 8) completely sclerotized, with a pair of large dorsal processes and a smaller pair behind these, a pair each of large dorsolateral and ventrolateral processes with 2 pairs of small lateral processes between these, and 3 or 4 minute ventral processes. Segment 8 terminating in a pair of sharp-tipped, approximate lobes. Based on 4 specimens, tributary of Rio Blanco at fish hatchery near Rio Blanco, Province Aconcagua, Chile.

Description of Pupal Skin of Hemerodromiinae sp.
(Figs. 1, 2)

Straw-yellow except darkened apices of anterior horns, bases of spiracular gills, and thorn-like integumentary processes on abdominal terga and pleura. Elongate, fusiform, straight in lateral outline. Length, 3.6–4.4 mm (abdominal segments of all specimens retracted); greatest width of thorax 0.9 mm; greatest width of abdomen, 0.8 mm. In dorsal view, retracted abdomen about equal in length to head and thorax combined. In ventral view, apices of hind tarsi reaching abdominal segment 6 when retracted. Anterior end with a pair of elongate, triangular, heavily sclerotized horns that are fused mesally almost to apex (fig. 2). Distance from anterior margin of eye to apex of horn about equal to longitudinal diameter of eye. A short, fine bristle ventrolaterally at mid-length of horn, a larger bristle dorsolaterally near base, and 4 pairs of shorter, stouter, widely-spaced bristles on mesonotum. Eight pairs of elongate (about 1.0 mm), whitish, tapering spiracular gills, 1 prothoracic pair arising about 0.6 mm behind anterior margin of prothorax, and 1 pair arising laterally on each of first 7 abdominal segments. Gills abruptly constricted and darkened for about 0.02 mm at attachment to body. Abdominal segment 1 smooth, unadorned dorsally and laterally. Segments 2–7 similar: dorsally divided into 3 portions by 2 transverse rows of darkened integumentary processes; anterior and middle portions strongly sclerotized; posterior portion membranous. Narrow anterior row composed of many minute, subequal, closely spaced processes; posterior row composed of 3 pairs of large, divergent, sharply pointed processes with 1–3 minute processes between each large one. Segments 2–7 each with 2–4 large, strongly recurved processes on each side; without integumentary processes ventrally. Terminal segment (abdominal segment 8) (fig. 2) completely sclerotized, at mid-length with a pair of large, sharply tipped dorsal tubercles and a smaller pair of lateral tubercles; terminating in a pair of lobes, each of which bears a small, sharp process dorso-apically and a long bristle ventro-apically. Based on 3 specimens, Rio Papallacta, 1 mile east of Papallacta, Ecuador.

The figures were prepared by Miss L. Heath, Systematic Entomology Laboratory, U. S. Department of Agriculture.

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PLEOTRICHOPHORUS TETRADYMIAE, A NEW SPECIES OF APHID FROM UTAH

(HOMOPTERA: APHIDIDAE)[1]

CLYDE F. SMITH, *Department of Entomology, North Carolina State University, Raleigh, North Carolina 27607*

and

GEORGE F. KNOWLTON, *Department of Zoology, Utah State University, Logan, Utah 84321*

ABSTRACT—*Pleotrichophorus* **tetradymiae**, n. sp. on *Tetradymia canescens* DC., is described from the Hansel Mountains (Box Elder County) in Northern Utah.

This new species was found while the junior author was on his terrestrial arthropod survey trips to Curlew Valley, part of a program of the Utah State University Ecology Center.

[1] Paper No. 3280 of the Journal Series of the North Carolina State University Agricultural Experiment Station, Raleigh, N. C.

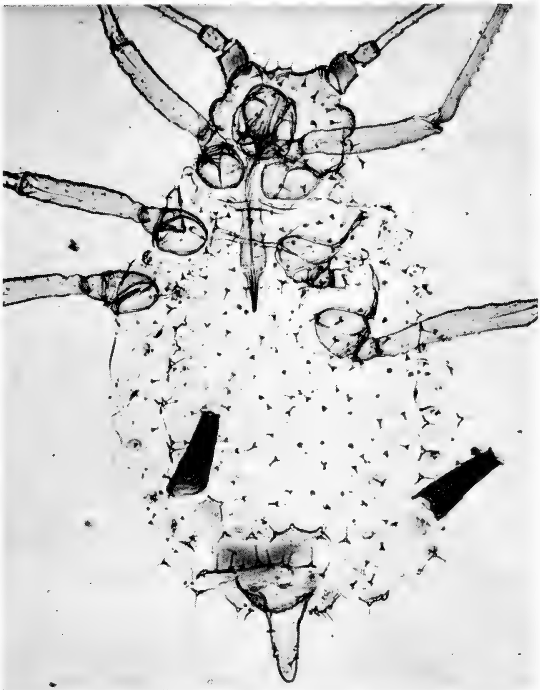
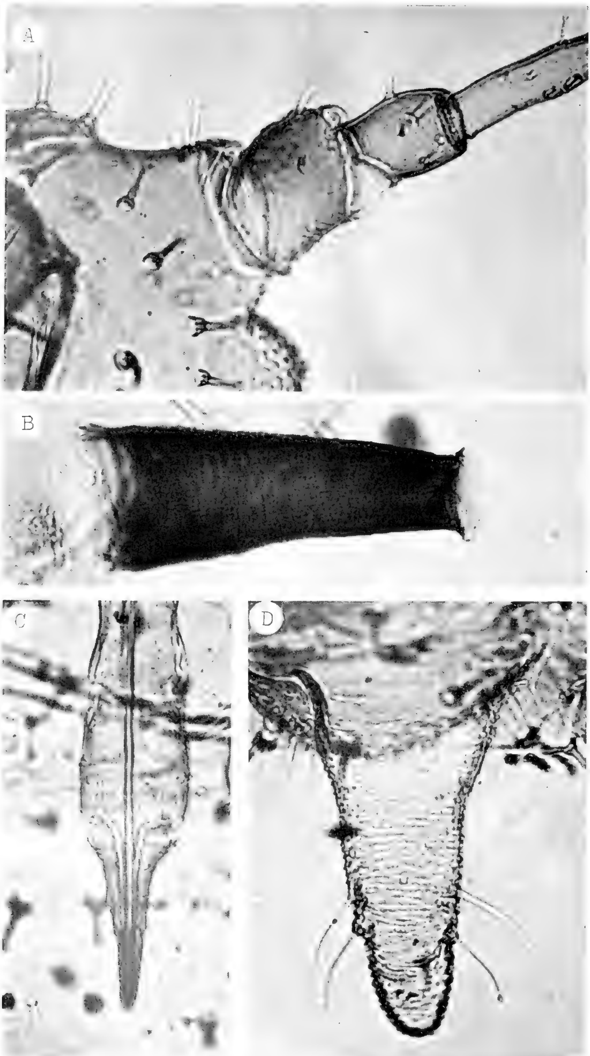


Fig. 1, *Pleotrichophorus tetradymiae*, n. sp., 60×.

This species keys to *Pleotrichophorus glandulosus* (Kaltenbach) in the key by Hille Ris Lambers (1969:165). However, it differs from *glandulosus* in having dark siphunculi, in the shape of setae, and in having conspicuous setae on a.s. III.

Pleotrichophorus tetradymiae, n. sp.
(Figs. 1, 2)

Apterous viviparae.—Color of living specimens black to blackish green. Cleared specimens pale on head; a.s. I dusky; II, pale. Joints between a.s. III and IV dusky; a.s. V and VI dark. Thorax pale. Legs pale. Siphunculi dark. Anal plate dark. Cauda pale. Setae conspicuous on head, antennae, legs and body. All setae similar in having a knobbed apex. A.s. III with 2–4 rhinaria. Cauda with 2 pairs lateral setae and 1 dorsal seta. T. ch. 3–3–3.


A
B
C
D

Measurements (10 specimens). Body 1.50[2] (1.50–2.12). Setae on vertex 0.04, a.s. III 0.02 or ca. ⅔ diameter of segment; dorsum of abdomen 0.05. A.s. III 0.39 (0.34–0.43); IV, 0.26 (0.26–0.35); V, 0.28 (0.25–0.33); VI, 0.11 (0.10–0.14) + 0.35 (0.30–0.39). R IV + V, 0.12 (0.12–0.14). Hind tibiae 0.85 (0.85–1.02). Hind tarsomere II, 0.10 (0.09–0.13). Siphunculi 0.26 (0.26–0.30). Cauda 0.25 (0.19–0.26).

Principal diagnostic characters. Conspicuous, knobbed setae on antennae and body; shape of R IV + V and dark siphunculi.

Alate viviparae.—(Cleared specimens). Head dusky. Antennae dark except very base of a.s. III. Thorax dusky. Legs dusky being dark on distal ⅕ of tibia and all of tarsus. Abdomen with some scleroites, sclerotic around the base of some setae. Postsiphuncular sclerites present. Siphunculi dark. Anal plate and cauda dusky. A.s. III with 12–17 rhinaria; IV, 4–7; V, 0. Cauda with 2 pairs lateral setae and 1 dorsal seta.

Setae distinctly knobbed on vertex and antennae. Longest setae on a.s. III ca. ½ diameter of a.s. III. Dorsal abdominal setae blunt to slightly knobbed.

Measurements (3 specimens). Body 1.84–1.90. Setae on vertex 0.03, a.s. III 0.02 or ca. ½ diameter of segment, dorsum of abdomen 0.03. Length of a.s. III, 0.39–0.51; IV, 0.33–0.36; V, 0.28–0.31; VI, 0.11–0.12 + 0.30–0.44. R IV + V, 0.11–0.12. Hind tibiae 0.93–1.05. Hind tarsomere II, 0.11. Siphunculi 0.24. Cauda 0.19–0.22.

Principal diagnostic characters. Same as aptera.

Holotype (an adult aptera) on a slide labelled K-69-1, holotype, *Pleotrichophorus tetradymiae* on *Tetradymia canescens*, Hansel Mountains, Utah. July 8, 1969, G. F. Knowlton. There are three specimens, one adult aptera and two nymphs, on the slide. Deposited in the United States National Museum. Paratypes in the collections of the authors, the British Museum, Hille Ris Lambers, Bennekom, Netherlands and H. L. G. Stroyan, Harpenden, England.

Collections on *Tetradymia canescens*, Utah, Hansel Mountains, (Box Elder County), June 30; July 8, 1969. Johnson's Canyon July 11, 1969. Kelton July 8, 1969. G. F. Knowlton collector.

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[2] The first number or measurement is that of the holotype, numbers in parenthesis indicate range in specimens studied. All measurements are in millimeters.

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Fig. 2, *Pleotrichophorus tetradymiae*, n. sp., 300×: A, portion of head and antenna; B, siphunculus; C, tip of rostrum; D, cauda.

HOST PLANTS OF TOXOPTERA AURANTII AT THE LOS ANGELES STATE AND COUNTY ARBORETUM, ARCADIA, CALIFORNIA[1]
(Homoptera: Aphididae)

Mortimer D. Leonard, *Collaborator, Entomology Research Division, Agricultural Research Service, U. S. Department of Agriculture*[2]

and

Harry G. Walker, *Entomologist, and* Leonid Enari, *Plant Taxonomist, Los Angeles State and County Arboretum, 301 North Baldwin Avenue, Arcadia, California 91006*

ABSTRACT—During 1966 and 1967 aphids were collected from 1,332 different kinds of plants at the Los Angeles State and County Arboretum, Arcadia, California. *Toxoptera aurantii* (Fonscolombe) was found on 47 of these, which were distributed in 25 genera and 19 different plant families. The genera are listed in alphabetical order and with each species the date or dates of collection are given and the relative abundance of *T. aurantii* is usually indicated.

During 1966 and 1967 aphids were collected from 1,332 different kinds of plants at the Los Angeles State and County Arboretum at Arcadia, California. *Toxoptera aurantii* (Fonscolombe) was found on about 47 of these plants which are distributed in 25 genera and 19 plant families. It is possible that nearly two-thirds of the plant genera and nearly all of the species listed herein have not been previously recorded as host plants of the black citrus aphid. The genera of the host plants are listed in alphabetical order including the family name, an alphabetical listing of the host species in each genus, the dates of collection and, where available, an indication of the abundance of the aphids. In addition, there is an alphabetical listing of the family name, an alphabetical listing of the host species in each genus, the and the number of collections in which *T. aurantii* were found.

Host Plants of **Toxoptera aurantii** at the Los Angeles State and County Arboretum Arranged Alphabetically According to Genera

Myrsinaceae
Ardisia sp.
28/II/67 abundant
Euphorbiaceae
Bischofia trifoliata Hook
25/VIII/66 moderate

Theaceae
Camellia japonica
1/XI, 15/XI and 21/XII/66 abundant
11/X/67 abundant
18/X/67 scarce

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[1] This is the fourth in a series of papers on the host plants of aphids at the Los Angeles State and County Arboretum at Arcadia, California in which Dr. Leonard was responsible for the identification of the aphids, Dr. Walker for their collection and Dr. Enari for the identification of the host plants.

[2] Mail address: 2480 16th Street, N.W., Washington, D.C. 20009.

Leguminosae	
Cassia tomentosa Ehrenb. & Hempr.	
30/XII/66	abundant
Rutaceae	
Citrus sp.	
20/X/66	scarce
Ranunculaceae	
Clematis lawsoniana 'Henryi'	
19/X/67	scarce
Ternstroemiaceae	
Cleyera japonica Thunb.	
21/XII/66	abundant
10/VIII/67	moderate
Flacourtiaceae	
Dovyalis caffra Warb.	
X/66	scarce
Rubiaceae	
Gardenia thunbergia Linn.	
27/IX/67	scarce
Anacardiaceae	
Harpephyllum caffrum Bernh.	
9/X/67	moderate
Hypericaceae	
Hypericum elatum Ait.	
5/X/66	abundant
Aquifoliaceae	
Ilex altaclarensis (Loud.) Dallim.	
23/VIII/66	scarce
23/VIII/67	abundant
I. altaclarensis 'Wilsonii'	
23/VIII/67	scarce
I. aquifolium 'Ciliata'	
18/X/67	scarce
I. aquifolium 'Variegata'	
25/VIII/66	abundant
I. cassine Linn.	
23/VIII/66	scarce
I. centrochinensis S.Y. Hu	
10/VIII/67	scarce
23/VIII/67	abundant
I. cornuta Lindl. & Paxt.	
13/VI/67	scarce
23/VIII/67	abundant
I. franchetiana Loesener	
23/VIII/66	abundant
23/VIII/67	abundant
I. 'John T. Morris'	
25/VIII/66	
19/X/67	scarce
I. latifolia Thunb.	
23/VIII/66	scarce
I. liukiuensis Loes.	
23/VIII/67	moderate
I. 'Lydia Morris'	
25/VIII/66	moderate
I. opaca Ait.	
13/VIII/66	scarce
I. perado Ait.	
23/VIII/67	moderate
I. pernyi Franch.	
23/VIII/67	moderate
I. rotunda Thunb.	
2/V/67	scarce
10/VIII/67	scarce
30/VIII/67	scarce
I. vomitoria Ait.	
23/VIII/66	moderate
23/VIII/67	moderate
Proteaceae	
Macadamia ternifolia F. Muell.	
28/XII/66	scarce
2/XI/67	scarce
Celastraceae	
Maytenus boaria Molina	
1/XI/66	scarce
Rutaceae	
Murraya paniculata (L.) Jack.	
4/XI/67	moderate
Myrsinaceae	
Myrsine africana Linn.	
10/X/67	scarce
M. semiserrata Wall.	
28/XII/67	moderate
Pittosporaceae	
Pittosporum daphniphylloides Hayata	
20/XII/66	moderate
P. moluccanum Miq.	
23/X/66	scarce
P. napaulensis Rehd. & Wils.	
21/XII/66	scarce
4/X/67	moderate
P. phillyraeoides DC.	
7/III/67	moderate

P. tobira Ait.
21/X/66 abundant
P. undulatum Vent.
4/X/67 moderate
Styraceae
Pterostyrax corymbosum Sieb. & Zucc.
20/X/66 scarce
Anacardiaceae
Rhodosphaera rhodanthema (F. Muell.) Engl.
23/X/67 scarce
Flacourtiaceae
Scolopia crenata Clos.
30/XII/66 abundant
12/X/67 abundant
Apocynaceae
Strophanthus divaricatus Wall.
20/X/66 scarce
Trachelospermum jasminoides (Lindl.) Lem.
8/XI/67 moderate
Araliaceae
Tupidanthus ealyptratus Hook.
27/X/67 moderate
Vitaceae
Vitis californica Benth.
15/VI/67 moderate
Flacourtiaceae
Xylosma congestum (Lour.) Merrill
11/XI/66 scarce
27/X/67 scarce

ALPHABETICAL LIST OF HOST PLANT FAMILIES OF **Toxoptera aurantii** INDICATING NUMBER OF GENERA, SPECIES, OR OTHER CLASSIFICATION AND NUMBER OF COLLECTIONS MADE DURING 1966 AND 1967

Family	Number of		
	Genera	Hosts	Collections
Anacardiaceae	2	2	2
Apocynaceae	2	2	2
Aquifoliaceae	1	17	25
Araliaceae	1	1	1
Celastraceae	1	1	1
Euphorbiaceae	1	1	1
Flacourtiaceae	3	3	4
Hypericaceae	1	1	1
Leguminosae	1	1	1
Myrsinaceae	2	3	3
Pittosporaceae	1	6	7
Proteaceae	1	1	2
Ranunculaceae	1	1	1
Rubiaceae	1	1	1
Rutaceae	2	2	2
Styraceae	1	1	1
Ternstroemiaceae	1	1	2
Theaceae	1	1	5
Vitaceae	1	1	1
Total	25	47	63

THE GENUS CALOBATINA ENDERLEIN
(DIPTERA: MICROPEZIDAE)

GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—The genus *Calobata* Enderlein is considered to consist of only the previously unrecognized species *Calobatina geometra* (Robineau-Desvoidy), with all other described species, including the type of the genus, *C. texana* Enderlein, as synonyms thereof.

In the North American catalogue of Diptera (Steyskal, 1965), I followed Cresson (1938) in considering *Neria geometra* Robineau-Desvoidy, 1830, described from "la Caroline," as an unrecognized species and in recognizing as valid species both *Calobatina geometroides* (Cresson) (synonym, *Calobatina varipes* Johnson, preoccupied) and *C. texana* Enderlein (synonym, *Meganeria daeckei* Cresson). Re-examination of material in the U. S. National Museum, including some recently acquired specimens, has shown that this course must be altered.

The type of *Neria geometra* Robineau-Desvoidy, according to information received through the courtesy of L. Tsacas, is not among the remains of the Robineau-Desvoidy collection now in the Paris museum and must be presumed no longer extant. Robineau-Desvoidy's description, contrary to the opinion of Cresson, contains nothing directly conflicting with the characters of the species referred to *Calobatina*. The size, stated to be 11 lines (= c 23 mm) is certainly greater than that of any North American micropezid, but the size of specimens that I have seen is also greater than given by Cresson (11–12 mm), one attaining a length of 18 mm. There will always be some doubt concerning the parameter Robineau-Desvoidy described. The cited color of the thorax ("lateribus subrubens") could have reference to the reddish-brown tomentum of the mesoscutal margins.

Cresson (1938, p. 354) quoted Osten Sacken as referring to the presence of postvertical bristles in "Taeniaptera geometra R. D.," and then stated "If Osten Sacken is correct as regards the postverticals, *geometra* cannot belong to the present genus (*Calobatina*)," although on page 353 in the generic diagnosis Cresson had just stated "postverticals . . . present." I find well developed postverticals in the material I have seen.

A number of intergrades between all black apical part of the hind and middle femora and a condition wherein the black is interrupted

[1] Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

by a distinct yellowish band (*texana* Enderlein) have been seen in specimens from widely separated localities. The color of the male fore tarsus, the characters of the head, and those of the male postabdomen are uniformly alike in all of these forms. There seems little reason therefore for not recognizing as the name of this very distinct, largest North American micropezid *Calobatina geometra* (Robineau-Desvoidy).

The species is known from the following localities; those from which I have seen material are marked with an asterisk: Pennsylvania (*Eberlys Mill, near Camp Hill, Cumberland Co.; *Pittsburgh, Allegheny Co.), Missouri (*Van Buren, Carter Co.), Kentucky ("Ky."), Virginia (*Nelson Co.), Tennessee (*Athens, McMinn, Co.; *Benton Co.; *Memphis, Shelby Co.), "Caroline," Texas (Brazos Co.; *Conroe, Montgomery Co.; *San Antonio, Bexar Co.), Mississippi (*Benoit, Bolivar Co.; Meridian, Lauderdale Co.), Georgia (Billy's Island, Okefenokee Swamp, Charlton Co.; *Rockmart, Polk Co.; Spalding Co.; *Warm Springs, Meriwether Co.), Florida (DeFuniak Springs, Walton Co.; Jacksonville, Duval Co.).

The larva and pupa were described by Wallace (1970) from material found in a hollow tree stump in Georgia. The adult is easily recognized from the descriptions in Cresson (1938). Full literature citations and synonymy are to be found in Steyskal (1965).

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PSEUDOCALOLAMPRA, A NEW GENUS OF COCKROACH FROM AFRICA
(DICTYOPTERA: BLABERIDAE)

LOUIS M. ROTH, *Pioneering Research Laboratory, U. S. Army Natick Laboratories, Natick, Massachusetts 01760*

and

KARL PRINCIS, *Entomological Institute, Lund University, Sweden*

ABSTRACT—**Pseudocalolampra**, n. gen., an ovoviviparous genus superficially resembling *Calolampra*, is described from Africa. Two species, *P. pardalina* (Walker) and *P.* **inexpectata**, n. sp. are provisionally assigned to the new genus.

There are about 20 species of *Calolampra* Saussure. Most of these are found in Australia but a few occur in Africa, India, Burma, China, Sarawak, Philippines, and Haiti (Princis, 1963). A study of the male genitalia of *Calolampra* suggested that the African species were not congeneric with Australian and Haitian forms. In this paper we assign African *Calolampra* to the new genus, *Pseudocalolampra*.

Pseudocalolampra, n. gen.

Type-species: *Epilampra pardalina* Walker (present designation).

Males fully winged, females apterous. Ventral anterior margin of front femora armed with 3 (rarely 4) spines (excluding the distal spine), the same margin of the mid and hind femora with 2 (rarely with 1) spines. Ventral posterior margins of all femora unarmed (except for the distal spines). Arolia present (♂) or absent (♀). Hypandrium (subgenital plate) asymmetrical (figs. 7, 8). Male genitalia with a dorsal sclerite of the second left phallomere present (figs. 9, 24, L2d). We provisionally assign to this genus *P. pardalina* (Walker) and *P. inexpectata*, n. sp.

Differences between *Pseudocalolampra* and *Calolampra* are summarized in table 1.

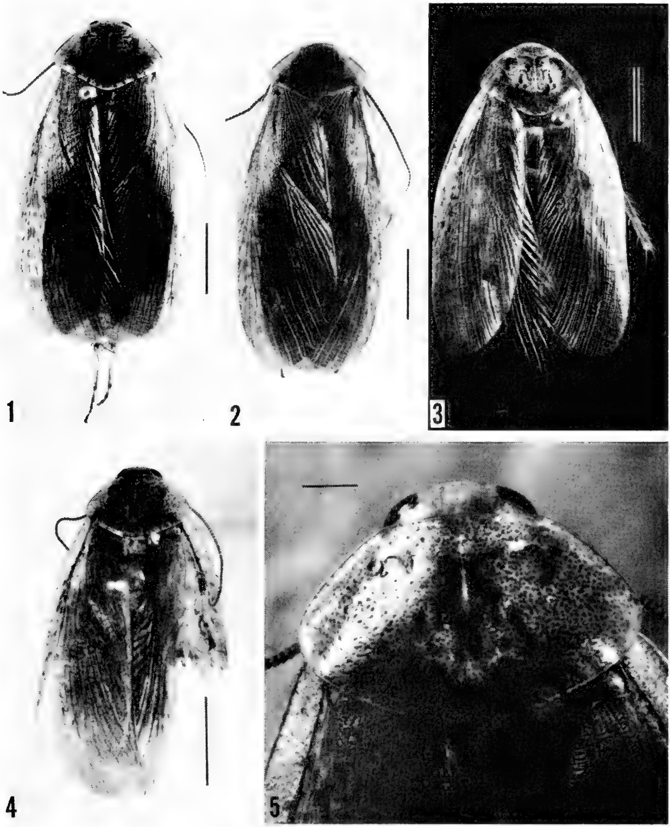
Pseudocalolampra differs from *Calolamprodes* Bey-Bienko by the unarmed ventral posterior margins of mid and hind femora (except for distal spines); in *Calolamprodes* there are 3 or 4 spines. *Calolampra characterosa* (Walker) from India may belong to *Calolamprodes.* Unfortunately the male genitalia of a male *characterosa* was damaged in preparation but L1 and the damaged prepuce and L2vm (R2 was lost) differed from *Pseudocalolampra.* The hypandrium of *characterosa* is characteristic of *Pseudocalolampra* but the ventral anterior and posterior margins of the mid femora have 3 or 4 spines respectively and those of the hind femora 3 and 1 respectively.

Table 1—Differences between *Calolampra* and *Pseudocalolampra*.

	Calolampra	*Pseudocalolampra*
No. large spines (exclusive of the distal spine) on ventral anterior margins of mid and hind femora	Usually 3 (rarely 2 or 4)	Usually 2 (rarely 1)
Hypandrium (margin between the styli)	Symmetrical, slightly (fig. 6) to markedly emarginate	Asymmetrical, roundly convex (figs. 7, 8)
Male genitalia		
L2d	Absent (figs. 27, 30)	Well developed and fused to L2vm (figs. 9, 24)
Prepuce	Covered with microtrichia (fig. 27) and curved upwards; when well developed cupshaped and ladel-like (fig. 30)	not covered with microtrichia, or cupshaped (figs. 15, 24).
R2	Figs. 28, 31	Figs. 10, 25
L1	Figs. 29, 32	Figs. 11, 26

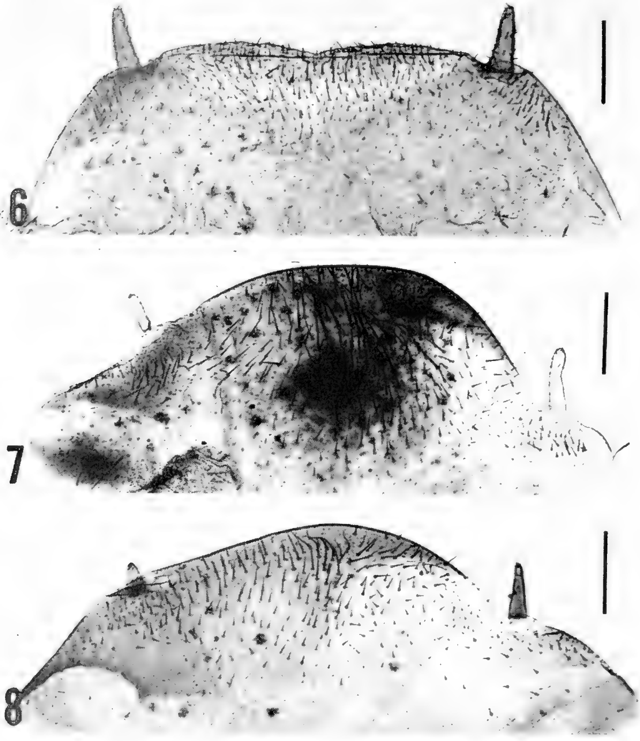
Pseudocalolampra inexpectata, n. sp.
(Figs. 4, 5, 8, 24–26)

Holotype.—♂, Kenya, Mtito Andei (= Mtolo Andei?), 2500 ft., 26–28. III. 1911, S. A. Neave leg. (British Museum of Natural History). Head with a distinct ridge between eyes, yellowish with a brown macula extending from the ridge to the line indicating the shortest interocular distance. Antennae sordid-yellowish. Pronotum transverse, with a dark-brown symmetrical figure on yellowish background in the middle and rather densely covered throughout with dark punctures (fig. 5). Tegmina yellowish with small dark flecks on the veins and a short broad longitudinal line between subcosta and radius. Wings slightly darkened, as long as the tegmina, moderately extending beyond the apex of abdomen. The dorsal as well as the ventral side of the abdomen yellow. Hypandrium asymmetrical convex (fig. 8). Legs yellow with brown spines. Lower anterior margins of all femora bearing 1 distal spine as well as the lower posterior margins of front and middle femora; distal spines absent from posterior femora. Additional spines are lacking on the lower posterior margins of all femora, but the ventral anterior margin of the front femora usually has 3 and the mid and hind femora usually 2 additional spines. Tarsal claws symmetrical, well developed arolia present. Length of body 16 mm; length of pronotum 4 mm; width of pronotum 5 mm; length of tegmen 16 mm.



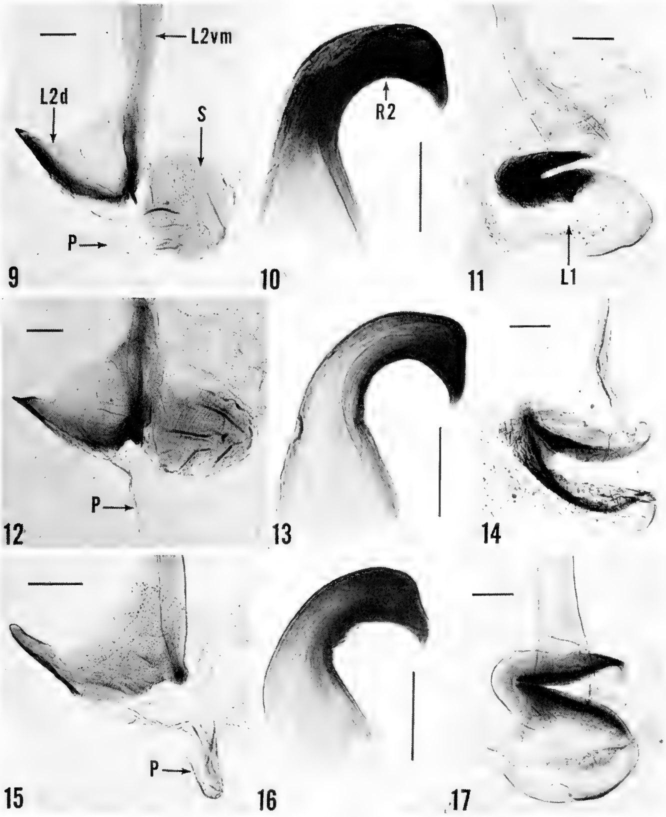
FIGS. 1–3, Adult male, *Pseudocalolampra pardalina* (Wlkr.): 1, Swaziland, Eranchi, South Africa (Lund Univ.); 2, Tzaneen Dist., Letaba Valley, South African Transvaal (Lund Univ.); 3, Hluhluwe, Natal (Lund Univ.), Fig. 4, 5, *P. inexpectata*, n. sp. (type ♂ British Museum of Natural History), Kenya. (scale, figs. 1–4 = 5 mm, fig. 5 = 1 mm).

If *Calolampra aptera* Schulthess-Schindler, which was described from a female collected in Ogaden (Ethiopia) and which has been regarded as a synonym of *pardalina*, should prove to be the female of *inexpectata*, then our species falls in the synonymy of *aptera*.

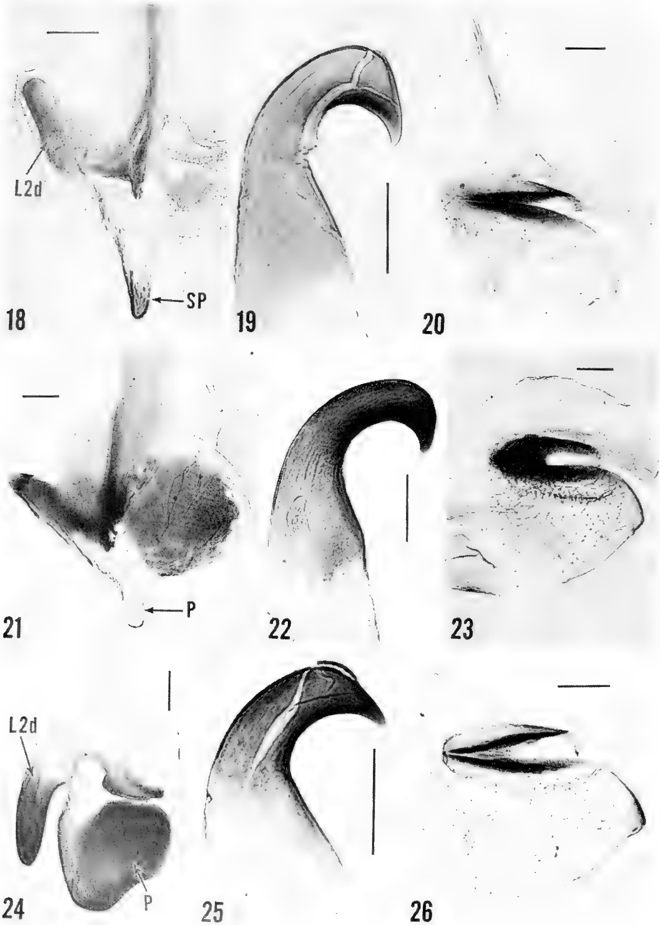


Figs. 6–8, Male subgenital plates (ventral views): 6, *Calolampra irrorata* (Fab.) (lectotype, British Museum of Natural History); 7, *P. pardalina* (Wlkr.) (from specimen shown in fig. 1); 8, *P. inexpectata*, n. sp. (from type ♂ shown in fig. 4). (scale = 0.5 mm).

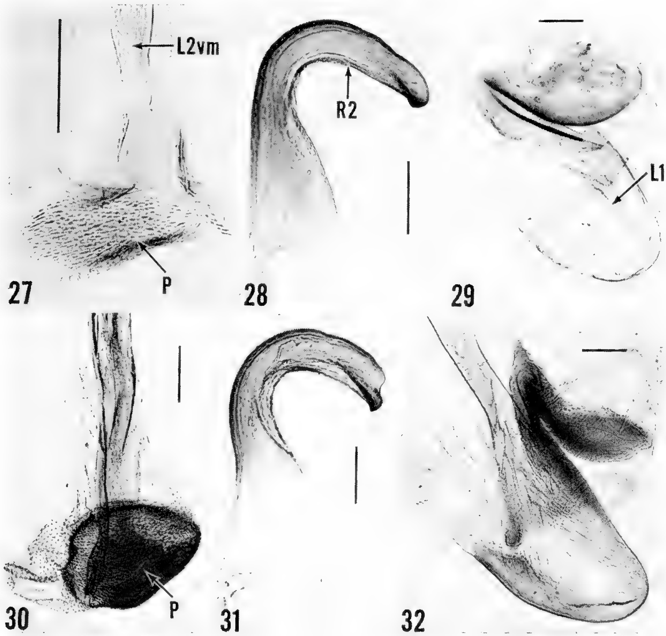
The type specimen (fig. 4) is unique and slightly smaller than *P. pardalina* (body length more than 17 mm) (figs. 1–3). The male genitalia are strikingly different from those of *P. pardalina*; in *pardalina* L2d is directed dorsolaterally (fig. 9) whereas in *inexpectata* it is more fingerlike and directed distally (fig. 24). The prepuce is much more developed and sclerotized in *inexpectata*. The phallomeres R2 and L1 of both species are essentially similar (cf. figs. 10, 11 and 25, 26).



Figs. 9–17, Male genitalia of *Pseudocalolampra pardalina* (Wlkr.): 9–11, holotype, Lake Ngami, Betschuanaland (British Museum of Natural History); 12–14. South Africa (from specimen shown in fig. 1) (L1 in fig. 14 was distorted during preparation). Figs. 15–17, *Calolampra arborifera* Hanitsch. Shinyanga, Tanganyika. (type ♂, Oxford, Hope Dept. Ent.) (scale = 0.2 mm), (L1 = first sclerite of left phallomere; L2d = dorsal sclerite of left phallomere; L2vm = ventromedial sclerite of left phallomere; P = prepuce; R2 = hooked sclerite of right phallomere; S = sclerotized membrane).



Figs. 18–26, Male genitalia of *Pseudocalolampra* spp.: 18–20, *P. pardalina* (Wlkr.), South African Transvaal (from specimen shown in fig. 2); 21–23, *P. pardalina*, Natal (from specimen shown in fig. 3); 24–26. *P. inexpectata*, n. sp., Kenya (from type ♂ shown in fig. 4). (scale = 0.2 mm). (SP = sclerotization of prepuce; other abbreviations as in figs. 9–17).



Figs. 27–32, Male genitalia of *Calolampra* spp.: 27–29. *C. irrorata* (Fab.) (lectotype, herewith designated, British Museum of Natural History), the prepuce in fig. 27 was markedly flattened in preparation; 30–32, *C. aliena* Rehn and Hebard, Haiti (type ♂, Museum of Comparative Zoology, Harvard University). (scale = .2 mm). (abbreviations as in figs. 9–17).

Pseudocalolampra pardalina (Walker) occurs from Kenya to Botswana and Mozambique. The L2 phallomere and prepuce from several different localities show some variation. In the type specimen from Botswana (fig. 9) and the one from Swaziland (fig. 12) L2d tapers to a point. In the type of *Calolampra arborifera* Hanitsch, a synonym of *pardalina* (see Princis, 1963a), from Tanganyika, L2d (fig. 15) is slightly more rounded at the tip. The L2d's of the Transvaal (fig. 18) and Natal (fig. 21) specimens are stouter and more broadly rounded, than they are in the other specimens. The prepuce is only slightly developed in the type specimen (fig. 9, P) but is distinctly developed and fingerlike in the other specimens; in one of these (fig. 18) the tip of the prepuce is sclerotized. The sclerotized portion of the membrane to the right of L2vm and L2d (fig. 9, S) is absent in the type of *arborifera* (fig. 15) and poorly developed in the Transvaal specimen (fig. 18).

ACKNOWLEDGMENTS

We thank the following individuals for the loan of material: Dr. David R. Ragge, British Museum (Natural History), London; Professor G. C. Varley, University of Oxford, Hope Dept. of Zoology (Entomology); Dr. S. L. Tuxen, Zoological Museum, Copenhagen, Denmark. We are grateful to Mr. Samuel Cohen for taking the photographs.

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CHTHONOTHRIPS NIGROCINCTUS HOOD, LECTOTYPE DESIGNATION AND DESCRIPTION OF MALE

(THYSANOPTERA: PHLAEOTHRIPIDAE)

Apparently part of the original description of the phlaeothripine species *Chthonothrips nigrocinctus* Hood (1957, Proc. Biol. Soc. Wash. 70:142–143) was omitted by accident. The description fails to mention the ♂, designate a type, or give any collection data, although Hood's series includes both sexes with a ♀ labeled holotype and a ♂ labeled allotype. Each of the descriptions of other species in the paper mentions the ♂ if it exists; details the type-series; and designates the holotype, or states that it is based on a unique specimen, or both.

The ♂ of *nigrocinctus* resembles the ♀ in color and general structure, and is also apterous. Both sexes have a brown wash on the proepimera and a pair of pale brown spots on abdominal tergum III that Hood did not mention. The ♂ prothorax and fore femora are scarcely larger than those of the ♀ and the fore tibiae are a little shorter. Sterna IV–VII of the ♂ have the reticles that are peculiar to the ♂ in many species of fungus-feeding phlaeothripines. These reticles, which are absent from plant-feeding phlaeothripines, are in partial, transverse bands behind the antecostae. Sternum VIII has the glandular area in a wide, transverse band that extends behind the antecosta to the lateral margins and covers about half the area of the sternum.

The ♀ labeled holotype, on which Hood based his description, is here designated lectotype. The lectotype, U.S.N.M. no. 17249, was collected in Brazil, Santa Catarina, Nova Teutonia, under fallen leaves, Sep. 1955, F. Plaumann, Hood no. 1787, with 1 ♀ paralectotype. Additional ♀ paralectotypes and ♂ specimens have the same data except as follows: 1 ♀, Oct., Hood 1788; 3 ♀ ♀ 5 ♂ ♂, July, Hood 1789; 6 ♀ ♀ 3 ♂ ♂, Aug., Hood 1790; 1 ♂, Nov. 1954, Hood 1995.—KELLIE O'NEILL, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture, Washington, D. C. 20250.*

GENERIC PLACEMENT AND ADULT BEHAVIOR OF THE GENUS LEPTOHOPLIA SAYLOR
(COLEOPTERA: SCARABAEIDAE)

H. F. HOWDEN, *Biology Department, Carleton University, Ottawa, Ontario*

and

A. R. HARDY, *Entomology Department, University of California, Riverside, California 92502*

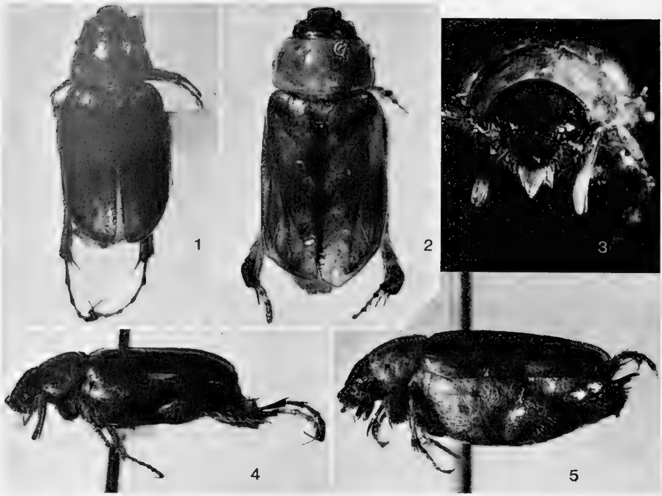
ABSTRACT—The subfamily and tribal placement of *Leptohoplia testaceipennis* Saylor is considered. A comparison of the body shape, mouth parts, abdominal characters, and tarsal characters, relates the genus to *Rhombonalia* Casey in the Anomalini. Distribution records and notes on adult behavior are included.

Saylor (1935) described the monotypic genus, *Leptohoplia*, with *testaceipennis* Saylor as type-species. At the time of description Saylor found the genus "very difficult" to place, assigning it to the tribe Hoplini. Possibly because the species has been infrequently collected, the relationships of the genus have not been reconsidered, Arnett (1960) and other workers accepting Saylor's placement. The acquisition of a good series of both males and females (the original description was based on three males), allows us to assess sexual characters, variation and general relationships. The discussion on relationships is followed by a section on field observations of the adult behavior.

RELATIONSHIPS AND GENERIC PLACEMENT

Leptohoplia Saylor undoubtedly belongs in either the Melolonthinae or the Rutelinae; Saylor, without stating his reasons, placed the genus in the melolonthine tribe Hoplini. *Leptohoplia* does have characters in common with the Hoplini, but we believe it shows closer affinities to the genus *Rhombonalia* Casey in the Anomalini.

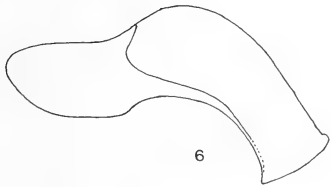
Subfamily placement varies with authors, depending on the combination of characters used. Arnett (1960, p. 418) gives as one characteristic of the subfamily Melolonthinae: "Fifth visible abdominal sternite connate with penultimate abdominal tergite to form a subapical abdominal ring, five or six visible abdominal sternites;". In the tribes and genera he includes in the Melolonthinae the degree of fusion of the penultimate sternite and tergite varies, the genus *Isonychus* having them connate, the genus *Hoplia* having them free. *Leptohoplia* has the penultimate tergite and sternite connate, but so do *Rhombonalia* and *Anomala* in the Rutelinae. Numerous authors, Paulian (1941) for example, consider *Hoplia* and its relatives to belong to the subfamily Hoplinae, basing this on the single tarsal claw on the



Figs. 1–5, *Leptohoplia testaceipennis* Saylor: 1, dorsal view of male; 2, dorsal view of female; 3, head of male showing tuft of hairs; 4, lateral view of male; 5, lateral view of female.

hind leg, on the single, often obsolete, hind tibial spur and on the presence of scales. *Leptohoplia* lacks all of these characters which would relate it to *Hoplia.* The most constant character separating the Melolonthinae (including the Hoplini) from the Rutelinae seems to be the differences in claws. If a species has the tarsal claws, particularly of the hind legs, essentially equal in size (or single as in *Hoplia*) then it is placed in the Melolonthinae. If the species has the hind tarsal claws unequal, then it belongs to the Rutelinae. In the case of the Anomalini, not only are the tarsal claws unequal in size, but in the majority of species the males have the apical tarsal segment and claws of the anterior legs enlarged. This is true of *Leptohoplia*, relating it, therefore, to the Anomalini. At least seven native genera of Anomalini occur in North America north of Mexico, several of these having numerous characters in common with *Leptohoplia.*

Leptohoplia has the body elongate-oval (figs. 1, 2); largely glabrous above; clypeus rounded with anterior edge distinctly thickened; antenna 9-segmented with 3-segmented club, the club approximately twice as long as basal 6 segments in male, slightly shorter than basal 6 segments in female; mentum narrow, almost conical, largely concealed by a conspicuous brush of setae (fig. 3); pronotum



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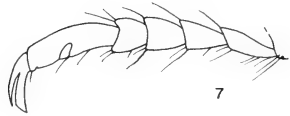

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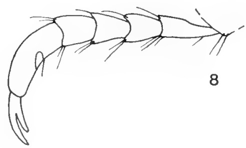

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Figs. 6–8, *Leptohoplia testaceipennis* Saylor: 6, lateral view of male genitalia; 7, anterior tarsus of male; 8, anterior tarsus of female.

with complete marginal bead; elytra with striae obsolete, sometimes indicated by rows of shallow punctures; fore tibia with two teeth, one apical; fore tarsi 5-segmented, the apical segment longer than third and fourth combined, slightly larger in male (fig. 7) than in female (fig. 8); fore tarsal claws in male with inner claw enlarged and cleft, less so in female; smaller claw on all legs very slender, two-thirds length of larger claw, but often largely absent (seemingly due to abrasion) and represented by a minute lobe; smaller claws in female seemingly abraded, minute; hind tibia with moderately developed transverse band of setae at apical third, and usually partial band at basal third; hind tibia with two apical spurs, one slender and often abraded; in female (fig. 5) hind tibia shorter and thicker than in male (fig. 4), all tarsi much shorter than in male; genitalia of male (fig. 6) typical of Anomalini.

The combination of the elongate-oval body shape, narrowed mentum, and obsolete elytral striae relate *Leptohoplia* more closely to *Anomala* and *Rhombonalia* than to other anomaline genera such as *Strigoderma.* The thickened anterior edge of the clypeus and the narrowed, somewhat conical mentum relates *Leptohoplia* most closely to *Rhombonalia.* In *Anomala* the mentum is usually broad and flat, while in *Rhombonalia* it is distinctly narrowed. In respect to body shape, antennal and clypeal characters, morphology of the legs and the male genitalia, *Leptohoplia* could easily be placed in the genus *Rhombonalia.* However the extremely unusual and conspicuous tuft of hairs (fig. 3) on the mentum, coupled with the obsolete striae and unusually heavy-bodied female, seem to justify generic separation. We would, therefore, retain *Leptohoplia* as a distinct genus, placing it beside *Rhombonalia* in the Anomalini.

Adult Behavior

The monotypic *Leptohoplia testaceipennis* appears to be limited to sandy areas in the lower portions of the Colorado Desert. The species has been taken in deep sand habitats 15 miles east of Calexico and at Glamis in Imperial County, California, and a single specimen has been seen labeled Yuma, Arizona. Generally the species is active from April to July in the late afternoon and evening. Specimens, particularly males, come to black-light and the males are agile flyers.

A large number of adults were observed and collected on April 23 and May 5, 1970, by A. Hardy near Glamis and the following observations pertain to this colony. The colony was situated just east of Glamis at an elevation of approximately 300 feet. The area is at the eastern edge of the large, drifting sand hills which run diagonally through the southeastern part of Imperial County. The sand hills arise from a hardpan and may reach several hundred feet in height. Vegetation (characterized as "Creosote Bush Scrub" by Munz, 1959) in the area is scattered and is composed mostly of creosote bush (*Larrea*), smoke tree (*Dalea*), cheesebush (*Hymenoclea*), along with scattered mesquite (*Prosopis*) and wash willow (*Chilopsis*), and abundant annuals and perennials (*Sphaeralcea*, *Oenothera*, etc.). During April and May light winds blew erratically over the dunes; the air became still near sunset and sunrise.

At dusk near the crests of the dunes the first *Leptohoplia* appeared. They emerged from the sand gradually, first exposing the head and pronotum. They remained motionless in this position for several minutes, then moved to the surface. They then remained quiescent with the antennae extended, the club widely spread, for from one to five or more minutes. The beetles then became active, often making flights ranging from two to several hundred feet in length. Flight patterns appeared to be random, upwind if there was a breeze and usually within a few inches of the ground. During these periods of activity the beetles could be seen everywhere on the dunes.

Males predominated, and it is assumed they were searching for females. One female in the clutches of an antlion (*Myrmeleon* sp.?) had the elytra and pygidium exposed above the sand. During a period of about 15 seconds, six male *Leptohoplia* flew to the exposed portion of the female and attempted to copulate, forming a moving ball of beetles around the exposed portions of the dead female. The attraction of the males to the partly exposed, motionless female makes us suspect the presence of an attractive pheromone. Unfortunately no normal mating attempts were observed. Close observation was difficult, since most beetles flew when the observer was eight to ten feet away.

At night a black-light placed on the dunes attracted nearly 200 male and female *Leptohoplia* in a two to three hour period. The same light, on other occasions, placed several hundred feet away from the dunes on the hardpan attracted less than a dozen individuals.

Daytime sifting in the dunes yielded a number of species of Scarabaeidae, such as *Diplotaxis*, *Bothynus*, and *Anomala*. However, no *Leptohoplia* were taken, even when the sand was sifted to a depth of three feet. This coupled with the worn condition of the legs of many specimens seems to indicate that the species are strong burrowers.

ACKNOWLEDGMENT

We would like to thank Mr. Colin Jones, Staff Photographer, Carleton University, for assistance with the photographs used herein.

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NEW GENERIC SYNONYMY AND NEW COMBINATIONS IN ANOBIIDAE (COLEOPTERA)

RICHARD E. WHITE, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—*Priotoma* Gorham is recognized as a junior synonym of *Byrrhodes* Lec., and *Scymnuseutheca* Pic as a junior synonym of *Microzogus* Fall. New combinations include *Protheca hirsuta* (Pic), a species formerly in *Pseudodorcatoma*, and *Euceratocerus maculicollis* (Champion) a species described in *Ptilinus*.

Recent work aimed toward a reclassification of the world Anobiidae has resulted in the following changes.

Byrrhodes Leconte

Byrrhodes Leconte, 1878, p. 412. Type-species: *B. setosus* Leconte, by monotypy.

Priotoma Gorham, 1886, p. 350. Type-species: *P. quadrimaculata* (Gorham) by original designation. **New synonymy.**

Eutylistus Fall, 1905, p. 264. Type-species: *E. incomptus* (Lec.), designated by White, in press.

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[1] Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

The only character that Fall (1905, p. 264) recognized as of significance in distinguishing *Byrrhodes* from *Eutylistus* (= *Priotoma*: Champion, 1913) was the impressed elytral striae of *Byrrhodes*. I have examined the type-species of *Byrrhodes* and *Priotoma* and have found them to be nearly identical in all characters of generic significance. Among Central and South American specimens assignable to these genera I find nearly continuous intermediate conditions between the smooth elytral lines between bands of punctures to be found in *Priotoma incompta* (Lec.) and *P. tristriata* (Lec.) and the impressed striae of *B. setosus* Lec., and conclude that the elytral striae are not of generic significance.

Microzogus Fall

Microzogus Fall, 1905, p. 315. Type-species: *M. insolens* Fall, by monotypy.
Scymnuseutheca Pic, 1909, p. 170. Type-species: *S. apicalis* Pic by monotypy. **New synonymy.**

I have examined the original description of *Scymnuseutheca*, a specimen in the USNM from the Baker collection taken in Gaudeloupe (from the type series?) determined as *S. apicalis* Pic, the description and illustration in Lepesme (1947, pp. 212, 213), and have compared them with type specimens of *Microzogus insolens* Fall in the USNM collection. I conclude that the two species are congeneric. Lepesme is in error in stating that the antennae are 11 segmented; they are 10 segmented. *Microzogus insolens* Fall is clearly specifically distinct from *M. apicalis* (Pic); the large punctures on both the pronotum and elytra of *M. insolens* are larger and sparser than the large punctures on the pronotum and elytra of *M. apicalis*. Also the pubescence of the latter species is longer and denser than that on *M. insolens*.

Protheca hirsuta (Pic), n. comb.

Pseudodorcatoma hirsuta Pic, 1937, p. 195.

A specimen in the USNM (from the Nevermann collection) bears the following data "Costa Rica, F. Nevermann, 23-II-26; an Gebusch; TYPE; Cotype, No. 54555, U. S. N. M.; Pseudodorcatoma hirsuta NM; Pseudodorcatoma, Ps. hirsuta Pic". This specimen is hereby designated as lectotype. It is congeneric with *Protheca hispida* Leconte, the type-species of *Protheca* (designated by Lucas, 1920).

Euceratocerus maculicollis (Champion), n. comb.

Ptilinus maculicollis Champion, 1913, p. 160.

Four specimens in the USNM from Honduras (Suyapa Morazan) are in good agreement with the description and illustration of the above species. These specimens are clearly members of the genus *Euceratocerus*, not *Ptilinus*.

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TWO NEW ORIENTAL SPECIES OF THE GENUS MYOLEPTA NEWMAN (DIPTERA: SYRPHIDAE)[1]

F. CHRISTIAN THOMPSON, *10 Edmunds Road Wellesley Hills, Massachusetts 02181*

ABSTRACT—Two new species of Oriental *Myolepta* Newman (Diptera: Syrphidae) *M.* **petiolata** and *M.* **orientalis**, are described from Thailand. A key to the Oriental species of *Myolepta* is included.

Two new Oriental species of the genus *Myolepta* Newman are described from Thailand. These two species are unique among the known species of *Myolepta* due to their long antennae. *Myolepta* characteristically has short antennae, about one half as long as the face, and roughly oval third antennal segments, whereas the sister-group to *Myolepta*, *Lepidomyia* Loew, has elongate antennae, as long as or longer than the face, and elongate third antennal segments, two or more times as long as broad. The only other difference between *Myolepta* and *Lepidomyia* is the presence in *Lepidomyia* of a facial tubercle in the female (Thompson, 1968). Also *Lepidomyia* is endemic to the New World tropics but *Myolepta* is distributed throughout the Holarctic region and most of the Neotropical region. Until now only one

[1] Contribution no. 1394 from the Systematics and Morphology Research Laboratory, Department of Entomology, University of Massachusetts, Amherst.

species of *Myolepta* has been known from the confines of the Oriental region. The two new species, although they have long antennae like *Lepidomyia*, are placed in *Myolepta* because 1) they lack the facial tubercle in the female, and 2) of their Oriental distribution. The three known oriental species of *Myolepta* can be distinguished by the following key.

Key to the Oriental Species of **Myolepta** Newman

1. Antennae short, less than one-half as long as face; third antennal segment oval; scutellum black .... **himalayana** Brunetti (India)
   Antennae long, about as long as or longer than face; third antennal segment elongate; scutellum not all black, with some light color 2
2. Abdomen petiolate; scutellum orange .... **petiolata**, n. sp. (Thailand)
   Abdomen oval, not petiolate; scutellum black, with a yellow tip .... **orientalis**, n. sp. (Thailand)

Myolepta himalayana Brunetti

Myolepta himalayana Brunetti, 1915, Rec. Indian Mus. 11:233, pl. xii, fig. 12, male head, profile, fig. 13, wing; 1923, Fauna British India, Diptera III:229, fig. 46, male head, profile.

Myolepta himalayana is readily distinguished from both new species by the above key and also the following characteristics: 1) completely reddish-orange second abdominal segment; 2) orange abdominal tip; and 3) yellowish-orange trochanters and bases and tips of the tibiae, with the rest of the legs black.

Myolepta petiolata Thompson, n. sp.
(Figs. 2, 3)

Metallic bluish-black fly except for orange scutellum and with a petiolate abdomen.

Female.—Head: face metallic bluish-black, with short scattered white pile, medially shiny and laterally golden pollinose; facial grooves long, extending two-thirds of the distance to antennal pits; cheeks metallic bluish-black, golden pollinose on posterior half; front metallic bluish-black, with short white pile, golden pollinose on upper two-thirds and shiny on lower third; frontal lunule orange; vertex not protuberant, metallic bluish-black, with short white pile and shiny; occiput metallic bluish-black, with white pile and golden pollinose. Antennae slightly shorter than face, orange except dark apical tip and dorsal half of third segment; first segment with three short black dorso-apical bristles; second segment with a short black dorso-apical bristle; third segment elongate, tapering on apical half to a broad blunt tip, about two and one half times as long as first and second segments together; arista dark orangish-brown, slightly longer than antenna and also face.

Thorax: slightly longer than broad, bluish-black, grayish pollinose except golden pollinose on transverse sutures and shiny on anterior part of sternopleurae and all pteropleurae; pleurae with short white pile; dorsum with short white pile except

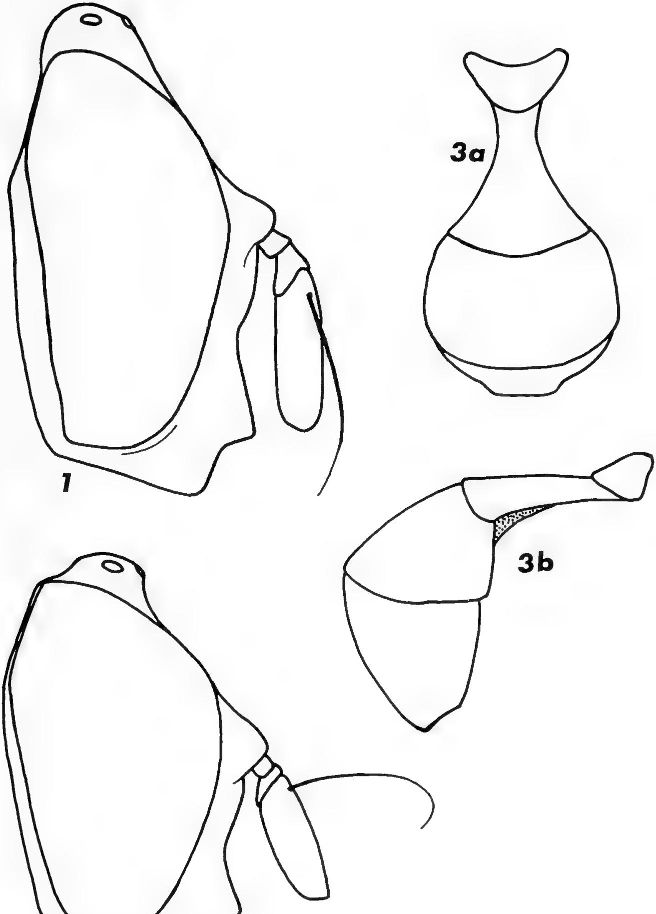

Fig. 1, *Myolepta orientalis*, n. sp., head of female in lateral view. Figs. 2, 3, *M. petiolata*, n. sp.: 2, head of female in lateral view; 3, abdomen, a. dorsal view; b. lateral view.

black pile in front of transverse sutures and in a complete transverse band behind the sutures; metasternum bare; metathoracic spiracular pile patch present; meta-epimera extending behind coxae and separated by only a narrow membraneous band. Scutellum orange, with white pile, without ventral pile fringe or apical emarginate rim. Plumulae and squamae orange. Halters orange. Legs: with pale pile; coxae dark brown and gray pollinose; trochanter dark brown; femora reddish-brown except yellow basal fifth; tibiae reddish-brown; tarsi dark brown except yellow first segments and basal half of second segments. Wings: hyaline except for a slightly brownish tinge behind stigma, with stigma brownish, with orange humeral bristles; basal part of wing bare—costal cell, both basal cells, anal cell except for a small apical patch with microtrichi, base of discal cell, posterior part of wing behind anal cell and base of cubital cell; apical part of wing microtrichose.

Abdomen: as long as thorax, petiolate, constricted at base of second segment, metallic bluish-black, with appressed golden pile; venter silvery pollinose and with short scattered white pile. Abdomen of type is badly greased, thus it is impossible to determine whether there were pollinose marking on the dorsum.

Holotype female.—THAILAND, NW Chiangmai Prov., Chiangdao; 450 m., 5–11 April 1958 (T. A. Maa, no. 320). The type is deposited in the Bishop Museum, Hawaii.

Discussion: *Myolepta petiolata* can be distinguished from all other known species of *Myolepta* by its petiolate abdomen and almost complete postmetacoxal bridge (the extension of meta-epimeron behind the coxae). For discussion of other differences between *petiolata* and *orientalis* or *himalayana*, see the key or the discussion under those respective species.

Myolepta orientalis Thompson, n. sp.

(Fig. 1)

Metallic bluish-black fly with tip of abdomen golden tomentose and tip of scutellum yellow.

Female.—Head: face metallic bluish-black, with fine short scattered white pile, light golden pollinose except for shiny semicircular spot under antennae which is connected narrowly and laterally with shiny area of front; facial grooves long, extending about two-thirds of the distance to antennal pits; cheeks bluish-black with a slight reddish tinge under certain light conditions, with fine short scattered white pile and shiny; front metallic bluish-black, with fine short scattered white pile, light golden pollinose on upper two-thirds, with pollen denser on medial third, shiny on lower one-third except pollinose narrowly on sides, with two medial longitudinal grooves on upper two-thirds which delimit the medial third from sides; frontal lunule orange as are antennal sockets; vertex metallic bluish-black with a slight reddish tinge under some light conditions, with a few scattered white hairs, shiny, slightly protuberant; occiput golden pollinose and white pilose. Antennae orange except light brownish on upper two-thirds of third segment, as long as face; second segment with a short black dorso-apical bristle; third segment twice as long as first and second segments together, with parallel ventral and dorsal margins, with blunt tip; arista orange, as long as antenna.

Thorax: slightly broader than long, metallic bluish-black except reddish tinged at sutures and orangish-brown postalar calli; pro- and metathorax grayish pollinose; mesothoracic pleurae bare except for scattered white scales and shiny; metasternum bare; metathoracic spiracular pile patch present; dorsum with disc dull-grayish pollinose except for two indistinct broad brownish longitudinal pollinose stripes and white pollinose at ends of transverse sutures, with lateral margins shiny, with appressed black pile and with scattered narrow white scales. Scutellum with apical emarginate rim, without ventral pile fringe, black except yellow apical fifth, with black pile and few white hairs intermixed. Plumulae short and brown. Squamae dirty white with brown margin and fringe. Halters orange. Legs: with light pile except dark pile on apical half and dorsal edge of femora; coxae and trochanters orange; femora and tibiae metallic bluish-black; tarsi orange except dark brown apical four segments of protarsi. Wings: hyaline except veins orange on apical third and dark brown on basal two-thirds, with luteous stigma, with a few black humeral bristles, microtrichose except for following bare areas—basal two-thirds of costal cell, both sides of spurious vein in first basal cell, posterior half of second basal cell, anterior half of anal cell and anterior half of alula.

Abdomen: as broad as thorax, short oval, curved ventrally after second segment, with an indistinct medial semicircular depression on apical half of fourth segment, with fifth segment retracted under fourth segment, metallic bluish-black except orange apical third of fourth segment, shiny except grayish pollinose on first segment; venter with light pile; first tergite with white pile; second tergite with appressed golden pile on lateral third and appressed black pile medially; third tergite with appressed golden pile laterally, medially with longitudinal band of tomentum which occupies one-eighth of basal margin of segment expanding posteriorly to occupy one-half of apical margin, elsewhere with appressed black; fourth tergite completely covered with golden tomentum.

Holotype female.—THAILAND, NW Chiangmai Prov., Chiangdao; 450 m., 5–11 April 1958 (T. A. Maa, no. 336). The type is deposited in the Bishop Museum, Hawaii.

Discussion: *Myolepta orientalis* can be easily separated from *M. petiolata* by the characters given in the key and by its: 1) golden tomentose abdominal tip; 2) brown plumulae; 3) dirty white squamae; 4) orange coxae and trochanters; and 5) metallic bluish-black femora and tibiae.

Acknowledgments

I would like to thank Dr. J. L Gressitt for the loan of the material described in this paper.

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BYLAWS OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON[1]

Article I.—Name

The name of this organization is "The Entomological Society of Washington."

Article II.—Object

Section 1.—The object of the Society is to promote the study of entomology in all its aspects and to cultivate mutually advantageous relations among those in any way interested in entomology.

Section 2.—Among the means to be employed to this end shall be meetings for the discussion of entomological topics, and publications of such nature as may be deemed desirable.

Article III.—Membership

Section 1.—Members shall be persons who have demonstrated interest in the science of entomology.

Section 2.—Applications for membership shall be made to the Membership Committee in writing. They shall be accompanied by brief statements of qualifications.

Section 3.—Election of members shall be the responsibility of the Membership Committee in accordance with the procedure outlined in Article VII, Section 2.

Section 4.—Any person who has been a member of the Society for five years and whose dues are paid in full may become a Life Member by paying $100.00. Dues for a Sustaining Member are $500.00 for a 5-year period. Life Members are exempt from paying further dues.

Section 5.—Members of 15 years or more standing, not in arrears for dues or otherwise indebted to the Society when retiring from income-producing employment, may request, and be continued by, the Executive Committee as members without further payment of dues. Members thus relieved of the payment of dues will not be sent copies of the Proceedings.

Section 6.—The Society may elect honorary members in recognition of long and meritorious effort to advance entomological science. Individuals so recognized shall be approved unanimously by the Executive Committee and by two-thirds vote of members present at any regular meeting. Honorary members shall be elected for life, shall pay no dues, and shall be accorded all privileges of members. The number of honorary members carried concurrently on the membership roll shall

[1] The last revision of the Bylaws was published in the Proceedings, vol. 61(1): 41–47, Feb. 1959. Amendments since then are noted in vol. 72(3): 422, 423, Sept. 1970. Further amendments were adopted at the regular meetings of January and May 1971, those of the latter being proposed by the undersigned committee during its preparation of these Bylaws for publication.—*Ad hoc Committee on Bylaws*, KARL V. KROMBEIN, PAUL M. MARSH, CURTIS W. SABROSKY, *Chairman*.

not exceed three, except when an honorary member is chosen Honorary President, in which case there may be four.

Section 7.— A membership list shall be published at least once every three years in the Proceedings of the Society.

Article IV.—**Dues**

Section 1.—The annual dues shall be six dollars payable January 1. Members elected prior to October shall receive all numbers of the Proceedings for that year. Members elected after September shall be exempt from dues for the calendar year in which they are elected and shall receive the Proceedings beginning with January of the next year.

Section 2.—The Treasurer shall notify those members one year in arrears for dues. After one month's notice, if dues are not paid the member's name shall be removed from the mailing list for the Proceedings. The member shall be notified of such action by the Corresponding Secretary. A member who is two years in arrears for dues may be dropped from membership by vote of the Executive Committee after two months' notice.

Section 3.—A member shall be considered to be one year in arrears if he has not paid his dues by March of the year following the year in which they were payable.

Section 4.—Members dropped for non-payment of dues, or those who have resigned, may be reinstated by payment of dues for the current year and by payment at membership rates for all copies of the Proceedings for which they are delinquent.

Article V.—**Officers**

Section 1.—The elected Officers of the Society shall be a President, a President-Elect, a Recording Secretary, a Corresponding Secretary, a Treasurer, an Editor, a Custodian, a Program Chairman, and a Membership Chairman. These shall be chosen from resident members.

Section 2.—The President or, in his absence, the senior officer present (as listed in the previous Section) shall preside at all meetings of the Society and of the Executive Committee. The President or his substitute shall have authority to and shall appoint any standing or special committees whose services are required in the interests of the Society. He shall conduct such correspondence as should appropriately bear his signature as presiding officer. If he is a member of the Washington Academy of Sciences, he shall represent the Society as Vice-president of the Academy; or he may appoint to substitute for him a qualified member of the Society. The President shall deliver an address on some subject pertinent to the objectives of the Society at the first or second meeting subsequent to the completion of his term of office.

Section 3.—The President-Elect shall automatically succeed to the Presidency at the close of the annual meeting, or whenever the President is unable to complete his term of office.

Section 4.—The Recording Secretary shall make a record of the proceedings of the Society and of the meetings of the Executive Committee, and shall submit a record of the Society's proceedings to the Editor for publication.

Section 5.—The Corresponding Secretary shall conduct all official correspondence of the Society except as otherwise provided, shall keep a list of all members and subscribers together with their addresses, and shall be responsible for the mailing of the Proceedings.

Section 6.—The Treasurer shall have charge of and be responsible for all funds and investments of the Society, and shall make routine disbursements. Unusual disbursements and investments shall be made only at the direction of the Executive Committee. He shall collect all sums due to the Society from any source, notify all members and subscribers who are in arrears, and shall present to the Executive Committee an annual report on the financial status of the Society, and conduct such correspondence as is necessary to carry out these duties. The fiscal year of the Society shall be November 1 to the following October 31. The Treasurer shall close his books at the end of the fiscal year, so the accounts of the Society may be audited prior to its annual meeting.

Section 7.—The Editor shall be responsible for editing all publications of the Society, and shall conduct such business as is necessary to carry out this responsibility.

Section 8.—The Custodian shall have charge of the reserve stock of the Society's publications, shall make such sales as lie within the interests of the Society, and shall be responsible for preserving such records, papers, or items of the Society as shall be deemed necessary by the Executive Committee.

Section 9.—The Program Chairman shall be responsible for arranging, with the assistance of the members of the Program Committee, the program of each meeting of the Society and for notifying the resident members of the Society of all meetings. Those members living in metropolitan Washington and nearby areas shall be considered resident members.

Section 10.—The Membership Chairman shall be responsible for activities of the Membership Committee as provided for in these Bylaws. He shall notify the Corresponding Secretary of the names and addresses of new members, and cooperate with that officer and the Treasurer in maintaining an accurate membership list.

Section 11.—At the annual meeting, having before it the list of candidates submitted by the Nominating Committee, the membership present may make other nominations from the floor. A separate election by written ballot shall be held for each office for which there are two or more candidates, the ballots being distributed, collected and counted by tellers appointed by the President. When only one candidate for an office is before the Society, election shall be *viva voce* on motion and second from the floor and in that case two or more offices may be treated in one motion.

Section 12.—The officers shall serve for one year, assuming their duties at the end of the Annual (December) Meeting and serve until their successors are elected; except the Treasurer who shall assume his duties as soon as arrangements can readily be made with his predecessor and the banks for transfer of Society funds. The Executive Committee may ask for such reports of officers as are deemed necessary. Except for the President and President-Elect, who cannot be re-elected to these offices in consecutive years, there shall be no limitation as to the number of terms to which an officer may be elected.

Section 13.—Vacancies in any office except President and President-Elect shall be filled through appointment by the Executive Committee. Members selected to fill such vacancies shall hold office only until their successors are elected. If the office of President-Elect becomes vacant, the position will be filled by a special election in accordance with regular nomination procedures.

Section 14.—The Society may elect an additional officer to be known as Honorary President who shall serve in that capacity during the remainder of his life. His nomination shall be approved unanimously by the Executive Committee. Election shall be by three-fourths majority of the membership present at a regular meeting. The Honorary President shall be exempt from the payment of dues and shall be accorded all privileges of members.

Article VI.—**Executive Committee**

Section 1.—The activities of the Society shall be guided by an Executive Committee. The Committee membership shall consist of all officers and the last available past president.

Section 2.—The Executive Committee shall assume the responsibility for and shall conduct the activities of the Society, direct finances, and provide for meetings and publications. As provided elsewhere in these Bylaws, the Committee shall report fully to the Society once each year, on its conduct of the Society's business, either through the different officers or by specially approved representative. The report shall include an approved audit of the Treasurer's accounts. The Committee shall also consider and present to the Society proposals for change or improvement, and shall transact all other business requiring attention and not otherwise assigned.

Section 3.—The Executive Committee shall hold such meetings as are required to transact the business of the Society during the year. One of these shall be sufficiently prior to the Annual Meeting to permit consideration and approval of a summary report for presentation by the President at the Annual Meeting on the state of the Society and the work of the officers. Other meetings of the Executive Committee may be called at any time by the President or his substitute and shall be called promptly by the presiding officer on request of any three members of the Committee other than the presiding officer. The presence of five members of the Executive Committee at any meeting shall establish a quorum.

Article VII.—**Standing Committees**

Section 1.—The standing committees of the Society shall consist of a Membership Committee, a Program Committee, a Publications Committee, a Finance Committee, and a Nominating Committee. New non-elective members of these committees shall be appointed by the incoming President each year. The Committees shall report to the Society at one of its meetings or to the Executive Committee as may be required.

Section 2.—The Membership Committee, consisting of the elected chairman and four appointed members, shall search for prospective new members of the Society among professional workers, students and amateurs in entomology, see that their applications are properly executed, and by majority vote approve the candidates' qualifications for membership. The name of each new electee shall be reported by the Membership Committee at a regular meeting and in the absence of adverse notice from the members the electee's name shall be read as a new member at the next regular meeting, and if feasible he shall be introduced by a sponsoring member. If the committee receives an adverse notice concerning an electee, the candidate's name shall be referred to the Executive Committee and final approval shall be by majority vote of that committee with formal announcement of membership to be made in the usual manner at the next regular meeting following action by the Executive Committee.

Section 3.—The Program Committee, with the elected Program Chairman serving as head, shall arrange for the programs and meeting places of all regular meetings of the Society. This Committee shall consist of the Chairman and three members, the latter to be appointed each year.

Section 4.—The Publications Committee shall consist of the Editor as Chairman and three appointed members. The appointed members shall assist the Editor in matters of policy, format and finances of the Proceedings and other publications of the Society. The committee shall consider and put into execution plans for promoting the sales of Society publications. It shall review manuscripts for the Memoirs and any other special publications, and make recommendations to the Executive Committee regarding their publication. The appointed members of the Publications Committee shall serve for three-year terms staggered so that one member is replaced each year.

Section 5.—The Finance Committee, consisting of the Treasurer as Chairman, the Editor, the Custodian, and the Program Chairman, shall assist the Treasurer in matters of finances of the Society and make recommendations to the Executive Committee relative to these matters. It shall be a particular duty of this Committee to prepare for the Executive Committee at the beginning of each year a statement of the income and expenditures of the preceding year and to prepare a budget based on the estimated receipts and disbursements of the coming year, with such recommendations as seem desirable.

Section 6.—The Nominating Committee of three members shall prepare a list of candidates comprising one nominee for each office, execpt the office of President, for presentation to the membership at the regular meeting one month before the annual meeting. The Committee shall secure the acquiescence of each candidate before presentation.

Section 7.—Not later than October of each year, the President shall appoint an Auditing Committee of three persons to inspect the accounts of the Treasurer and report to the Society at its next annual meeting.

Section 8.—Such other Standing and Special Committees as the Executive Committee deems necessary shall be appointed by the President.

Article VIII.—**Meetings**

Section 1.—The regular meeting of the Society shall be held, unless otherwise ordered by the vote of the Society or of the Executive Committee, on the first Thursday of each month except June, July, August and September. The annual meeting for the election of officers shall be the regular meeting for the month of December. Special and field meetings may be called by the Executive Committee. The Program Committee or committees appointed for special meetings may, with the approval of the Executive Committee, incur reimbursable expenses. Twenty members shall constitute a quorum.

Section 2.—The suggested order of business at the regular meetings, except the annual meeting, shall be as follows:

1. Reading and approval of minutes.
2. Reports of officers and committees.
3. Introduction of new members.
4. Miscellaneous business.
5. Presentation of notes and exhibition of specimens.
6. Presentation of announced topics.
7. Introduction of visitors.
8. Adjournment.

Section 3.—The suggested order of business at the annual meeting in December shall be:

1. Reading and approval of minutes.
2. Introduction of new members.
3. Presentation by the President of a summary report on the state of the Society and the work of the retiring officers.
4. Election of new officers.
5. Miscellaneous business.
6. Presentation of notes and exhibition of specimens.
7. Presentation of announced topics.
8. Introduction of visitors.
9. Installation of newly elected President.
10. Adjournment.

Section 4.—Either the first or the second regular meeting following the annual meeting shall be set aside for the delivery of the annual address of the retiring President.

Article IX.—**Publications**

Section 1.—Publications of the Society shall consist of a periodical to be known as the Proceedings of the Entomological Society of Washington which shall contain the proceedings of the Society and such papers as are accepted for publication in it, a series of Memoirs, and such miscellaneous handbooks or other special publications as may be deemed desirable. Each member in good standing, except a retired member relieved of payment of dues, is entitled to one copy of each issue of the Proceedings (see Art. IV, Sec. 2).

Section 2.—Financial support of the Proceedings shall be provided by the annual dues, from subscription revenues, from the sale of complete or partial sets of the Proceedings, from the fees of life and sustaining memberships, from page charges, and from such other funds as the Executive Committee shall determine.

Section 3.—The Society shall maintain a separate fund to be known as the Special Publication Fund. At the discretion of the Executive Committee, any unrestricted portion of the Special Publication Fund may be used for publishing Memoirs, handbooks, or other special publications. In any one year, a sum not exceeding the previous five years' income from interest on the Fund monies may be taken from this Fund and applied toward the publication of the Proceedings; such sum to be returned to the Special Publication Fund at the discretion of the Executive Committee. The Special Publication Fund will be derived from bequests and gifts, from the sale of Memoirs, handbooks, or other special publications, and from such other funds as the Executive Committee shall determine.

Section 4.—Members shall be given preference over non-members in the publication of manuscripts.

Article X.—**Amendments**

These Bylaws may be amended at any regular meeting by a two-thirds vote of the members voting, if the total number voting represents a quorum, provided that such amendment has been passed by a two-thirds vote of the Executive Committee and presented to the Society in written form at the meeting prior to the meeting at which the vote is taken.

SOCIETY MEETINGS

781st Regular Meeting—October 8, 1970

The 781st regular meeting of the Entomological Society of Washington was called to order by President Krombein on October 8, 1970 at 8:00 p.m. in Sternberg Auditorium, Walter Reed Army Medical Center, Washington, D. C. Thirty-four members and 35 guests were in attendance. Minutes of the previous meeting were approved as read.

W. R. M. Mason and *P. D. Hurd, Jr.* were received into the Society and the names of *J. E. Horne*, *R. W. Matthews*, *R. C. Riley*, *P. A. Cammer*, *J. A. Stewart*, *D. W. Price*, *J. D. Hacker*, *W. G. Eberhard*, *M. J. W. Eberhard*, and *C. A. Korytkowski* were read for the first time as candidates for membership.

President Krombein noted the nominating committee was now seeking the names of possible candidates for Society offices in 1971. He then announced the deaths of Dr. Fred Bishopp, 1932 Society President, and Dr. Thomas Snyder, 1949 Society President and Honorary President at the time of his death. Dr. Bishopp's obituary for the Proceedings will be written by a committee consisting of D. Reed (chairman), C. Hoffman, and S. Jones, while R. St. George (chairman), along with A. E. Emerson and C. Muesebeck compose the committee to write Dr. Snyder's obituary for the Proceedings.

T. Bissell responded to the call for notes and exhibitions of specimens by exhibiting the bird-nest like larval cases formed from the excrement of a chrysomelid beetle which feeds on palmetto palm.

G. Steyskal presented for display a 17-year cicada which was caught flying despite the fact that its abdomen had been eviscerated by a bird.

L. Davis noted he had about 100 inches of recording tape with cicada calls if anyone were interested.

H. Sollers-Riedel reported that Dr. Fisher had thanked her and the Society for the birthday card he was sent on his 92nd birthday.

Next President Krombein presented the speaker of the evening, Lt. Col. William Pearson, Entomological Consultant for the Office of the Surgeon General, U. S. Army, who gave the history and present status of malaria control in Panama. The talk was accompanied by Kodachrome slides of actual control operations along with insects and other arthropods native to Panama.

Following the introduction of visitors, President Krombein announced the November Society meeting will begin with a brief memorial service for the late Honorary President, Dr. Thomas Snyder.

The meeting was adjourned at 9:40 p.m., and refreshments were served.—Respectfully submitted, JOHN A. DAVIDSON, *Recording Secretary*.

782nd Regular Meeting—November 5, 1970

The 782nd regular meeting of the Entomological Society of Washington was called to order by President Krombein on November 5, 1970 at 8:00 p.m. in Room 43, USNM. Forty-five members and 15 guests were in attendance.

The meeting was begun with a short program in memory of Dr. Thomas Snyder, the late Honorary President of the Entomological Society of Washington. Three relatives of Dr. Snyder were present: Captain and Mrs. W. R. Lawrence and Joseph B. Handy. President Krombein began the program by reading excerpts of letters from termite specialists W. G. H. Coaton and A. E. Emerson. Next, Dr. Alexander Wetmore spoke of his friendship with Dr. Snyder beginning with a field trip they took into the Florida Everglades. Then Mr. Raymond St. George enumerated some of Dr. Snyder's accomplishments when the latter worked for the Bureau of Entomology, Division of Forest Insects. The memorial program was closed by Dr. Frank Campbell, a close personal friend of Dr. Snyder during the last few years.

Minutes of the previous meeting were approved after corrections.

J. E. Horne, R. W. Matthews, R. C. Riley, P. A. Cammer, J. A. Stewart, D. W. Price, J. D. Hacker, W. G. Eberhard, M. J. W. Eberhard, and *C. A. Korytkowski* were received into the Society while the names of *D. M. Caron* and *J. L. Alexander* were read for the first time as candidates for membership.

Next, Nominating Committee member V. E. Adler presented the suggested slate of Society officers for 1971.

The evening's program consisted of brief reports on current entomological works. W. W. Wirth began the program with a discussion of insects of hot springs which included beautiful color slides of these unusual breeding sites. Three boxes of specimens were also presented for viewing. F. E. Wood changed the pace with a relevant illustrated presentation concerning the importance of spiders in the malfunctioning of gas air conditioners. R. F. Whitcomb discussed the transmission of mycoplasma and viruses by leafhoppers with color slides. D. H. Messersmith and P. G. Bystrak discussed the feeding habits of *Forcipomyia* flies and R. H. Foote completed the program with some new ideas on the use of computers in cataloguing.

The notes which followed began with a color slide of W. S. Fisher who was visited in Florida by Mrs. Yates. T. L. Bissell presented slides of 2 aphid specialists he visited while at the British Museum and D. H. Messersmith displayed a praying mantis which ate its right front leg.

President Krombein adjourned the meeting at 9:50 p.m. after which refreshments were served.—Respectfully submitted, JOHN A. DAVIDSON, *Recording Secretary*.

BOOK REVIEWS

John Banister and his Natural History of Virginia 1678–1692. By Joseph and Nesta Ewan. 485 pp., 70 figs. 1970. University of Illinois Press, Urbana, Ill. 61801. Price: $15.00.

This book is a detailed and thoroughly documented account of the studies of natural history made by John Banister (1650–92), a young English clergyman who spent 14 years in Virginia. During his student years in England he had been an enthusiastic naturalist, especially in the collecting of plants. In Virginia he followed those interests actively, and regularly sent specimens, notes and illustrations of plants back to England. By 1680 he also had assembled a collection of insects with accompanying notes, and evidently made additions to it during the following 12 years; however, it is not clear whether any of the entomological material was returned prior to his accidental death by shooting in 1682. Then, his notes, comprising about 15 handwritten pages (of which 4 dealt with Mollusca, and several with spiders) and numerous specimens, were sent to England and were utilized by several naturalists in their writings. Their acknowledgement of his contributions, or even the original sources of specimens, often was scanty, however, so that the extent to which Banister's insect material was used is not fully known. Linnaeus may have based some Virginia insects on Banister specimens or drawings, but surviving labels are too uncertain to prove a connection. Although some of his plants are still preserved at Oxford University, and perhaps elsewhere, Banister's insect specimens have not been traced and probably were destroyed long ago. Nearly 100 years earlier, some notice had been given Virginia insects when John White, who came to Virginia in 1585 with Sir Walter Raleigh's second expedition, made drawings of various insects (see page 291, also Austin H. Clark, Alumnae Bull. Randolph-Macon Woman's College 30 (3): 1–9, 1937).

Dr. Joseph Ewan, professor of biology at Tulane University, is an eminent writer and lecturer on the lives and work of early American biologists, especially botanists. His 1950 book, "Rocky Mountain Naturalists," includes a fine biography of T. D. A. Cockerell as well as references to many entomologists among some 1200 naturalists mentioned. Now, he and Mrs. Ewan correlate Banister's career with important persons of the period in England and Virginia, noting, for instance, that Banister was one of the founders of the College of William and Mary. The Ewans write of Banister (p. xiii); "His works are a significant record of early Virginia, and had they been published even incomplete as they were at his death, they would fundamentally have altered the course of American botany, entomology, and malacology."

Though John Banister evidently did exceptionally advanced work for his time, and though his botanical contributions may warrant the above evaluation, I question whether it is true for entomology. From the "Insect and Arachnid Catalogue," published here with annotations, it is clear that Banister tried to equate the Virginia insects he found with those described (pre-Linnaean) by Thomas Mouffet, Martin Lister, and others in England. He enumerated a modest number of common Virginia insects, together with observations on their biology. His notes are fullest concerning Hymenoptera and Coleoptera. He noted the halteres of Diptera and likened them to the balancing poles of tight-rope walkers. If Banister had completed and published more on insects, early colonists would have had something for reference, including habits and importance, and Thomas Say and other later resident writers would have had more guidance on their local fauna. However, from what is shown here, the entomology was rather fragmentary and clearly secondary to botanical work. In the Orthoptera, for example, he distinguished about 5 kinds of grasshoppers and katydids, 2 cockroaches, one cricket, and 2 mantids (one of which apparently was the hemipteron *Ranatra*).

The authors consulted several entomologists (O. L. Cartwright, Hugh Leech, Richard P. Mills, Harry B. Weiss) to interpret in current nomenclature the species and chronology of Banister's notes. To these editorial notes, two further clarifications may be added: The bee nesting in timber (p. 286) is plainly a carpenter bee, and the 8-legged creature creeping rapidly sideways, forward, and backward in musty books (p. 306) must have been a pseudoscorpion. Some of Banister's species designations are binomial, but most are not.

In summary, though a brief review can mention only a few aspects of this scholarly work, this is a splendid source book for many phases of early natural history. It is conveniently indexed and otherwise documented, as, for example, with a chronology, a time chart of other naturalists within Banister's general period, a map of early colonial Virginia, a diagram of pre-Linnaean roots in North America and Europe, and a bibliography. The book's preparation was surely a task to which the authors were long dedicated, and all readers with a bent toward history well revere them for it.—ASHLEY B. GURNEY, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture, c/o U. S. National Museum, Washington, D. C. 20560.*

The Moths of America North of Mexico, Including Greenland, edited by D. C. Ferguson, J. G. Franclemont, R. W. Hodges, E. G. Munroe, R. B. Dominick, and C. R. Edwards. **Fascicle 21, Sphingoidea**, by Ronald W. Hodges. E. W. Classey Ltd. and R. B. D. Publications Inc., London. 1971. 158 pp., text figs., 14 colored plates. Price: $24.00 this fascicle; subscription, $19.60 per fascicle. Distributed exclusively in North America by Entomological Reprint Specialists, P. O. Box 77971, Dockweiler Station, Los Angeles, California 90007.

This study represents the first of about 41 fascicles under the title "The Moths of America North of Mexico" which is the first attempt to cever the more than 10,000 species of moths in the continental United States, Canada, and Greenland. The fascicles will appear at the rate of two or three per year; publication will proceed as manuscripts are received, not necessarily in numerical order.

The prospectus states: "The text will be a synthesis of all revisionary studies on the moths of this region. . .*It will contain descriptions and illustrations of new genera and species.* It will embody a reclassification of extensive segments of the North American Lepidoptera. . .Genera and higher taxonomic divisions will be consisely defined, and keys will be included where necessary. For each species there will be a synonymy, a brief comparative description pointing out the significant characters that distinguish it from its nearest relatives, information on its distribution, habitat and life history, including larval food plant if known. Similar information will be given for recognized subspecies. . .The descriptions will be supported by line illustrations in the text of genitalia and other structural features wherever necessary for identification of species." In addition, each species as well as major forms and subspecies, will be portrayed in full color, which is the real feature of this series.

The design of this monumental work is for use by both the amateur and the professional entomologist. I am not a specialist in the Lepidoptera; but, if I were to collect moths, and particularly sphingids in this case, I feel that I would have little difficulty in identifying them by use of the colored plates. If I were to further venture into the dissection of genitalia, I would find that the technical terms used in the terminology of the genitalia would be fully defined and illustrated with labelled diagrams. Learning to prepare the genitalia would have to come from some other source, but, once that is learned, I could make it through this terminology with little difficulty. My only concern is that the cost of the entire series might be a little high if I were a amateur lepidopterist.

I cannot speak for the professional lepidopterist, but "The serious student and specialist will find the text uncompromisingly accurate and the list of synonyms, bibliographies and taxonomic content indispensable."

The composition of the Board of Editors certainly reflects the aim of reaching both the amateur and the specialist. The specialists are represented by Drs. Douglas C. Ferguson, John G. Franclemont, Ronald W. Hodges, and Eugene G. Munroe. They are supported by two dedicated amateurs, Dr. Richard B. Dominick and Mr. Charles R. Edwards, both of whom have an interest in the Lepidoptera, particularly of South Carolina, and who are responsible for all of the color photography. Contributions will be made by collaborating authorities on certain groups. The excellent line drawings are being done by Mrs. Elaine R. Hodges.

In this first fascicle to appear, Dr. Hodges has presented the first comprehensive review of the superfamily Sphingoidea for North America. A key is provided for the adults of the 40 genera plus partial keys to the genera based on pupae and mature larvae. Keys and brief discussions of the diagnostic characters for the 115 species, as well as synonymies, distribution, and host plant data, constitute the bulk of the text. Common names that have been proposed have been included.

Of course, the attractiveness of this series, and particularly this fascicle, is due to the superb color plates of the moths in natural size. There were many difficulties both in taking the photographs and in printing, but the resulting plates are unsurpassed in clarity and naturalness of color. The fascicle is printed on a good quality paper, the printing is large and clear, the page size large ($9 \times 11\frac{1}{2}$), and the binding is adequate with its temporary heavy paper cover.

The editors are to be complimented for their desire to tackle such a monumental project, and Dr. Hodges has given it a good start. The publishers (E. W. Classey and R. B. D. Publications) and printer (Curwen Press) are also to be congratulated for their fine work and support of this series.—PAUL M. MARSH, *Systematic Entomology Laboratory, Agriculture Research Service, U. S. Department of Agriculture, c/o U. S. National Museum, Washington, D. C. 20560.*

Information for Contributors

Publication in the Proceedings is reserved for members only. Publication of papers by non-members may be obtained after acceptance at a cost to the author of $18.00 per printed page. Regular papers are published in approximately the order that they are received. Manuscripts should not exceed 30 typewritten pages including illustrations. Papers of less than a printed page may be published as space is available at the end of longer articles.

Manuscripts for publication, proof and other editorial matters should be addressed to the *Editor* (for address, see inside front cover of this issue).

Typing—All manuscripts must be typed on bond paper with double-spacing and ample margins. Carbon copies or copies on paper larger than 8½ × 11 inches are not acceptable. Do not use all capitals for any purpose. Underscore only where italics are intended in the body of the text, not in headings. Number all pages consecutively. References to footnotes in the text should be numbered consecutively and typed on a separate sheet.

First page—The page preceding the text of the manuscript should include (1) the complete title, (2) the order and family in parentheses, (3) the author's name or names, (4) the institution with city, state and zip code or the author's home city, state and zip code if not affiliated, (5) in the upper left hand corner, the complete name and address to which proof is to be sent.

Abstract—All manuscripts, including notes of one page or less, must be accompanied by an abstract suitable for publication. The abstract must be typed on a separate sheet following the title page, should be brief (not more than 3% of the original), and written in whole sentences, not telegraphic phrases.

Names and descriptions of organisms—The first mention of a plant or animal should include the full scientific name with the author of a zoological name *not* abbreviated. Descriptions of taxa should be in telegraphic style.

References—Citations in the text of papers longer than one printed page should be by author and date and should refer to a list of concluding REFERENCES listed alphabetically. See a recent issue of the Proceedings for style of references. In shorter articles, references to literature should be included in parentheses in the text.

Illustrations—No extra charge is made for line drawings or halftones. Authors must plan their illustrations for reduction to the dimensions of the printed page and the individual figures *must* be mounted on suitable board. Proportions of full-page illustrations should closely approximate 4$\frac{5}{16}$ × 6″ (26 × 36 picas); this usually allows explanatory matter to appear on the same page. On the back of each illustration should be stated (1) the title of the paper, (2) the author's complete name and address, and (3) the number of the illustration such as "No. 1 (of 3)" etc. Figures should be numbered consecutively. Plates will be returned only at the author's request and expense.

Figure legends—Legends should be typewritten double-spaced on separate pages headed EXPLANATION OF FIGURES and placed following REFERENCES. Do not attach legends to illustrations.

Proofs and reprints—Proofs and a reprint order will be sent to the authors by the printer with explicit instructions for their return. Major changes in proof will be charged to the author.

Page charges—All regular papers of more than one page will be charged at the rate of $6.00 per printed page. Immediate publication may be obtained at the rate of $18.00 per printed page. These charges are in addition to those for reprints. Member authors who have no institutional affiliation or funds available may request to the Editor in writing to have charges for regular papers waived. Charges made for immediate publication or to non-members will not be waived.

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of the
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of WASHINGTON

DEPARTMENT OF ENTOMOLOGY
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THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

ORGANIZED MARCH 12, 1884

All correspondence concerning Society business should be mailed to the appropriate officer at the following address:

Entomological Society of Washington
c/o Department of Entomology
Smithsonian Institution
Washington, D. C. 20560

MEETINGS.—Regular meetings of the Society are held in Room 43, Natural History Building, Smithsonian Institution, on the first Thursday of each month from October to June, inclusive, at 8 P.M. Minutes of meetings are published regularly in the *Proceedings.*

MEMBERSHIP.—Members shall be persons who have demonstrated interest in the science of entomology. Annual dues for members are $6.00 (U.S. currency).

PROCEEDINGS.—Published quarterly beginning with March by the Society at Washington, D.C. Members in good standing are entitled to the *Proceedings* free of charge. Nonmember subscriptions are $8.00 per year, both domestic and foreign (U.S. currency), payable in advance. All remittances should be made payable to *The Entomological Society of Washington.*

The Society does not exchange its publications for those of other societies.

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PROCEEDINGS OF THE

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Vol. 73 DECEMBER 1971 No. 4

THE LIFE CYCLE AND REDESCRIPTION OF MORDVILKOJA VAGABUNDA (HOMOPTERA: APHIDIDAE)[1,2]

CLYDE F. SMITH, *Department of Entomology, North Carolina State University, Raleigh, North Carolina 27607*

ABSTRACT—*Mordvilkoja vagabunda* (Walsh) produces large galls on the end of the twigs of *Populus* spp. (*deltoides* group). The fundatrispuria emigrate to *Lysimachia* spp. where they feed on the leaves, stems and terminals at first but later move to the underground parts of the plant. Sexuparae develop in the fall and fly to *Populus* spp. where they deposit eggs which overwinter. However, *M. vagabunda* may also live indefinitely on *Lysimachia*. Descriptions are given of the fundatrix, fundatrispuria, first instar from the fundatrispuria, apterous alienicola and sexupara.

Walsh (1862:306) described *vagabunda* in the genus *Byrsocrypta* from specimens (sexuparae) collected near Rock Island, Illinois. They "occurred very abundantly on various forest trees in September." He called it the vagabond aphid because he knew nothing of its hosts. Walsh stated "alate expanse .43–.51 inch" (10.78–13.26 mm.). The 6th joint of the antennae is two-thirds as long as 4 and 5 put together. Walsh and Riley (1868:57) referred to ". . . . the vagabond gall, and they are produced by a plant louse belonging to the genus *Pemphigus* and which has been described as *Pemphigus* (*Byrsocrypta*) *vagabundus* by the senior editor of this paper." Walsh and Riley (1869:107) gave figures of the gall and alate vivipara. Oestlund (1887:22) gave a description of the forms (spring) from the gall and stated, "the species described by Walsh as *vagabunda* is evidently something else from that producing the large irregular gall on the end of the twigs of poplar to which the name *vagabunda* has also commonly been applied." Cockerell (1906:34) proposed the name *Pemphigus oestlundi* for the species

[1] Paper no. 3322 of the Journal series of the North Carolina State University Agricultural Experiment Station, Raleigh, North Carolina.

[2] I appreciate the suggestions and the loan and/or gift of specimens from L. J. Stannard, Illinois Natural History Survey, Louise Russell, United States Natural Museum, D. Hille Ris Lambers, Bennekom, Netherlands and H. L. G. Stroyan, England.

described by Oestlund (1887:22) as *P. vagabundus* (Walsh). Davis (1910:411) lists *oestlundi* Cockerell as a synonym of *vagabundus* Walsh. However, he later lists *vagabundus* Walsh as a synonym of *oestlundi* Cockerell (Davis 1911:256(4); 1913:117). These are the only references I have seen where *oestlundi* was recognized. Del Guercio (1908:10) erected a new genus *Mordvilkoja* with *vagabunda* Walsh as the type species.

Most of the specimens I have seen are smaller than indicated by Walsh (1862). However, I have some specimens that nearly fit his minimum measurements. Also, the majority of the sexuparae are found on poplars, but a specimen may be found occasionally on other trees or in spider webs. Therefore, as indicated by Oestlund (1887:22) there can be some question concerning the identity of the species described by Walsh (1862). However, there certainly is no doubt about the species Walsh and Riley (1868 and 1869) referred to as *vagabunda* Walsh. Baker (1920:70) accepted the name *vagabunda*. I also propose to retain the name *Mordvilkoja vagabunda* (Walsh) for the vagabond poplar aphid, a name which has been in common usage for more than 100 years.

The first instar from the fundatrispuria and the apterous alienicola resemble the same morph of *Parathecabius lysimachia* (Börner) in having 4-segmented antennae. The sexuparae and apterous alienicola are also similar. However, the antennae of the fundatrispuria are quite different, the p.t. of *M. vagabunda* being several times longer than the base whereas *lysimachiae* has a p.t. about ¼ the length of the base. The first instar of *Thecabius affinis* (Kaltenbach), another closely related species has 5-segmented antennae. Also, the p.t. of the fundatrispuriae is shorter than the base.

Life History

Various authors have published on the "life history" of the vagabond poplar aphid, but none of them discovered the summer host. In 1961, I discovered an aphid on *Lysimachia* sp. which I thought was a new species of *Parathecabius*. In 1968, while examining slides from Illinois I saw the neotypic slide of *Mordvilkoja vagabunda* (Walsh) which had been selected by Hottes and Frison (1931:360). This appeared to be identical with sexuparae I had collected from *Lysimachia*. In 1969, and again in 1970, I made transfers from the vagabond poplar gall (fig. 5) to *Lysimachia* and was successful both years and the sexuparae proved to be the same as the specimens on the neotype slide.

Ignoffo and Granovsky (1961a, 1961b) gave an excellent account of the development of the gall and the aphid in the gall. In Minnesota, "migration of alate fundatrigeniae from galls to an undiscovered secondary host began on June 26 and continued for 51 days." In North

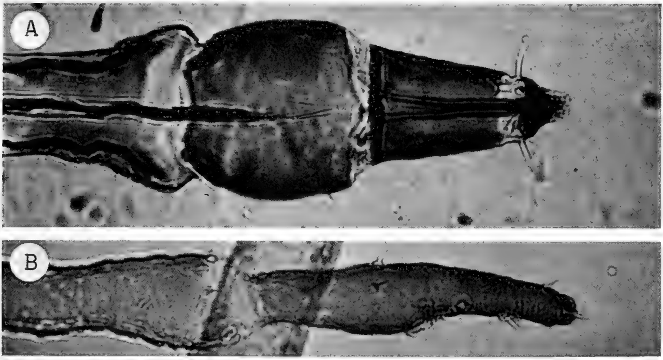

FIG. 1. *Mordvilkoja vagabunda* (Walsh), fundatrix: A, Rostrum, 270×, coll. 69-160, *Populus deltoides*, Statonburg, N. C. May 27, 1969, C. K. and C. F. Smith; B, A.s. V(part) and VI, 270×, coll. 69-160.

Carolina migration from the galls begins about May 1 and ends about July 1.

In North Carolina, *M. vagabunda* migrates from *Populus deltoides* Marshall (cottonwood) to *Lysimachia quadrifolia* L. where it first infests the leaves and stems. Later in the season, it moves to the underground portions of the stems and the main roots where it may remain from one year to the next, or sexuparae, which go to *Populus* spp., may be produced from September to November.

The following abbreviations are used: a.s.—antennal segments; p.t.—processus terminalis; R IV + V—terminal segments of the rostrum; T. ch.—tarsal chaetotaxy.

FUNDATRIX

(Fig. 1)

Cleared specimens. Dusky on head; a.s. I, VI; R IV + V; legs; genital plant and spiracles; very pale on rest of body.

Head without distinct wax plates. Antennae 4-segmented, a.s. III may show signs of dividing, p.t. with 1–3 "clear spots" bearing a spine-like structure similar to those formed on the p.t. of the fundatrispuria. Rostrum attaining meso-coxae, R IV + V without accessory setae.

Thorax with medial, pleural and lateral wax plates. T. ch. 2-2-2.

Abdomen with small medial, pleural and lateral wax plates. Genital plate with about 22 setae, 12 of which form more or less of a single row along the caudal margin. Cauda with 4(?) setae.

Measurements[3] of one specimen. Body 3.85, a.s. I, 0.07; II, 0.11; III, 0.20; IV, 0.11 + 0.09. R IV + V, 0.12. Meta-tibia 0.52, metatarsomere II, 0.13.

[3] All measurements are in millimeters.

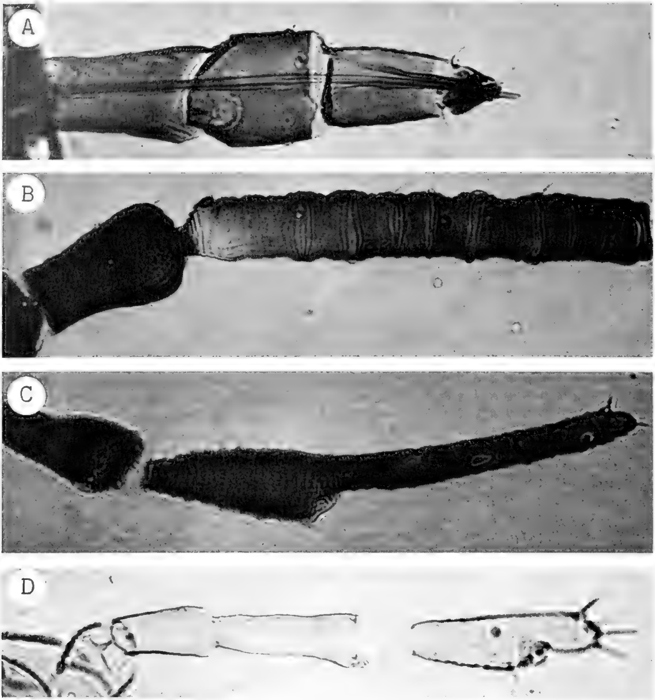

FIG. 2. *Mordvilkoja vagabunda* (Walsh), fundatrispuria (A, B, C) and 1st instar from fundatrispuria (D): A, Rostrum, 270×, coll. 67-310-1, *Populus* sp. (gall), Kinston, N. C. May 28, 1967, C. F. Smith coll.; B, A.s. II and III, 270×, coll. 65-64(1) *Populus deltoides* Mt. Pleasant, N. C., May 27, 1965, C. F. Smith coll.; C, A.s. V (part) and VI, 270×, coll. 65–64(1); D. Antennae, 270×, coll. 63-310 reared from fundatrispuria.

Principal diagnostic character. P.t. long and bearing 1–3 "clear spots."

FUNDATRISPURIA
(Fig. 2A–C)

Cleared specimens dark on head, antennae, thorax, legs, genital plate, anal plate and cauda.

Head without wax plates. Antenna 6-segmented. Setae on a.s. II about 9, base of VI, 2–4. Rhinaria on a.s. III, 8–11; IV, 1–3; V, 0–1. Primary rhinarium on a.s. V may have chitinous islands. P.t. with 1–3 "clear spots," each with a spine-like seta. R IV + V without accessory setae.

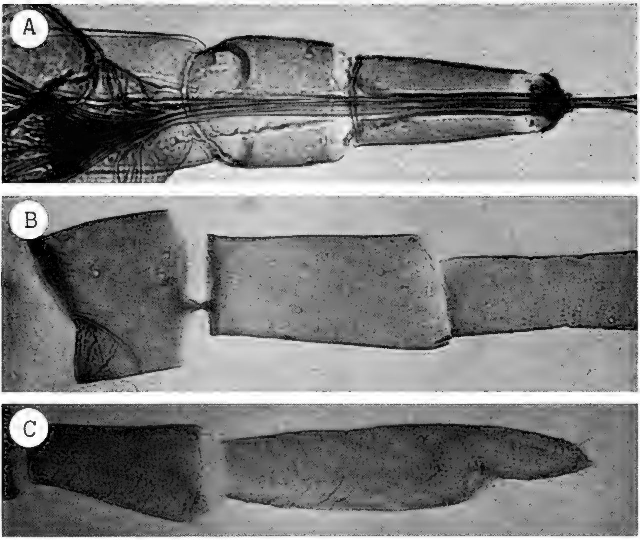

FIG. 3. *Mordvilkoja vagabunda* (Walsh), apterous alienicola: A, Rostrum, 270×, coll. 62-1180-2, *Lysimachia* sp. McGrady, N. C., July 20, 1962, G. F. Turnipseed, coll.; B, A.s. I, II, III (part), 270×, coll. 63-195-1. *Lysimachia* (roots), Boone, N. C. Oct. 15, 1963, C. K. and C. F. Smith coll.; C. A.s. V, VI, 270×, coll. 63-195-1.

T. ch. variable, 3–5, pro- and meso-tarsomeres with one of the setae being spine-like. Meso-thorax with small wax plates, the distance between them ca. 5–7 times their greatest diameter.

Abdomen with medial and pleural wax plates, medial plates may not be on all segments. Siphunculi small, pore-like, slightly smaller than lateral wax pore plates. Genital plate with about 24 setae, about 12 of which are on the caudal edge, the majority of the others grouped in the center part of the genital plate. Cauda with 2 setae.

Measurements of 1 specimen. Body 1.8. A.s. III, 0.27; IV, 0.08; V, 0.09; VI, 0.12 + 0.18. R IV + V, 0.11. Meta-tibia 0.82; metatarsomere II, 0.20.

Principal diagnostic characters. Long p.t. bearing 1–3 "clear spots," head without wax plates; small, widely separated wax plates on meso-thorax; and small, pore-like siphunculi.

FIRST INSTAR FROM FUNDATRISPURIA
(Fig. 2D)

Antennae 4-segmented with a membraneous "neck" between a.s. III and IV. Setae on a.s. I, 3; III, 3; base of IV, 2. R IV + V without accessory setae. Plantal setae short, inconspicuous, less than ⅕ length of claw. Abdominal tergites III to VI each with 4 wax pore plates (medial and pleural), abdominal tergites VII with 2 wax pore plates. Abdominal tergites VIII apparently without wax pore plates. Each wax pore plate bearing 1 seta. Cauda with 2 setae.

Apterous Alienicola on **Lysimachia.**

(Fig. 3)

Head dusky on vertex, with 4, (may be indistinct), wax plates. Eyes 3-faceted or may have multiple facets in addition. Antennae pale, 6-segmented, a.s. II distinctly longer than I, with about 9 setae. Rostral IV + V smooth, without accessory setae.

Thorax pale. Legs dusky. Tibia with 6 spine-like setae at the apical end and two rows of spine-like setae on the dorsal surface, setae about ⅓ diameter of tibia. T. ch. 3-2-2, setae spine-like, however, occasionally there will be accessory setae on tarsomere I, in which case the accessory setae are more hair-like. Other setae on tibia and on tarsomere II hair-like, pointed. Denticulations very sparse on tarsomeres.

Abdomen with wax plates on tergites III to VII, 4 wax plates on each tergite except number VII which has only 2. Gonapophyses usually with (5-12)-2-(7-12) setae. Genital plate with about 24 setae located primarily around the periphery. Cauda bearing 2 setae.

Measurements of one specimen. Body 2.5. A.s. III, 0.15; IV, 0.06; V, 0.09; VI, 0.14 + 0.05. R IV + V, 0.15. Meta-tibia 0.71; metatarsomere II, 0.21.

Principal diagnostic characters. A.s. II distinctly longer than a.s. I. R IV + V without accessory setae. Shape of p.t.

Sexuparae on **Lysimachia**

(Fig. 4)

Head dark with a distinct longitudinal suture and 0–4 dorsal wax plates which are distinct. Antennae dark. A.s. II bearing about 18 setae. Rhinaria on a.s. III, 8–16; IV, 1–3; V, 0–1. Rhinaria encircling about half of a.s. III and ⅓ to ½ of a.s. IV. A.s. II distinctly longer than I. Setae on antennal segments pointed, on a.s. III ca. ½ diameter of segment, a.s. VI with 6 setae distad of the primary rhinarium and 2 to 6 setae proximad. Rostrum attaining mesothoracic coxae, R IV + V smooth (without denticulations), elongate and bearing 0 to 2 accessory setae.

Thorax dark. Wax pore plates on mesothorax distinct. Legs dark. Tarsomeres with faint, rather sparse, denticulations. T. ch. variable, 5 to 7 setae on each tarsomere I. Pro-tarsomere I with peg-like seta, other tarsomeres without peg-like setae. Setae on hind tibia pointed, increasing in length toward the distal end, about ½ diameter of tibia. Wings hyaline, stigma dark.

Abdomen pale, bearing nearly round lateral wax plates and variable wax plates on the medial area of the dorsal surface. Lateral wax plates usually bearing 1 seta, occasionally 2, especially toward caudal end. Wax plates may be paired or joined. Wax plates on abdominal tergite VIII usually joined. Abdomen with wax pore plates on ventral surface which do not have a distinct border. Siphunculi absent. Genital plate bearing about 30 setae, about 10 of them grouped more or less in the center with about 14 along distal edge. Gonapophyses usually 9-(0-3)-9 setae. Cauda bearing 2 or 3 setae.

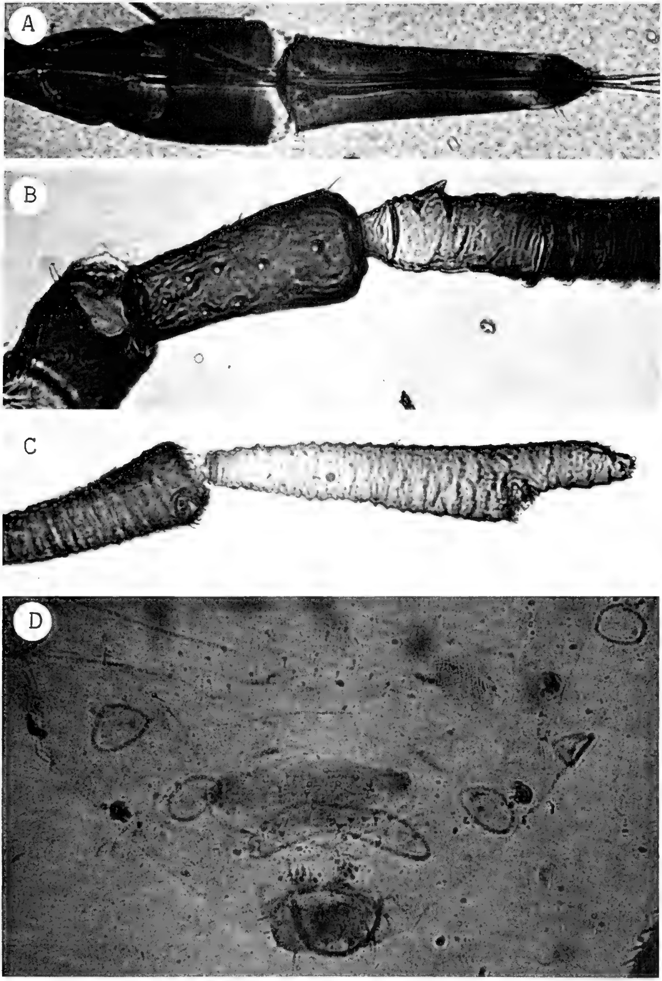

FIG. 4. *Mordvilkoja vagabunda* (Walsh), sexupara: A, Rostrum, 270×, coll. 61-381 (1), *Populus deltoides*, Farmer, N. C., October 24, 1961, C. F. Smith, Coll.; B, A.s. I, II, and part of III, 270×, coll. 64-186, *Lysimachia*, McGrady, N. C., October 26, 1964, C. F. Smith, coll.; C, A.s. V (part), a.s. VI, 270×, coll. 64-186; D, Tip of abdomen, 120×, coll. 62-1152, *Populus* sp. (crevices, and under loose bark) McGrady, N. C., October 15, 1962, C. K. and C. F. Smith, coll.

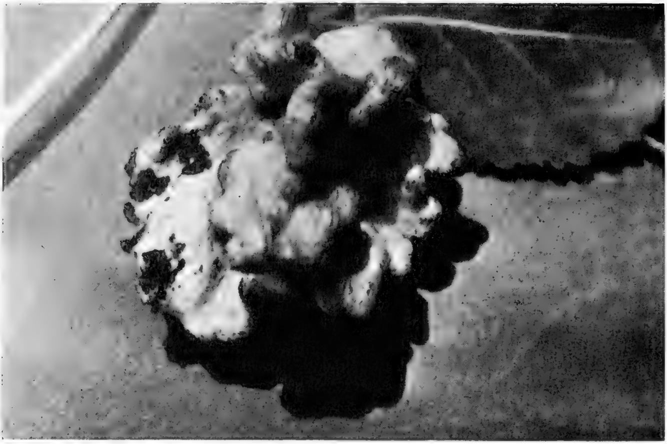

FIG. 5. *Mordvilkoja vagabunda* (Walsh) gall on *Populus deltoides*, Durham, North Carolina July 2, 1965.

Principal diagnostic characters. A.s. II distinctly longer than a.s. I; length and shape of p.t. (fig. 4C); R IV + V, length and shape, and usually without setae.

Measurements of one specimen. Body 2.85. A.s. III, 0.35; IV, 0.13; V, 0.14; VI, 0.18 + 0.07. R IV + V, 0.19; metatibia 1.08; metatarsomere II, 0.27.

Types

Hottes and Frison (1931:360–1) selected a neotype slide and stated "In view of the fact that this species was originally described from fall migrants from Illinois by Walsh, and the types are lost, slide no. 9744 of fall migrants in the collection of the Illinois State Natural History Survey has been selected as the *neotypic* slide." I have seen this slide. There are 2 specimens, the one at 9 o'clock is circled with ink and I am designating this as the neotype.

Collections

The primary hosts appear to be *Populus deltoides* Marshall and *P. sargenti* Dode. It has been recorded from *P. balsamifera* Linneaus (*P. tacamahacca* Mill). I have seen numerous sexuparae on *P. candicans* Aiton in the fall of the year but I have never seen any galls in the spring. Alternate hosts are *Lysimachia quadrifolia*, *L. terrestris* and possibly other *Lysimachia*. Sexuparae leave *Lysimachia* and congregate in crevices and under loose bark of any species of *Populus* in the area.

I have seen specimens from Colorado, Connecticut, Georgia, Illinois, Indiana, Maine, Maryland, Massachusetts, Montana, Minnesota, North Carolina, North Dakota, New York, Pennsylvania and Utah in the United States and Manitoba and Ontario, Canada.

In literature it has also been recorded from Iowa, Missouri, Nebraska, Nevada, New Jersey, and Ohio in the United States and Alberta, Canada.

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THE FEMALE OF THATUNA GILLETTI OMAN, WITH BIOLOGICAL NOTES (HOMOPTERA: CICADELLIDAE)[1]

PAUL OMAN, *Department of Entomology, Oregon State University, Corvallis, Oregon 97331*

ABSTRACT—The female sex and some immature stages of *Thatuna gilletti* Oman are described for the first time and information given about the habitat and host plant of the species.

I described *Thatuna gilletti* (Oman, 1938:176) from a series of 10 male specimens taken in the vicinity of Moscow, Idaho during the period 1920–31 by several collectors. Nothing has been published regarding the females or the biology of the species. Between 1931 and 1970, so far as I am aware, representatives of the species were collected only twice. G. G. E. Scudder (1961) reported the capture of a male near Erie, British Columbia, Canada in 1961, and there is a male in the Oregon State University collection taken June 8, 1963 by David R. Smith, 7 miles southwest of Lane, Kootenai Co., Idaho. Erie, B. C. is only a few miles north of the U. S.-Canadian border, and not far from the northwestern corner of Idaho. Wolfe (1955c)[2] has reported *T. gilletti* from Washington, but without definite locality or date. Thus, the occurrence of the species in that state remains uncertain but is to be expected. These records suggest a limited distribution in the mountainous region of Idaho, Washington and British Columbia west of the Continental Divide.

This paper contains a description and illustration of the female and the later nymphal stage of *T. gilletti*, and notes on the biology and ecology of the species.

When I first characterized the genus *Thatuna*, I stated "Female unknown, probably brachypterous." Subsequent study of the relationships of *T. gilletti* to other leafhopper genera led me (Oman, 1949:77) to state without equivocation that females of *T. gilletti* were brachypterous, although I had not then seen either females or immature stages. In 1968, when I resumed study of the leafhopper taxa to which *Thatuna* is related, I predicted[3] that females of *gilletti*, when found, would prove

[1] This study was supported in part by Grant GB-7706, "Phylogeny and Distribution of Nearctic and Palearctic Leafhoppers," from the National Science Foundation. A literature search was aided by a Grant-in-Aid from the General Research Fund of the Oregon State University. Page charges were paid from Grant GB-7706.

[2] Metcalf (1963:32 and 1964:345) cites 2 references to *Thatuna gilletti* by Wolfe, but the reference to Wolfe 1955a:25 is apparently an error for page 25 in Wolfe 1955c. I find no reference to *T. gilletti* in Wolfe 1955a.

[3] Letter, Oman to W. F. Barr dated July 5, 1968.

to be brachypterous and that the species lived on some sort of a perennial shrub, probably one of the chaparral plants or similar type shrubs that occur in the Moscow Mts. near Moscow, Idaho. Field studies during early June 1970 established the accuracy of those predictions.

Thatuna is closely related to *Bathysmatophorus* Sahlberg, an Old World taxon apparently limited in distribution to northern latitudes or high altitudes in Eurasia. The characters of the female substantiate this relationship, which has been further demonstrated by Ishihara (1957) who also pointed out that the venation of the forewing of the male, which I had used to differentiate *Thatuna* and *Bathysmatophorus*, is so variable in the latter genus as to lack value for generic separation. Thus the distinctions between males of the two taxa are the small appendix of the forewing in *Thatuna* and the striking differences in structure of the genital parts. The female of *Thatuna* has the forewings much shorter on the commissural line than elsewhere, with the caudal margin therefore strongly oblique, whereas *Bathysmatophorus* females have the caudal margin of the forewing broadly rounded and the wing only slightly shorter at the commissural line than elsewhere.

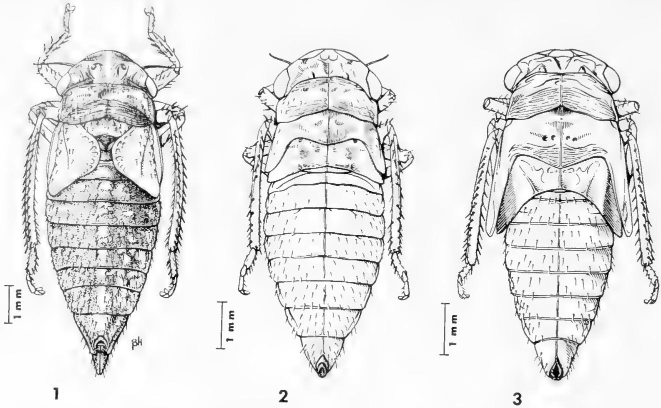
Thatuna is much more closely related to *Bathysmatophorus* than to any Nearctic taxon, and shares many characteristics with that Palearctic genus. In the Nearctic fauna I consider it closest to *Lystridea* Baker, although the females have some resemblance to those of *Errhomus oregonensis* (Baker). In this group of relict taxa that make up the Errhomenini (= Errhomenellini *auct.*) evolutionary change has been much greater in the males than in females.

Metcalf's (1963) association of the Errhomenini with the Aphrodinae in his family Aphrodidae is completely unjustified on morphological or other grounds. I consider the Errhomenini to be closely related to the Cicadellinae (= Tettigellinae of Oman, 1949; Tettigellidae of Metcalf, 1965) if not a part of that subfamily. Young (1968:16) considers both the Evacanthini and Errhomenini, which I treated (Oman, 1949) as tribes of the Cicadellinae, to be taxa of subfamily status. The relationships of these taxa are being studied by G. A. Anufriev and me.

I am grateful to W. F. Barr and J. F. Gates Clarke, who assisted me in the search for this interesting and elusive insect. I also thank Edwin W. Tisdale of the University of Idaho, for identification of the host plant of *T. gilletti*, and A. R. Gittins for many courtesies during my visit to Idaho.

Adult Female. General appearance as illustrated (fig. 1); more robust than the male and with crown proportionately much longer; mid-length of crown approximately twice length of crown next eye and slightly less than ½ width of head at anterior margins of eyes. Length 7.7–9.0 mm.; width of head 2.65–2.76 mm. (Length of male excluding wings 7.33–7.46 mm.; head width 2.30–2.45 mm.).

Body, except beneath wings and parts of thoracic venter, and legs very sparsely



FIGS. 1–3. *Thatuna gilletti* Oman, dorsal view: 1, adult female; 2, female nymph; 3, male nymph.

clothed with short, procumbent, whitish setae, these slightly longer and more conspicuous on the lower parts of the face and the abdominal venter distally, including ovipositor sheath and sternum VII. Crown and pronotum rugulose and transversely striated as in the male. Lateral margins of pronotum straight and nearly parallel, not diverging posteriorly so much as in the male. Forewing very short medially and laterally, apex bluntly rounded and reaching to base of abdominal tergum IV; hind wing a short, triangular pad, its posterior margin usually visible through the forewing so that latter appears to be appendiculate. Forewing rugulose, venation irregular and prominent on disk, obscure marginally. Abdominal terga polished. Sternum VII more than twice as long as sternum VI, posterior margin with a shallow, broad, flaring median notch.

Color pale cinereous brown with brown to fuscous mottlings as illustrated; anterior margin of head with a transverse pale band between the eyes; posterior margins of forewings usually pale cinereous without markings.

Nymphs. Proportions of female nymphs as illustrated (fig. 2). Length of 5th instars 6.85–7.10 mm., 3rd and 4th instars essentially the same proportions but smaller; color as in adult or paler in recently moulted specimens. Male nymphs (fig. 3) with crown short as in adult, only slightly longer medially than laterally, length of 5th instars 6.32–6.74 mm., 3rd and 4th instars of same proportions but smaller. Wing pads of male nymph reaching to middle of tergum IV; wing pads and thoracic terga usually mahogany brown. Face and dorsum of nymphs polished, shining; setae longer and more conspicuous in nymphs of both sexes than in adult females.

Sexual dimorphism is evident in both adults and nymphs. The sex of nymphs can be readily determined both by the size of the wing pads and by the shape of the genital plates. The plates are divided on the mid-line for about ⅔ their length in females but for only slightly more than the terminal ⅓ in males.

In the Moscow Mountains of Idaho, *T. gilletti* lives in thickets or sparse growths of Mallow ninebark, *Physocarpus malvaceus* (Greene) Kuntze. *P. malvaceus* is part of a shrubby, sclerophyllous plant formation that grows under the canopy of Ponderosa pine at the lower elevations, or in open areas among the fir forests higher up. Adult males and a few adult females of *T. gilletti* were present at the lower elevations when their host plant was in full bloom, but at higher elevations where the plant was just beginning to flower only a few males had matured. The Physocarpus growths at lower elevations are often mixed with growths of "Ocean spray," *Holodiscus discolor* (Pursh) Maxim. Populations of *T. gilletti* were encountered on June 3 and 4, 1970 at several locations from 975–1280 m. They seem to prefer shaded situations at the lower, drier, elevations, but were numerous as nymphs at 1280 m. on stands of ninebark growing in the open.

On the basis of the rather limited sample taken on June 3 and 4, the sex ratio of the Moscow population is approximately 1:1. One mating pair was taken on June 4 at 975 m. by Dr. Barr. The pair was in the customary end to end position, the plates of the male dorsal to the female sternum VII. The females are agile climbers, but seldom jump. Males jump readily and fly well; their presumed tendency to move about in search of the less mobile females is no doubt the reason collectors have encountered them but not the females.

Since the foregoing was written I have seen a sample of 43 specimens (19 ♂♂, 15 adult ♀♀ and 9 ♀♀ nymphs) from 1 mile west of Granite, Bonner Co. Idaho, collected June 9, 1971 by W. F. Barr and D. W. Foster; also 1 ♂ from Kootenai Co. Idaho, 4 miles west of Athol, June 9, 1971, W. F. Barr. The Granite population was just maturing, as evidenced by the teneral condition of most of the females and several males. Dr. Barr[4] reported this population was found in a densely wooded habitat containing a great deal of both perennial and annual understory vegetation with very few ninebark plants in the immediate vicinity. The forest was primarily fir. Female specimens were taken from thimbleberry (*Rubus parviflorus* Nutt.) and from grass and miscellaneous other plants. From these observations it is evident that some populations of *gilletti* are not dependent upon ninebark as a host, as might be assumed from our observations of the Moscow Mt. population.

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THREE NEW SPECIES OF MALLOPHAGA FROM AFRICAN MAMMALS (TRICHODECTIDAE)

K. C. EMERSON, *2704 North Kensington Street, Arlington, Virginia 22207*

and

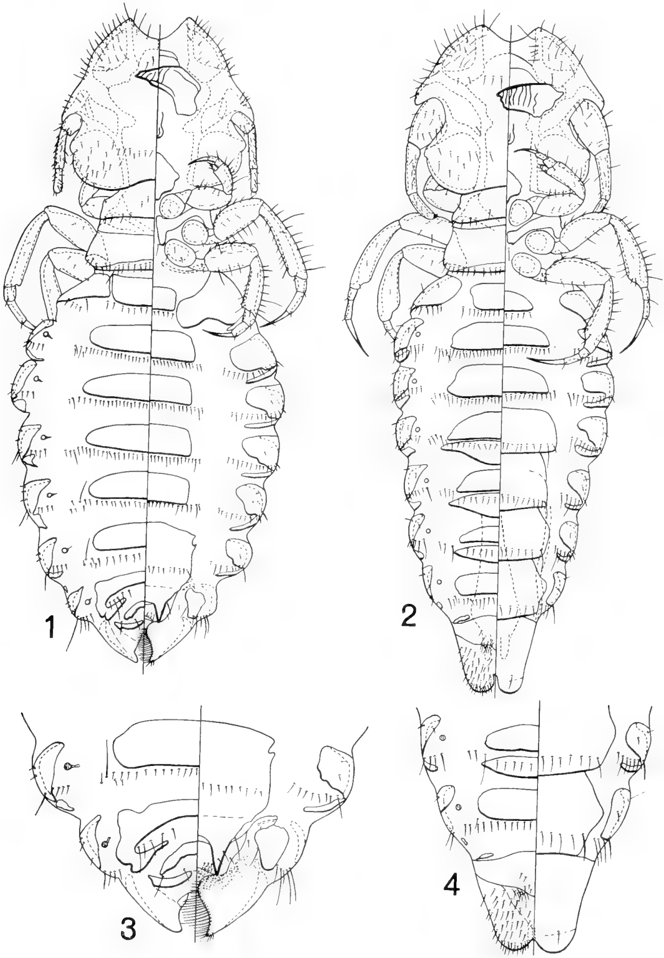
ROGER D. PRICE, *Department of Entomology, Fisheries, and Wildlife, University of Minnesota, St. Paul, Minnesota 55101*

ABSTRACT—*Damalinia* **neotheileri**, n. sp. and *D.* **semitheileri**, n. sp. are described and illustrated from *Gorgon taurinus*; and *Tricholipeurus* **moschatus**, n. sp. is described and illustrated from *Nesotragus moschatus*, all from Africa.

The three new species herewith described and illustrated were sent to the authors by Dr. Theresa Clay, Department of Entomology, British Museum (Natural History). The holotypes are deposited in that museum.

Damalinia neotheileri, n. sp.
(Figs. 1–5)

Holotype male.—External morphology and chaetotaxy as in fig. 2, terminal abdominal segments as in fig. 4, and genitalia as in fig. 5. Total length, 3.07 mm. Close to *Damalinia theileri* Bedford, 1928, but separated by differences in the shape of the head, the shape of the terminal abdominal segments, the genitalia,



FIGS. 1–4. *Damalinia neotheileri*, n. sp.: 1, dorsal-ventral view of female; 2, dorso-ventral view of male; 3, dorso-ventral view of female terminalia; 4, dorso-ventral view of male terminalia.

and size. For *D. neotheileri*, the forehead is shorter and the median indentation is broader than for *D. theileri*. The terminal abdominal segment of *D. theileri* is prolonged, ending in a circular-shaped appendage; for *D. neotheileri*, this prolongation is a tapered extension of the preceding segment. The paramera of *D. neotheileri* are curved outward at the distal tips and are not fused at the anterior ends; the paramera of *D. theileri* are pointed but straight at the distal tips and are fused at the anterior ends to form a large plate. *D. neotheileri* is much larger than *D. theileri*.

Allotype female.—External morphology and chaetotaxy as in fig. 1 and terminal abdominal segments as in fig. 3. Total length, 3.20 mm. Close to *D. theileri*, but separated by differences in the shape of the head, the terminal abdominal segments, and size. The forehead of *D. neotheileri* is shorter and the median identation is broader than for *D. theileri*. The abdominal sternal plate of segment VIII of *D. neotheileri* is short and of *D. theileri* is of normal size. *D. neotheileri* is much larger than *D. theileri*.

Type host.—*Gorgon taurinus albojubatus* Thomas.

Type material.—Holotype male collected off the type host on the Athi Plain, Nairobe, Kenya (no date given) by G. R. C. van Someren. Allotype female and two paratype females collected off *Gorgon taurinus* subsp. taken on the Grumeti River, Lake Province, Tanzania, on September 24, 1965, by G. B. Corbet (Corbet No. 1637). One female paratype collected off *Gorgon taurinus* subsp. in the Eiland Reservation, Leysdorp District, Northern Transvaal, Union of South Africa, on August 30, 1955, by J. N. Swart (British Museum No. 1959-172). Two female paratypes and four nymphs collected off *Gorgon taurinus hecki* Neumann on the Bardamat Plains, Narok District, Kenya, in March 1960 by D. W. Brocklesby. One nymph collected off *G. taurinus hecki* on the Loita Plains, Narok District, Kenya, in March 1960 by D. W. Brocklesby.

Damalinia semitheileri, n. sp.
(Figs. 6–8)

Holotype male.—Terminal abdominal segments as in fig. 8 and genitalia as in fig. 6. Total length, 3.30 mm. This species, with the male very close to that of *D. neotheileri*, is differentiated by the shape and chaetotaxy of the last abdominal segment and by gross differences associated with the genitalia.

Allotype female.—Terminal abdominal segments as in fig. 7. Total length, 3.10 mm. The female of this species is close to that of *D. neotheileri*, but the two are readily separable by differences in the shapes of the tergal sclerites on the posterior segments.

Type host.—*Gorgon taurinus* subsp.

Type material.—Holotype male, allotype female, and one nymph taken from the skin of a specimen of the type host collected at Livingstone, Northern Rhodesia, on May 6, 1962.

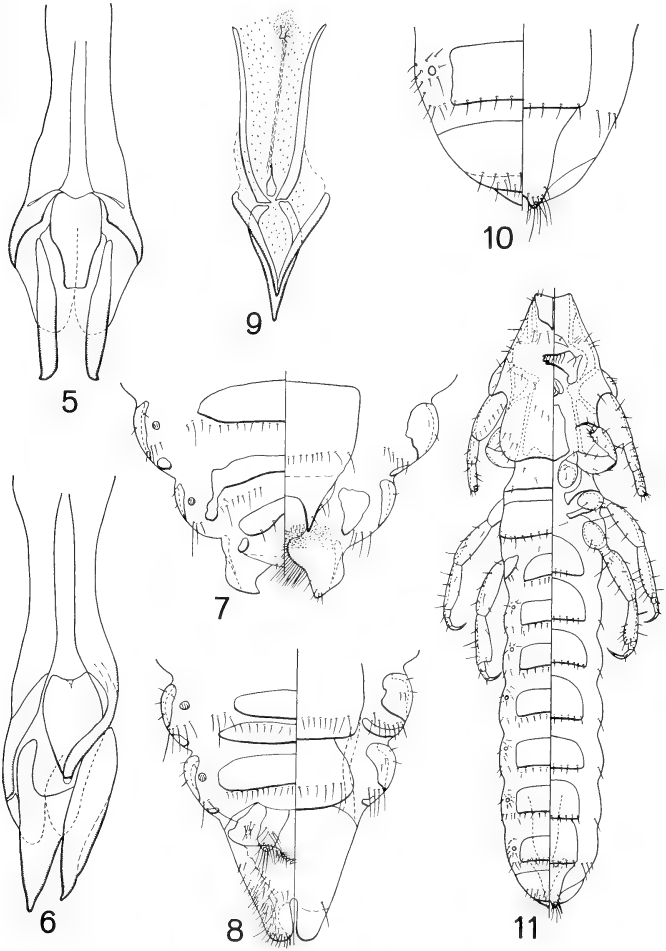


FIG. 5. *Damalinia neotheileri*, n. sp., male genitalia. Figs. 6–8. *D. semitheileri*, n. sp.: 6, male genitalia; 7, dorso-ventral view of female terminalia; 8, dorso-ventral view of male terminalia. Figs. 9–11. *Tricholipeurus moschatus*, n. sp.: 9, male genitalia; 10, dorso-ventral view of male terminalia; 11, dorso-ventral view of male.

Tricholipeurus moschatus, n. sp.
(Figs. 9–11)

Holotype male.—External morphology and chaetotaxy as in fig. 11, terminal abdominal segments as in fig. 10, and genitalia is in fig. 9. Total length, 1.54 mm. Close to *T. victoriae* (Hopkins, 1943), but separated by differences in the genitalia and size. The endomera of *T. victoriae* are fused into a rod which tapers regularly to its apex; the endomera of *T. moschatus* are normal, being fused only at the apex. *T. victoriae* is much larger than *T. moschatus*.

Type host.—*Nesotragus moschatus* (von Dueben).

Type material.—Holotype male and the head of another male collected off the type host at Naro Motu, Kenya, on October 6, 1960, by G. B. Corbet (Corbet No. 315) (British Museum No. 1962-43).

NOTES ON THE GENERA HOMALOMITRA BORGMEIER, PYCNOPOTA BEZZI, AND SPHINCTOMYIA BORGMEIER
(Diptera: Sphaeroceridae)

George C. Steyskal, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—Notes are given on the subfamily placement and morphology of *Homalomitra ecitonis* Borgmeier, *Pycnopota manni* Bezzi, and *Sphinctomyia aenigmatica* Borgmeier.

Recently Father Thomas Borgmeier turned over to the U. S. National Museum the type specimens of 2 species of Brazilian Diptera described by him, viz., *Homalomitra ecitonis* Borgmeier (1931) and *Sphinctomyia aenigmatica* Borgmeier (1954). Both of these species are still the only known species of their genera. Both were described in considerable detail. *Homalomitra* was originally referred to the Sphaeroceridae (as Cypselidae) and is still listed in that family by Richards (1967). *Sphinctomyia*, however, was originally assigned doubtfully to the Sciadoceridae. In Fr. Borgmeier's letter of transmittal of these specimens to the U. S. National Museum he stated that he thought *Sphinctomyia* might belong with the Platypezidae, and not with either the Sciadoceridae or Phoridae. Examination of the holotype of *S. aenigmatica*, however, reveals that it is quite certainly a sphaerocerid with some features of resemblance to *Pycnopota manni* Bezzi (1926), described from Bolivia. *Pycnopota* was originally referred to the Sphae-

[1] Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

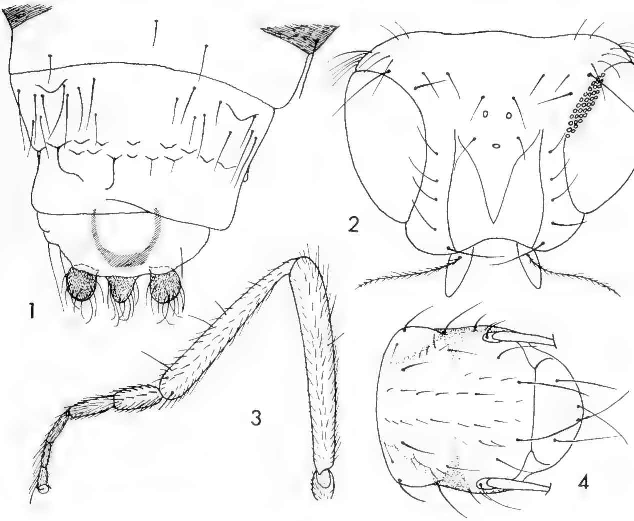


FIG. 1. *Sphinctomyia aenigmatica* Borgm., dorsal view of female postabdomen, holotype. FIGS. 2–4. *Pycnopota manni* Bezzi, female allotype: 2, dorsal view of head, with portion of ommatidia of one eye shown; 3, right hind leg; 4, dorsum of thorax.

roceridae (as Borboridae) and is also still retained in that family by Richards (1967).

In Richards' latest key to Sphaeroceridae with reduced or absent wings (1965), *Sphinctomyia* does not easily fit at any point largely because of the following combination of characters: prosternum elliptical, little longer than broad; wings (in my opinion well expanded) much longer than ocellar triangle, not pointed, without distinct veins (the 4 apparent veins cited and figured by Borgmeier are cuticular folds); halteres well developed; eyes moderately reduced; scutellum with one pair of bristles. In addition to the shape of the prosternum already mentioned, little can be added to Borgmeier's description. The tip of the wholly membranous abdomen, however, has been removed, the postabdomen extended from its previously fully retracted condition, and mounted in euparal on a microscope slide, from which fig. 1 was drawn.

Since I have compared *Sphinctomyia* with *Pycnopota*, additional data concerning the female allotype of *P. manni* Bezzi, also in the U. S. National Museum, are in order: prosternum (visible at very oblique angle) quite broad; dorsum of thorax as in fig. 4; dorsal view of head as in fig. 2, eyes with strongly convex ommatidia; palpi about ⅔ as long as the inflated clypeus (epistoma, torma, prelabrum) and closely appressed thereto; hind leg as in fig. 3.

Homalomitra ecitonis and *Sphinctomyia aenigmatica* were taken in the company of the ant *Labidus praedator* (F. Smith), which species has been included in the genus *Eciton*, sometimes with *Labidus* as a subgenus. *Pycnopota manni* Bezzi was collected by W. T. Mann at a period when he was a student of ants, but no data concerning the conditions of its collection are available.

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TABANIDAE OF MARYLAND, ADDENDA
(Diptera)

Patrick H. Thompson, *Hyattsville, Maryland 20783*[1]

ABSTRACT—This paper cites collections and published studies extending the geographical and seasonal distributions of Maryland Tabanidae and summarizes those extensions not previously published.

The geographical and seasonal distributions of Maryland Tabanidae presented in Thompson (1967) were extended as a result of studies in Patuxent Wildlife Research Center, Laurel, Maryland (Thompson 1970a, 1970b) and in river swamps of the lower Eastern Shore (Thompson and Sagle 1971). The latter studies extended the ranges into Maryland of *Tabanus zythicolor* Philip (1 female, Aug. 21, 1969, 3 miles W of Libertytown and 2 females, Aug. 21, 1969, Pocomoke Cypress Swamp) and *T. gladiator* Stone (1 female, Aug. 12, 1968, Pocomoke Cypress Swamp); and of 1 other species, the collection data for which were

[1] Present address: Veterinary Toxicology and Entomology Research Laboratory, U. S. Department of Agriculture, College Station, Texas 77840.

TABLE 1. State and county records and extensions of geographical and seasonal distributions of 24 species of Maryland Tabanidae.

Species	Locality	County	Date	Collector	Source
Chrysops					
atlanticus Pechuman[a, b, c, d]	Pocomoke	W	May 19–Aug. 21	WBS	T & S
brimleyi Hine[e]	Locust Valley	F	May 13–14	PHT	unpubl.
" " [e]	Wye	T	May 25	GCS	USNM
brunneus Hine[d]	Shelltown	S	Aug. 19	WBS	T & S
" " [d]	Pocomoke	W	Jun. 23–Aug. 21	WBS	T & S
callidus Osten Sacken[e]	Chestertown	K	July 18	FMS	FMS
" " " [e]	Lake Roland	B	July 4	FMS	FMS
" " " [d, e]	Wye	T	May 25	GCS	USNM
carbonarius Walker[d, e]	Locust Valley	F	May 13–Jul. 6	PHT	unpubl.
" " [e]	Wye	T	May 25	GCS	USNM
cincticornis Walker[e]	Locust Valley	F	May 13–14	PHT	unpubl.
dimmocki Hine[d]	Patuxent	PG	May 27–Aug. 2	PHT	T
" " [e]	Chestertown	K	July 18	FMS	FMS
reicherti Fairchild[d]	Patuxent	PG	Jul. 20–Aug. 30	PHT	T
geminatus Wiedemann[d]	Pocomoke	W	Jun. 7–Jul. 22	WBS	T & S
hinei Daecke[e]	Milburn Lnd.	S	Aug. 22	WBS	T & S
" " [d, e]	Pocomoke	W	Jul. 23–Aug. 22	WBS	T & S
nigribimbo Whitney[d]	Pocomoke	W	Jul. 2–Aug. 21	WBS	T & S
" " [d]	Crownsville	AA	June 19–25	WGB	WGB
obsoletus Wiedemann[e]	Chestertown	K	Aug. 13	FMS	FMS
" " [d]	Crownsville	AA	May 13–Jun. 22	WGB	WGB
vittatus Wiedemann[e]	Chestertown	K	Jul. 18	FMS	FMS

TABLE 1. (*Continued*)

Species	Locality	County	Date	Collector	Source
Diachlorus					
ferrugatus (F.)[d]	Pocomoke	W	Jul. 5–Aug. 22	WBS	T & S
Chlorotabanus					
crepuscularis (Bequaert)[e, g]	Pocomoke	W	Aug. 7–12	WHT	LLP
Leucotabanus					
annulatus (Say)[d, e, f, g]	Pocomoke	W	Aug. 8	WHT	LLP
Tabanus					
fairchildi Stone[d]	Patuxent	PG	July 1	PHT	T
lineola F.[e]	Fairlee	K	Aug. 13	FMS	FMS
maculipennis var. *imitans* Walker[d]	Shad Lnd.	W	Jul. 3–16	WBS	T & S
melanocerus Wiedemann[e]	Fairlee	K	Aug. 13	FMS	FMS
molestus Say[d, h]	Pocomoke	W	July 9–15	WBS	T & S
reinwardtii Wiedemann[d, e]	Beltsville	PG	Jun. 30–Jul. 19	NOM	NOM
stygius Say[d]	Pocomoke	W	Jun. 11–Jul. 28	WBS	T & S
Hybomitra					
daeckei (Hine)[d]	Pocomoke	W	May 26–Jul. 16	WBS	T & S

[a] AA, B, PG, F, K, S, T and W represent Anne Arundel, Baltimore, Prince Georges, Frederick, Kent, Somerset, Talbot, and Worcester Counties, respectively.

[b] FMS, GCS, NOM, PHT, WBS, WGB, and WHT represent F. M. Stiner, Jr., G. C. Steyskal, N. O. Morgan, P. H. Thompson, W. B. Sagle, III., W. G. Bodenstein, and W. H. Tyson, respectively.

[c] FMS, LLP, T & S, T, NOM, USNM, and WGB represent F. M. Stiner, Jr., L. L. Pechuman, Thompson and Sagle (1971), Thompson (1970), N. O. Morgan, U. S. Natonal Museum (Smithsonian), and W. G. Bodenstein, respectively.

[d] Extension of seasonal range.

[e] County record.

[f] State record.

[g] Species represented by male specimen (s).

[h] Reported by Catts (1969) from Kent County (County record).

reported by Thompson and Sagle (1969); and added distribution records for 14 species in the 3 southernmost counties of the Eastern Shore. These collections in the Pocomoke River swamps in 1968 and 1969 also extended the seasonal distributions of 10 species as recorded in Thompson (1967). Table 1 summarizes these records and those from collections not previously recorded.

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TWO NEW SPECIES OF PHAENICIA FROM THE WEST INDIES (DIPTERA: CALLIPHORIDAE)[1]

MAURICE T. JAMES, *Department of Entomology, Washington State University, Pullman, Washington 99163*

ABSTRACT—Two new species, *Phaenicia* **retroversa**, from Bahama (type locality) and Cuba, and *P.* **lucigerens**, from Jamaica, are described. Their close relationship to *P. caeruleiviridis* (Macquart) suggests a common origin of the three.

Examination of some *Phaenicia* from the West Indies has revealed the presence of two new species that appear to be closely related to the common *P. caeruleiviridis* (Macquart) of the eastern United States. Both resemble *caeruleiviridis* in several features including the very narrow frons of the male, the general configuration of the head, the chaetotaxy except for the lack of fronto-orbitals in the male, and the structure of the aedeagus. The forceps complex in the male genitalia is different, particularly in respect to the geniculate outer forceps, a

[1] Scientific paper no. 3563, College of Agriculture, Washington State University. Work was conducted under Project 9043.

character which distinguishes this pair of species from the other known American representatives of this genus. Presumably, these species represent an extension of the ancestral *caeruleiviridis* stock into the Caribbean area, where differentiation has taken place.

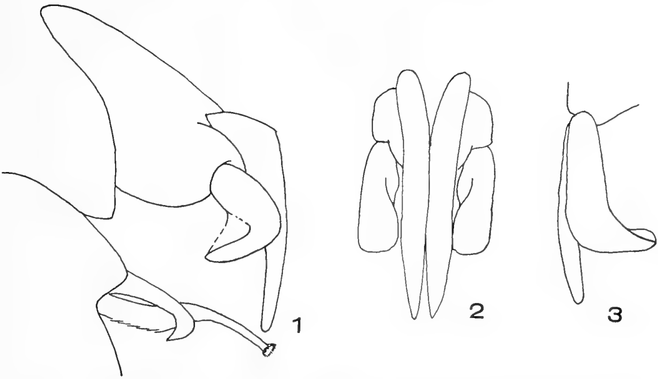
A character that has been overlooked in American species of *Phaenicia* is the nature of the abdominal pollinosity. In such species as *P. sericata* (Meigen) the abdomen is wholly shining green to coppery, but the shine is not as brilliant as in *P. caeruleiviridis*, *P. eximia* (Wiedemann), and most other species of the native American fauna. When the abdominal terga of *P. sericata* are examined under magnification of 60× or greater, with proper lighting, a large part of the surface appears covered with a whitish pollen. Even on the fourth tergum, where the white pollinosity is not evident, the surface is dulled somewhat by a metallic green pollen consisting of minute scales. In contrast, the fourth tergum in *P. caeruleiviridis* is very glossy and lacks evidence of metallic pollen. This glossy condition may occur on a portion or nearly all of the third tergum, at least dorsally.

In this paper the apparent, rather than the actual morphological, segmentation of the abdomen is used; the abdomen, therefore, will be considered to be composed of four principal segments.

The most comprehensive treatment of the North American species of *Phaenicia* is to be found in Hall (1948). No species have been added to the known fauna of North or Central America and of the West Indies since that date.

Phaenicia retroversa, n. sp.

Distinguishable from other known American species, except *lucigerens*, n. sp., by the geniculate outer forceps of the male genetalia. The completely brilliantly shining third and fourth abdominal terga are characteristic. The body is usually distinctly bicolored, with a bluish-green thorax and a distinctly purplish abdomen. Bigot described two species from the West Indies with such coloration, namely *Somomyia semiviolacea* from Puerto Rico and *S. soulouquina*, from Haiti. Both were based on female types which, according to Aldrich, are in such bad condition that the possibility of an accurate identification is doubtful (see discussion in Hall, 1948). Some *P. caeruleiviridis* specimens from Florida show this bicoloration. Aubertin (1933) thought that *semiviolacea* and *soulouquina* might be synonyms of *P. rica* (Shannon), but I doubt this. Bigot's descriptions disagree with my series of *retroversa* in several respects, particularly in the statement that the second abdominal segment lacks macrochaetae, so it is best to regard the Bigot names as *nomina dubia*.



FIGS. 1–3. *Phaenicia* spp., male genitalia: 1, *retroversa*, n. sp., lateral view; 2, same, forceps, dorsal view; 3, *lucigerens*, n. sp., forceps, lateral view.

Male.—Head mostly blackish; facials becoming brownish-black to brownish-yellow, especially below, facial warp yellow to yellowish; pollen whitish to very pale yellow, yellow on facial warp, rather dense on parafrontals except upper parts, parafacials, facials, and occipital orbits, less so on occiput than on orbits and on genae. Minimum distance between eyes 0.03 head width, or little more than diameter of anterior ocellus; frontale at narrowest virtually obliterated, reddish brown below, black above. Frontals 8–12, becoming increasingly weaker above, extending to narrowest part of frons; fronto-orbitals and outer verticals lacking; inner verticals strong. Parafrontals with some short, soft, whitish hairs on lower part between frontal rows and eyes; hairs of gena seta-like, black; occiput with some longer yellowish hairs, especially noticeable below but occurring wholly behind metacephalic suture. Setulae of facials extending almost half-way to antennal bases. Antenna mainly black; pedicel orange at apex, otherwise brownish-black; flagellum orange at base and orange-yellow for a variable distance below; thicker part of arista brownish-black. Sclerotized parts of proboscis shining black, palpi bright yellow.

Thorax green to bluish-green, rarely blue, sometimes with a cupreous sheen on dorsocentral areas; pleura, particularly mesopleuron, usually with more of a bluish sheen; bristles and most setulae of thorax black, hairs of propleuron and anterior margin of humerus whitish-yellow, those near stigmatal bristle brown. Anterior margin of mesonotum, anterior part of humerus, propleuron, and mesopleuron above front coxa densely whitish pollinose; pollen of thorax otherwise inconspicuous but visible over most of area when viewed from an oblique angle. Acrostichals 2-2, dorsocentrals 3-3, humerals 3. Legs brownish-black, femora usually darker, almost black, tibiae usually brownish. Wing subhyaline, very lightly infumated; veins yellow to brownish-yellow; basicosta except on inner margin and subcostal sclerite yellow, epaulet brown; squamae lightly tinged with brown, becoming white at base; halteres yellow; anterior spiracle yellowish-brown, posterior dark brown.

Abdomen brilliantly purple; all setae and bristles black; terga 2 and 3 dorsally each with a marginal row of bristles, strong and long on 3, becoming weaker medially on 2. Terga 3 and 4 devoid of pollen, only a little metallic pollen at extreme base of 3 laterally; terga 1 and 2, except extreme apex of 2, with pollen which appears whitish when viewed posteriorly. Genitalia as in figs. 1 and 2; outer forceps geniculate, that is, curved ventrally at middle, appearing much shorter in dorsal view than inner forceps; aedeagus essentially as in *caeruleiviridis*. Length, 6.5–7.5 mm, of holotype, 7.5 mm.

Female.—Frons at narrowest point about one-fourth (0.23–0.25) head width; sides almost parallel, only slightly concave on lower part; 2 proclinate and 1 reclinate fronto-orbitals, both outer and inner verticals well developed; frontals extending to vertex. Pollen on ventral aspects of terga 1 and 2 more conspicuous than in male. Length, 7.5–8.5 mm, of allotype, 8.5 mm.

Holotype male, Grande Is., Bahama, June, 1952, A. Soltys; USNM type no. 71202. Allotype, female, same data. Paratypes: 1 female, 5 males, same data; 2 females, 2 males, New Providence, Bahama, May, 1952, G. W. Eddy; 1 male, 1 female, Habana, Prov. Habana, Cuba, March 15, 1966, F. Gregor; 1 male, Lomas de Camos, Prov. Habana, Cuba, fly trap, March 14, 1952, Dodge and Seago; 1 female, Marianao, Prov. Habana, Cuba, 15 m, July 20 to August 8, 1966, F. Gregor. Paratypes in the collections of the U. S. National Museum, Washington State University, and the Moravian Museum, Brno, Czechoslovakia.

Discussion.—The name *retroversa*, meaning "turned backwards," refers to the form of the outer forceps.

The contrast in color between thorax and abdomen is normally marked. In the pair of paratypes from Habana (city) there is some purple on the abdomen, but to the naked eye the contrast is not evident. Other characters, including the male genitalia, indicate the conspecificity of these specimens with others of the type series. In one New Providence male the outer forceps have become extended so that they do not bend, but their basal structure clearly indicates that the difference in appearance is due to this extension.

Phaenicia lucigerens, n. sp.

Most probably of the same ancestral stock as *P. retroversa*, to which it is apparently most closely related. Head and appendages in structure, chaetotaxy, and vestiture as in *retroversa*, except that pollen tends to be more yellowish; in the male it is more distinctly yellow on the parafacials and usually deep yellow to golden on the occipital orbits; in the female it is characteristically deep yellow, usually less so on the parafrontals and sometimes also on the parafacials. Thorax and most of abdomen dark blue, almost blue-black in places; chaetotaxy and vestiture as in *retroversa*. Femora black, tibiae dark brown. Wing clear hyaline, without the slight brownish tinge of *retroversa*; some infumated spots at base; basicosta brownish-yellow to light brown; subcostal sclerite usually brownish on apical half; squamae variable, pale brownish to distinctly brown, white at base. Tergum 3 largely devoid of pollen, more brilliantly shining than preceding segment, but bearing some metallic pollen at least at base and sometimes half way to apex, especially laterally, this pollen more extensive than in *retroversa*; tergum 4 wholly shining, brilliantly coppery or green with a strong coppery reflection in the male, often less pronounced in the female, sometimes almost wholly absent; in both sexes, however, there is a strong color contrast between terga 3 and 4. Male genitalia (fig. 3) similar to those of *retroversa*; structure of aedeagus essentially the same; outer forceps geniculate but the bend closer to the apex, in structure more foliate and not as heavy as in *retroversa*. Length, male, 6.0–7.5 mm, 7.0 in holotype; female, 6.0–8.0 mm, 7.5 in allotype.

The type series is entirely from Jamaica.

Holotype, male, NE slope Mt. Horeb, Portland, about 4600 ft., November 21, 1954, T. H. Farr; USNM type no. 71203. Allotype, female, Albany Green, St. Thomas, June 10, 1954, Farr. Paratypes: 1 male, same data as holotype; 2 males, 1 female, Long Mountain, St. Andrew, October 7, 1964, Farr; 1 male, about 6 miles NW of Wheeler Field, St. Thomas, August 24, 1954, Farr; 2 males, Morant Bay Road, St. Thomas, 14½ miles E of Kingston, August 2 and September 6, 1964, Farr; 1 female, Morant Point, sea level, St. Thomas, February 13, 1955, Farr; 1 male, 2 females, 2 miles N of Maypen, Clarendon, September 23, 1962, and September 27, 1964, Farr; 1 female, Second Breakfast Spring, St. Andrew, August 24, 1954, Farr; 1 male, Orangefield, St. Catharine, March 10, 1955, S. Heineman; 1 female, Hardewar Gap to Caledonia Peak, Portland, October 30, 1955, David Gregory; 1 female, Green Hill, Portland, July 26, 1950, I. Sibley; 1 female, Upper Mountain View, St. Andrew, October 31, 1954, C. B. Lewis; 2 males, Hope, Kingston, March 28 and April 11, 1960, Latta trap. Paratypes in the collections of the U. S. National Museum and Washington State University.

Discussion.—The name *lucigerens*, "light-bearer," refers to the appearance of the fourth tergum of the males and some females; when the fly is viewed posteriorly, without magnification, a brilliant flash of coppery light can be produced by rotating the specimen.

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THE LARVAE OF THE ANT GENUS BOTHROPONERA
(Hymenoptera: Formicidae)

George C. Wheeler *and* Jeanette Wheeler, *Laboratory of Desert Biology, Desert Research Institute, University of Nevada, Reno, Nevada 89507*

ABSTRACT—The larvae of nine species of the ant genus *Bothroponera* (Ponerinae: Ponerini) are described and figured. These fall into three generically distinct groups on the basis of body profile, mandible shape and tubercles: (I) *sublaevis*, *denticulata*, and *piliventris*; (II) *mayri*; and (III) *sjostedti*. The remaining species cannot be grouped, because we have only semipupae of *cariosa* and only immature larvae of *porcata*, *pumicosa* and *soror*. The mature larvae of the five species are keyed. It is concluded that W. M. Wheeler was justified in using larval differences (among others) in separating *Bothroponera* from *Pachycondyla*.

The Paleotropical ant genus *Bothroponera*, which comprises about 35 species, is a member of the tribe Ponerini in the subfamily Ponerinae. It is widely distributed throughout the Ethiopian, Malagasy, Indomalayan, Papuan and Australian Regions. The monomorphic workers are small or medium-sized or large, black or dark brown, opaque or subopaque and usually strongly sculptured. They form small colonies under stones, in rather moist clayey soil; they are rather sluggish and do not sting readily, but instead exude from the posterior end a whitish frothy substance (Wheeler 1922:69). The larger species are highly predatory and termitophagous (Wheeler 1922:15). Arnold (1915 *fide* Wheeler 1936:182) claimed that "the economic value of the Ponerinae in tropical countries can hardly be overestimated, for it may be safely asserted that at least 80 percent of their food consists of termites, and they thereby constitute one of the chief checks to these pests in the tropics."

Since our earlier study of *Bothroponera* larvae (1952:621–623) was based on unsatisfactory material and since we now have satisfactory material in five species, we are starting over and revising completely.

Genus **Bothroponera** Mayr—Type I

Profile paraponeriform (i.e., thorax and AI forming a moderately long and rather stout neck, which is curved ventrally; remainder of abdomen stout and elongate-subellipsoidal). Anus ventral, with posterior lip. Body beset with 6–87 tubercles of 3 different kinds. Integument densely spinulose. Body hairs few, simple, minute to short, or none. Integument of cranium roughened with spinules or rugules or granules. Head hairs lacking. Antennae low knobs, each on a disc and bearing 3–5 sensilla. Anterior surface of labrum bearing numerous sensilla (30–56); posterior surface densely spinulose, with very few sensilla. Mandibles ectatommiform (i.e., subtriangular in anterior view, the distal half slightly curved medially; with a distinct medial blade joining the body of the mandible in a smooth curve and bearing 2 medial teeth); with a few spinules on the basal half.

B. denticulata, *piliventris* and *sublaevis* belong to this type. Since we do not have mature larvae of *porcata*, *pumicosa* and *soror* and only semipupae of *cariosa* we cannot safely assign them to type, but suspect that they may be Type I.

Bothroponera sublaevis Emery
(Fig. 1)

Length (through spiracles) about 15 mm. Thorax and AI forming a moderately long and rather stout neck, which is curved ventrally; remainder of abdomen stout and elongate-subellipsoidal. Posterior end rounded. Lateral longitudinal welts low. Leg vestiges conspicuous, each a minute pit at the bottom of a larger pit; gonopod vestiges on AVII–IX; leg and wing vestiges present. Anus ventral with posterior lip. Eight vestigial tubercles on ventrolateral surfaces of thorax, distributed thus: TI 4, TII 2, TIII 2; about 0.024 mm tall. Integument densely spinulose; spinules long (about 0.018 mm), with stout conical base surmounted by a needle-like point; arranged in rows, which in some places form reticulate patterns. Body hairs few, simple, minute to short (0.04–0.18 mm), and widely scattered. Cranium suboctagonal in anterior view. Antennae low rounded elevations each mounted on a disc and bearing three sensilla. Integument of head roughened in a complicated pattern as follows: occiput with minute spinules in short transverse rows; frons (between antennae) granulose and rugulose; genae and upper clypeus rugulose. Head without hairs, but with a few sensilla, each of which bears a minute spinule. Labrum short, breadth twice the length; lateral borders convex; ventral border feebly concave; anterior surface with about 50 sensilla; posterior surface spinulose, the spinules arranged in transverse subparallel rows on the medial two-thirds, lateral sixths with coarser isolated spinules near the ventral border; posterior surface with a few sensilla. Mandibles with the basal half slightly dilated; distal half thickened laterally; from its anterior surface a blade extends medially and bears 2 subapical teeth; posterior surface of basal half with minute isolated spinules. Maxillae each narrowly round-pointed; all surfaces with numerous isolated spinules, which are longer ventrally; palp a peg bearing 5 apical sensilla; galea digitiform with 2 apical sensilla. Labium with the anterior surface densely spinulose, the spinules long and slender, isolated ventrally and in short rows dorsally; a transverse spinulose welt dorsally; palp a peg with 5 apical sensilla; opening of sericteries wide and salient. Hypopharynx densely spinulose, the spinules long and in short transverse rows, the rows so close together that the spinules overlap. (Material studied: 8 larvae from New South Wales, courtesy of Rev. B. B. Lowery, who reports a nauseating musty smell emanating from ants and larvae).

Bothroponera denticulata Kirby
(Fig. 2)

Length (through spiracles) about 16.7 mm. Very similar to *B. sublaevis* except as follows. Tubercles 6, ventrolateral, a pair on each thoracic somite; each a stout subcone about 0.2 mm tall, bearing 3 apical sensilla. No body hairs. Gonopod vestiges on AVII–IX. Cranium transversely subelliptical; occipital border concave at the midle. Labrum short; a fourth broader than long; ventral border widely

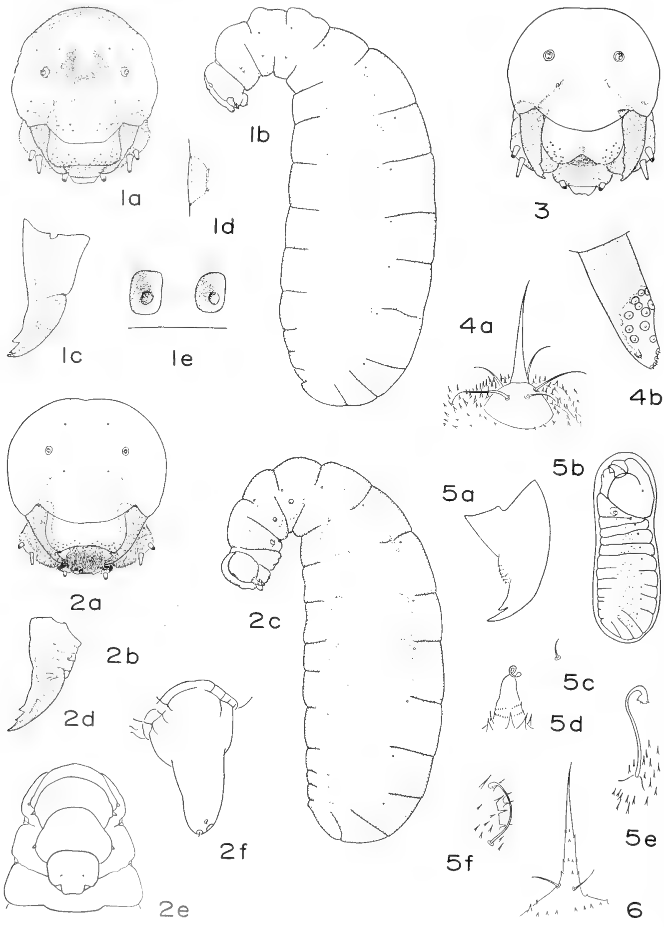

FIG. 1. *Bothroponera sublaevis* Emery: a, head in anterior view, × 20; b, larva in side view, × 8; c, left mandible in anterior view (shaded to show thickness), × 44; d, mesothoracic leg vestige in optical section, × 133; e, prothoracic leg vestiges in surface view, × 133. Fig. 2. *B. denticulata* Kirby: a, head in anterior view, × 17; b, rugae on head, × 56; c, larva in side view, × 6; d, left mandible in anterior view, × 31; e, anterior end of larva to show tubercles, × 6; f, left prothoracic tubercle in dorsal view, × 125. Fig. 3. *B. piliventris* F. Smith:

concave. (Material studied: 3 larvae from Queensland, courtesy of Rev. B. B. Lowery).

Bothroponera piliventris F. Smith
(Fig. 3)

Length (through spiracles) about 15.7 mm. Similar to *B. sublaevis* except as follows. Tubercles arranged asymmetrically varying in number from 66 to 87; subconical from stout to spire-like, tallest about 0.2 mm, all with a single apical hair and without surface spinules; distributed thus: TI 20–26, TII 14–16, TIII 11, AI 7–9, AII 3–6, AIII 2–4, AIV 3–4, AV 2–3, AVI 2, AVII 2, AVIII 0–2, AIX 0–2, AX 0. Body hairs very few, widely scattered, minute (0.018 mm long), simple. Gonopod vestiges on AIX. Cranium subhexagonal but with the occipital corners strongly rounded. Antennae each with 4 sensilla. Labrum bilobed; ventral surface of each lobe spinulose, the spinules long and usually isolated. Mandibles with blunt teeth. Maxillae with the apex broadly rounded; each palp with 5–8 apical sensilla. Hypopharynx with the rows of spinules forming a reticulum. (Material studied: 8 larvae and 1 semipupa from South Australia, courtesy of Rev. B. B. Lowery.)

Genus **Bothroponera** Mayr—Type ?
Bothroponera cariosa F. Smith
(Fig. 4)

SEMIPUPA. Length (through spiracles) about 10 mm. Similar to *B. sublaevis* except as follows. Tubercles 117, distributed thus: TI–AIII 10, AIV–AVII 8, AVIII 10, AIX 8, AX 6; each tubercle a conoid bearing a long apical spine and several basal hairs, tallest about 0.3 mm. Integument densely spinulose, the spinules long and isolated. Body hairs short (0.075–0.11 mm), simple, with flexuous tip, a few on each somite. Cranium semicircular in anterior view. Labrum bilobed, as broad as long, with the lateral borders sinuate. Mandibles with medial teeth smaller; apex strongly curved posteriorly; no spinules. Maxillae with the spinules isolated or in short rows; each palp a skewed peg with 10–13 sensilla. Each labial palp a skewed peg bearing 10 sensilla. (Material studied: 2 semipupae from South Africa, courtesy of Dr. W. L. Brown.)

Bothroponera porcata Emery
(Fig. 5)

YOUNG LARVA. Length (through spiracles) about 6.3 mm. Similar to *B. sublaevis* except as follows. Tubercles about 180, which are distributed thus: TI 9, TII–TIII 12, AI 14, AII 12, AIII 19, AIV 20, AV 25, AVI 21, AVII 19, AVIII about 10, AIX about 6, AX 0; shape grading from a stout subcone (with spinules in short rows around the base) bearing a peculiar apical hair, to the peculiar hair minus

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a, head in anterior view, × 22. Fig. 4. *B. cariosa* F. Smith: b, left maxillary palp in anterior view, × 185; a, tubercle on semipupa, × 93. Fig. 5. *B. porcata* Emery: a, left mandible in anterior view, young larva, × 77; b, larva in egg, × 17; c, body hair, young larva, × 185; d, typical tubercle, young larva, × 185; e, transitional tubercle with tall capitate hair, young larva, × 185; f, capitate hair without tubercle, young larva, × 185. Fig. 6. *B. pumicosa* Roger: tubercle, young larva, × 185.

tubercle. Body hairs absent. Labrum with spinules on anterior surface. Opening of sericteries a transverse slit in a depression.

LARVA IN EGG. Length of egg about 1.9 mm; length of larva (through spiracles) about 2.1 mm. Similar to young larvae except as follows. Head very large and tilted backwards. Prothorax small and wedge-shaped. Diameter nearly uniform from mesothorax through AVIII. Anus ventral. Integument with appressed spinules. Body hairs of two types: (1) 0.027–0.11 mm long, in a cluster on the lateral surface of each somite except AX, hairs stout, with recurved tip and bulbous and spinose apex; (2) simple, 0.009–0.018 mm long, a few on the ventrolateral surfaces of each somite. Mandibles with the apical tooth longer and narrower, the subapical tooth farther from the apex, the proximal tooth represented by a narrow flange with short rows of spinules medially. Each maxillary palp a low knob; each galea a cone directed ventromedially. Labium short, represented only by a curved band. (Material studied: 11 larvae from New South Wales, courtesy of Rev. B. B. Lowery).

Bothroponera pumicosa Roger
(Fig. 6)

YOUNG LARVA. Length (through spiracles) about 3.6 mm. Similar to *B. sublaevis* except as follows. Thorax and first abdominal somite folded ventrally; dorsal profile C-shaped; venter of AII–X flat. Tubercles 124; spine-like, about 0.13 mm tall, with a few basal hairs, integument with a few isolated spinules; distributed thus: TI–AIX 10, AX 4. Body hairs very few, widely scattered, except a small cluster on each ventrolateral surface of each thoracic somite; minute to short (0.009–0.27 mm long), simple, widely scattered. Head hairs few, moderately long (0.018–0.063 mm), simple. Labrum bilobed, about as long as broad. Mandibles with rows of minute spinules on the anterior surface. Each maxillary palp a stout cone with 9 sensilla. Each labial palp a low cluster of 6 sensilla; opening of sericteries a transverse slit in a depression. (Material studied: 2 larvae from South Africa, courtesy of Dr. W. L. Brown.)

Bothroponera soror Emery
(Fig. 7)

IMMATURE LARVA. Length (through spiracles) about 6.6 mm. Similar to *B. sublaevis* except as follows. Tubercles 84, distributed thus: TI 10, TII–AII 8, AIII–AIX 6, AX 0; tubercles spine-like, about 0.25 mm tall, with numerous spinules on the integument and a few hairs at the base. Gonopod vestiges on AIX. Integument of body densely spinulose, the spinules minute and in rows. Body hairs simple, long (0.094–0.19 mm), stout and nearly straight, generally distributed. Cranium transversely subelliptical. Head hairs few, simple, long (0.067–0.144 mm). Labrum bilobed; anterior surface of each lobe with 2 or 3 hairs and about 12 sensilla on or near the ventral border; ventrolateral corners with isolated spinules on anterior, ventrolateral and posterior surfaces. Mandibles with minute spinules in short rows on all surfaces of base. (Material studied: 5 larvae from Ghana and Congo, courtesy of Dr. W. L. Brown).

Weber (1943:298): "The larvae were lying on their sides and feeding on pieces of an unidentifiable insect."

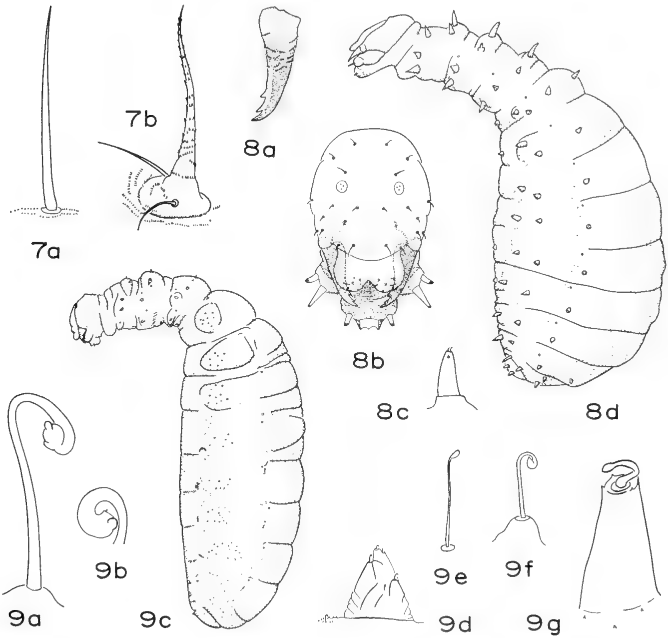

FIG. 7. *Bothroponera soror* Emery: a, body hair, young larva, × 185; b, tubercle, young larva, × 185. Fig. 8. *B. sjostedti* Mayr: a, mandible in anterior view, × 93; b, head in anterior view, × 133; c, tubercle, × 67; d, larva in side view, × 22. Fig. 9. *B. mayri* Emery: a, body hair, immature larva, × 370; b, tip of body hair, immature larva in side view, × 370; c, larva in side view, × 6; d, multiple tubercle, × 370; e, hair without tubercle, × 370; f, hair with low tubercle, × 370; g, typical tubercle with short capitate hair, × 370.

Genus **Bothroponera** Mayr—Type II

Profile paraponeriform (i.e., thorax and AI forming a moderately long and rather stout neck, which is curved ventrally; remainder of abdomen stout and elongate-subellipsoidal); anus ventral, with posterior lip. Body beset with exceedingly numerous (300) tubercles, which vary from multiple subcones to a single frustum bearing an apical capitate hair. Body hairs few and minute; head hairs none. Mandibles ectatommiform (i.e., subtriangular in anterior view; the distal half slightly curved medially; with a distinct medial blade joining the body of the mandible in a smooth curve and bearing 2 medial teeth).

We have only *B. mayri* in this type.

Bothroponera mayri Emery
(Fig. 9)

Length (through spiracles) about 14 mm. Similar to *B. sublaevis* except as follows. Tubercles about 300; not arranged symmetrically; large and multiple (with apical sensilla) anteriorly, grading into a peculiar hair posteriorly; distributed thus: each thoracic somite with about 12, AI–AIII 16, AIV 24, AV 40, AVI 44, AVII 42, AVIII 36, AIX 28, AX 0. Body hairs absent. Cranium subcircular; sensilla numerous. Antennae with 5 sensilla each. Maxillary and labial palps with 7 sensilla each.

YOUNG LARVA. Length (through spiracles) about 10 mm. Similar to the mature larvae, except in the following details. Thorax forming a slender neck which is bent ventrally at a right angle; abdomen stout, dorsal profile C-shaped, ventral nearly straight; lateral longitudinal welts feebly developed. Tubercles about 200 and distributed thus—TI 18, TII 15, TIII 11, AI 12, AII 16, AIII 24, AIV 28, AV 18, AVI 18, AVII 26, AVIII 20, AIX 8, AX 2. Head longer than the diameter of any thoracic somite; AI greater in diameter than head length. Mandibles with the teeth shorter and stouter. Maxillary and labial palps short pegs. Opening of sericteries a transverse slit.

VERY YOUNG LARVA. Length (through spiracles) about 5.2 mm. Similar to young larva except in the following details. Thoracic spiracles half the diameter of abdominal spiracles. Abdominal tubercles replaced by heavy long hairs with curved, swollen spinulose tip. Tubercles 44, distributed thus: TI 16, TII 17, TIII 11; hairs AI 16, AII 22, AIII 26, AIV 24, AV 28, AVI 30, AVII–X 0. Body hairs very few, short (0.012–0.05 mm), simple. Each maxillary palp a low knob with 10 sensilla. Each labial palp a low cluster of 8 sensilla. (Material studied: 9 larvae from New South Wales, courtesy of Rev. B. B. Lowery.)

Genus **Bothroponera** Mayr—Type III

Profile pachycondyliform (i.e., shaped somewhat like a crookneck squash; thorax and AI forming a distinct long slender neck, which is curved ventrally; remainder of abdomen stout and subovoidal, but with ventral profile nearly straight). Body beset with 90 stout-conoidal tubercles. Integument densely spinulose. Body hairs few, simple, minute. Head large and elongate. Surface of cranium with faint rugules. Antennae small, each with 3 sensilla. Head hairs few, short, simple. Mandibles odontoponeriform (i.e., subtriangular in anterior view; narrow; distal third slightly curved medially; with a distinct medial blade arising from the anterior surface and bearing 2 medial teeth); with a few spinules on the basal half.

We have only *B. sjostedti* belonging to this type.

Bothroponera sjostedti Mayr
(Fig. 8)

Length through spiracles about 3.8 mm. Tubercles 90, distributed thus: TI 10, TII–AI 8, AII–VII 6, AVIII–IX 8, AX 4; tubercles moderately slender subcones, about 0.15 mm tall. Integument densely spinulose, the spinules minute (longer ventrally) and in numerous subparallel rows or in reticulate patterns. Body hairs few, simple, minute (0.035–0.075 mm long), mostly ventral. Head elongate; cranium subelliptical, slightly longer than broad; integument roughened with ridges and spinules. Head hairs few, short (0.027–0.045 mm), simple, slightly curved.

Antennae small, each a low elevation bearing 3 sensilla. Labrum bilobed; lateral borders sinuate; anterior surface of each lobe with 12 minute hairs and/or sensilla on or near the ventral border; posterior surface spinulose, the spinules arranged in transverse subparallel rows on the medial two-thirds, the lateral sixths with coarse isolated spinules near the ventral border; posterior surface with 3 sensilla near the middle of each lobe. Mandibles narrow and subtriangular in anterior view; distal half thickened laterally, from its anterior surface a blade extending medially and bearing 2 subapical teeth on its medial border; basal half with short rows of minute spinules on anterior, medial and posterior surfaces. Maxillae narrowly round-pointed; the spinules isolated, small and sparse basally, becoming long, dense and in short rows apically; each palp a slender peg with 5 apical sensilla; each galea tall and digitiform, with 2 apical sensilla. Labium moderately spinulose, the middle with short spinules in short transverse rows, becoming long and isolated laterally; each palp a frustum with 5 apical sensilla; opening of sericteries wide and salient. Hypopharynx densely spinulose, the spinules long and in short transverse rows, the rows so close together that the spinules overlap. (Material studied: 3 larvae from Ghana, courtesy of Dr. W. L. Brown).

Key to the Mature Larvae of **Bothroponera** in Our Collection

In our previous studies of ant larvae we have not found enough distinct species in any one genus to justify a key to species. But we are now willing to try it in *Bothroponera.*

1a. Profile pachycondyliform; mandibles odontoponeriform; tubercles about 90 (TYPE III) .... **sjostedti**
1b. Profile paraponeriform; mandibles ectatommiform 2
2a. Tubercles about 300; on all somites except AX; tubercles varying from multiple subcones to frusta, each frustum bearing a single capitate hair (TYPE II) .... **mayri**
2b. Tubercles 6 to 87; not shaped as above (TYPE I) 3
3a. Tubercles 6–8; on thorax only 4
3b. Tubercles 60–87, grading from stout conoids to spire-like, on all somites except AX .... **piliventris**
4a. Tubercles 8 vestigial; body hairs few .... **sublaevis**
4b. Tubercles 6 stout subcones; body hairs none .... **denticulata**

Discussion

Mayr described *Bothroponera* as a genus in 1862. In the "Genera Insectorum" (1911) Emery treated it as a subgenus of *Pachycondyla.* But in 1922 Wheeler restored it to generic rank on the basis of (1) larval differences, (2) differences in distribution (Paleotropical vs. Neotropical) and (3) peculiarities in the habits of *Bothroponera.* Our studies of 134 species in 41 genera of ponerine larvae convince us that Mayr and Wheeler were correct and that the latter was justified in using larval characters in evidence.

Although the 5 species of *Bothroponera* that we have studied are separable into 3 generically distinct groups, they are all generically distinguishable from the larva of *Pachycondyla.*

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A NEW SPECIES OF POMERANTZIA BAKER FROM CALIFORNIA

(Acarina: Pomerantziidae)

Douglas W. Price, *Department of Entomology and Parasitology, University of California, Berkeley, California 94720*

ABSTRACT—A new pomerantziid mite, *Pomerantzia* **prolata**, from a forest habitat in California is described. This species is compared with *P. charlesi* Baker, the only other described species in this little known family. Comments on family characteristics and relationship to the Raphignathoidea are presented.

The family Pomerantziidae was described by Baker (1949) to accommodate a unique species of mite from peach orchard soil, Upson County, Georgia. This species, *Pomerantzia charlesi* Baker, remained for twenty years the only species assigned to this family. The present paper describes a second species, collected from soil in a ponderosa pine forest habitat in California.

Cunliffe (1955), Summers (1966), and Krantz (1970) included the Pomerantziidae in the Raphignathoidea, although noting that its phylogenetic relationships are uncertain. Southcott (1957) argues against its inclusion in this superfamily. The presence of genital discs, numerous solenidia on tarsus I, and the absence of empodia on all tarsi are characters not found in other Raphignathoid families. Although Atyeo and Baker (1964) note a resemblance between their Raphignathoid family Tarsocheylidae and the Pomerantziidae, these two families display a number of fundamental differences which argue against any close kinship. In addition to the features noted above, the structure of the palpi and chelicerae is distinct in the two families, and specialized propodosomal sensillae occur only in the Tarsocheylidae. Many of the features displayed by the Pomerantziidae are shared by certain of the Raphignathoid families, but in combination they indicate an isolated position for these rare forms.

Important distinguishing characteristics of the family Pomerantziidae include an elongate body with humeral sulcus, coxae I–II widely separated from coxae III–IV, femur subdivided on all legs, tarsi I with numerous (6–8) solenidiform sensillae, claws conventional on all tarsi but without empodia, all body setae smooth, without specialized propodosomal sensillae, chelicerae free or weakly fused basally and not forming a stylophore, with stout, sickle-shaped movable digits, short multi-chambered peritremes between basal parts of chelicerae, palpi with 6 freely-articulating segments, palp thumb-claw complex well developed, a linear series of dorso-median plates on idiosoma (1 propodosomal, 5 hysterosomal), propodosomal without eyes, without humeral setae, with three pairs of genital discs, and with a setiferous ovipositor. Our knowledge of these mites is insufficient at present to permit a clear separation of family and generic features.

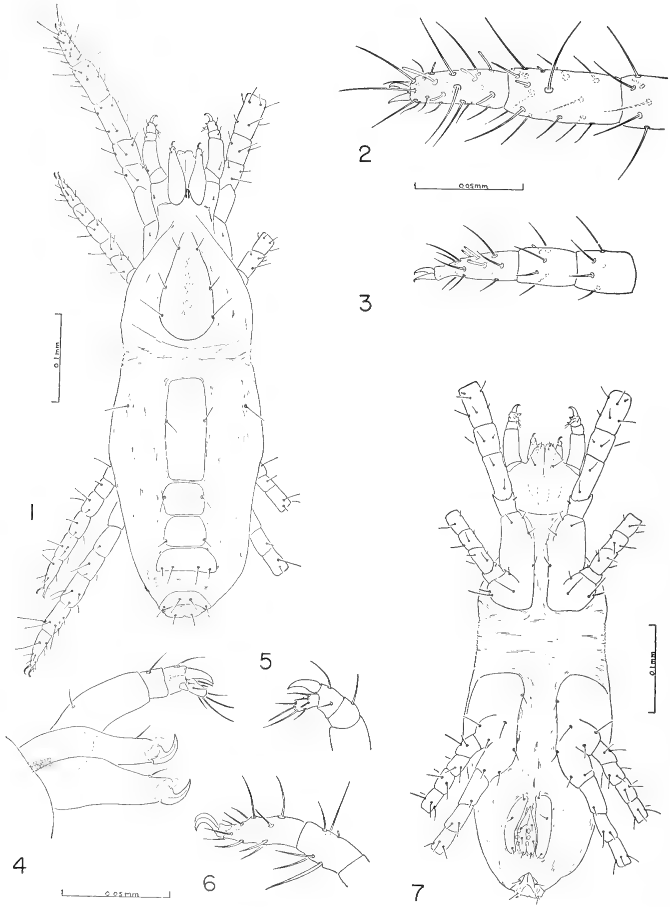
Pomerantzia prolata, n. sp.

Female: Weakly sclerotized, elongate, long-legged mites with a slight humeral sulcus. Legs I and II contiguous, arising on each side from a common coxal plate; coxal plates not fused medially. Legs III and IV arise similarly, widely separated from legs I and II. Leg I much longer than leg II; leg IV longer than leg III.

Gnathosoma small, with chelicerae free or weakly fused basally, each with one pair of dorsal setae distad, near stout, sickle-like, upcurved movable digit. Membranous lobes associated with movable digit, fixed digits absent. Peritremes composed of 7 or 8 tiny, beadlike chambers between cheliceral bases. Podocephalic canals conspicuous on bases of palp coxae. Palps with 6 well defined segments; coxae with 1 pair dorsal solenidia, trochanter without setae, femur and genu with 1 pair of setae each, tibia with 2 pairs of setae and 1 stout sensory peg on inner face. Tibial claw terminal and opposed by well developed, sub-terminal tarsus to form a typical thumb-claw complex. Palp tarsus with about 9 setae. Propodosoma bears a small, drop-shaped, dorso-median plate, with a fine net-like pattern in mid-region. Propodosomal plate with three pairs of marginal setae; the hind-most pair about twice the length of the 2 sub-equal anterior pairs. Propodosoma without eyes, humeral setae, or specialized sensory setae.

Hysterosoma with 5 dorso-median plates arranged linearly. First hysterosomal plate elongate, about three times as long as wide, with a single pair of marginal setae in middle region; second and third hysterosomal plates rounded squares, equal in size, each bearing one pair of marginal setae; fourth and fifth plates wider than long, each bearing 2 pairs of setae near posterior margins, inner pairs about twice as long as outer pairs. Fifth hysterosomal plate separated from fourth by extensive membranous region not found between other hysterosomal plates. Hysterosoma with 1 pair of dorso-lateral setae only, lateral to and somewhat in front of setae of first hysterosomal plate, arising apparently from membrane rather than from sclerites.

With one pair of subcapitular setae, and 2 pairs of small setae near oral opening. Assignment of setae as ventrals or coxals on coxal plates uncertain; the tentative arrangement is to consider 1 pair on each of the anterior and posterior coxal plates



FIGS. 1–7. *Pomerantzia prolata*, n. sp.: 1, adult female, dorsal aspect; 2, tibia and tarsus I; 3, genu, tibia, and tarsus II; 4, chelicerae and left palpus; 5, terminal segments of palpus, outer side; 6, tibia and tarsus III; 7, adult female, ventral aspect.

as ventrals thus leaving 4 pairs on coxae I (1 of which is a dorsal solenidion), 4 pairs on coxae II, 3 pairs on coxae III, and 3 pairs on coxae IV.

Genital and paragenital setal patterns exhibit some variation in specimens examined; the normal pattern is 3 pairs of genitals and 3 pairs of paragenitals. Three pairs of genital discs; and in mature females, a conspicuous, highly pleated, setiferous ovipositor is located internally in genital region. Anal aperture terminal, with 3 pairs of setae. No other ventral setae present.

Total counts of all setae on podomeres of legs I through IV respectively are: tarsi, 22-17-11-11; tibiae, 15-6-6-10; genua, 11-5-5-6; telo-femur, 5-5-4-5; basifemur, 5-4-3-3; trochanter, 1-1-2-1; coxae, 4-4-3-3 plus on coxal plates I–II, 1 seta and on coxal plates III–IV, 1 seta. Counts of solenidia only on terminal 3 podomeres of legs I through IV are: tarsi, 6-3-0-0; tibiae, 4-1-1-1; and genua, 1-0-0-0. In addition to the true solenidia, there are some setae on the legs which have blunt tips and may be chemo-sensory in function. These have thicker walls and are more narrow than the solenidia. Other leg setae more clearly serve a tactile function, although they range from micro-setae to very stout forms.

Averages and range of measurements of 8 mature females in microns are: idiosoma from tip of opisthosoma to bases of chelicerae 430, 396–463; chelicerae to tip of movable digit 70.1, 69.5–74.3; legs from coxo-trochanteral joint to tip of claws, leg I 245.1, 239.8–261.3; leg II 157.3, 146.3–167.8; leg III 174.0, 167.8–182.2; leg IV 230.5, 218.2–249.3; tarsus I to tip of claws 48.5, 43.2–55.1.

The type-species, *P. charlesi* Baker, differs from the species herein described in a number of characteristics. Although the most useful characters for species separation in the Pomerantziidae remain to be established, the most important here are the number of chambers in the peritremes, i.e., 3 in *charlesi*, 7–8 in *prolata* and the numbers of genital and paragenital setae, i.e., 5 and 4 pairs respectively in *charlesi*, 3 and 3 pairs in *prolata*. The net-like pattern in the center of the propodosomal plate is not indicated for *charlesi*. Also, the pair of posterior marginal pores noted for *charlesi* on the third hysterosomal plate do not occur on *prolata*.

A number of other chaetotaxic differences occur; these, however, need to be confirmed by an examination of the type species. There are 8 solenidia (including the sensory peg) on tarsus I of *charlesi*, 6 in *prolata*; 2 solenidia on tarsus II of *charlesi*, 3 in *prolata*; 3 solenidia on tibia I of *charlesi*, 4 in *prolata*. The setae of the first hystrosomal plate in *charlesi* are located near the anterior margin and considerably in front of the dorso-lateral hysterosomal setae; while in *prolata* these setae are located near the middle of this plate and posterior to the dorso-lateral setae. The arrangement of the 4 setae on hysterosomal plate V into two rows in *charlesi* is distinct from the arrangement of these 4 setae in a single row in *prolata*.

The male is unknown.

In the writer's opinion, the structures called peritremes by Baker (1949) are podocephalic canals. The peritremes appear to be represented only by the bead-like structures between the cheliceral bases. Tracheal trunks are seen to descend into the body directly from the anterior ends of these structures.

As noted, variation in numbers of genital and paragenital setae appeared in the specimens examined. Instead of the typical three pairs for both sets of setae, the number on one side was often reduced to two, or the occurrence of an extra seta raised the number to four. All other chaetotaxic patterns on the body and legs appeared constant.

The type locality is the Boyce Thompson Institute Forest Research Station, 5 miles south of Grass Valley, Nevada County, California. The holotype and 2 paratypes are deposited at the United States National Museum.

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A NOTE ON THE NOMINATE CHARACTER OF PARACANTHA DENTATA ACZÉL

(Diptera: Tephritidae)

A fine female specimen of what seemed to be *Paracantha dentata* Aczél was captured in Cajamarca, Peru, 6–7 March 1971 by Clifford O. Berg and presented by him to the U. S. National Museum. The specimen agrees well with Aczél's description (1952, Acta Zool. Lilloana 10:224) except that the entire insect is somewhat paler in color than the type of *P. dentata* and lacks the character of dentate fore femur. The type of *P. dentata*, collected 250 km north of Cajamarca, just across the border of the province of Cajamarca at Huancabamba, Piura province, is also in USNM. Its fore femur was removed, lightly macerated in NaOH, and remounted with the remainder of the specimen. The black toothlike structure of the fore femur, shown in Aczél's figure 4b, was found to be an artifact, for it dissolved away completely, leaving the femur entirely similar to those of other female *Paracantha* species.—George C. Steyskal, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture, c/o U. S. National Museum, Washington, D. C. 20560.*

A SUBSPECIES OF ANOPHELES NEW TO THE PHILIPPINE ISLANDS[1]
(DIPTERA: CULICIDAE)

RICHARD F. DARSIE, JR.[2] and ADELA CAGAMPANG-RAMOS, *Malaria Eradication Training Center, Manila, Philippines*

ABSTRACT—The occurrence of *Anopheles vagus vagus* Donitz in the Philippines is reported. Previously it was believed that *A. v. limosus* King was the only subspecies of *vagus* found in the country. Particular identifying characters of the adult female and larva are discussed.

In 1932, the late Dr. W. V. King described a new variety of *Anopheles vagus* Donitz from the Philippines, *A. vagus* var. *limosus*. It has proved to be a valid, insular form and was also reported by Colless (1948) from Northern Borneo and raised to subspecific rank by him. Since the definition by King, it has been the only form of *A. vagus* recognized in the Philippine anopheline fauna (Baisas and Dowell, 1967).

Recently, the appearance of a different form of *A. vagus* found in collections from Southeastern Mindanao Island was called to the attention of the authors.[3] Subsequently, a visit was made to the Mindanao provinces of Lanao del Norte and Lanao del Sur, and a number of specimens, which proved to be the type subspecies, *A. vagus vagus* Donitz, were collected. The authors first reported this finding in the recently published "Illustrated Key to the *Anopheles* Mosquitoes of the Philippines" (Ramos and Darsie, 1970).

The adults and larvae collected match the descriptions of Christophers (1933) and Reid (1968). The identification was confirmed by Mr. F. E. Baisas, formerly Chief Medical Entomologist, Philippine Malaria Eradication Service.

Adult Female. The identifying characters for subspecies *vagus*, found in the Philippine specimens, are the presence of subapical band or patch (tache) of light scales on the proboscis and pale scales on the prehumeral area of the wing costa. In subspecies *limosus*, these two areas are entirely dark-scaled. The pale patch on the proboscis proved to be the primary character; and of those bearing the pale patch, 76 percent exhibited the secondary character, prehumeral pale scales.

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[1] From the Malaria Eradication Training Center, Manila, Philippines, Malaria Program, Center for Disease Control, Health Services and Mental Health Administration, Public Health Service, U.S. Department of Health, Education, and Welfare, Atlanta, Georgia 30333. This program is supported by the Agency for International Development, U.S. Department of State.

[2] Present address: Vector Borne Disease Training Unit, Laboratory Division, Center for Disease Control, Atlanta, Georgia 30333.

[3] The authors are indebted to Mrs. A. U. Pagayon, Entomologist, Malaria Eradication Service, Department of Health, Manila, Philippines.

Fourth Instar Larva. This stage presents convincing evidence of the existence of subspecies *vagus* in the Philippines. The larvae have short outer and posterior clypeal hairs, less than one-third as long as inner clypeals; the latter are placed far forward near the inner clypeals and markedly medial to them. In subspecies *limosus*, the postclypeals lie farther back on the frontoclypeus and are only slightly, if at all, medial to the inner clypeals.

Specimens Studied: MINDANAO ISLAND: Lanao del Sur Province—7 ♀♀ and 2 ♂♂ with associated lar. and pup., 4 ♀♀ and 13 lar. from Basak Village, Marawi City, II-26-70; 3 ♀♀ from Lumbayao (village), Balindong (municipality), II-23-70; 2 ♀♀ from Pander-a-Ranao, Tugaya, II-24-70; 2 ♀♀ from Taraboko, Madamba, II-26-70; 3 ♀♀ from Lumbac, Ditsaan, II-28-70; 23 ♀♀ from Talagian, Masiu, III-3-70. Lanao del Norte Province—3 ♀♀ from Birwar, 7 ♀♀ from Banisilon, Tankal, III-4-70; 2 ♀♀ from Eastern Sucudan, 3 ♀♀ from Western Sucudan, Kolambugan, III-5-70. South Cotabato Province—13 ♀♀ from Wali, Maitum, III-28-70. LUZON ISLAND: Bulacan Province—6 ♀♀ from Kay Banban, San Jose del Monte, VI-10-70. Quezon Province—27 ♀♀ from Lalig, Tiaong, VI-15-70, 113 ♀♀ from Suba, Majayjay, VI-15-70. Laguna Province—3 ♀♀ from San Isidro, Calauan, V-15-70.

The above record represents the currently known distribution of subspecies *vagus* in the Philippines. Specimens have been deposited in the U.S. National Museum.

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SOME SAWFLIES FROM PAKISTAN

(HYMENOPTERA: DIPRIONIDAE, TENTHREDINIDAE)

DAVID R. SMITH, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—The four species of *Gilpinia* (Diprionidae) known from Pakistan are keyed. One new species, *G.* **ghanii**, is described as well as the female of *G. indica* (Cameron). *Ardis* **asulca**, new species, (Tenthredinidae) is described and *Nematus melanaspis* Hartig is reported from Pakistan.

The following descriptions are based on specimens sent to me by Dr. M. A. Ghani, Commonwealth Institute of Biological Control, Pakistan Station, Rawalpindi, Pakistan.

DIPRIONIDAE

Gilpinia Benson

Gilpinia is the only genus of Diprionidae known from Pakistan. All species of this genus are associated with conifers.

Gilpinia polytoma (Hartig)

This species was recorded from Pakistan by Benson (1965) and occurs from Europe to Japan. In Pakistan, the larvae feed on *Picea smithiana* Boiss. The scalelike inner hindtibial spur of the female and slender penis valve of the male separate *polytoma* from other *Gilpinia* species in Pakistan. For detailed descriptions see Reeks (1941).

Gilpinia pindrowi Benson

Benson (1961) described this species from Punjab, Murree, Pakistan. The adults were reared from larvae on *Abies pindrow* Spach. I have seen additional specimens from Murree as well as from Gharial, Kaldana, Olore (Swat), and Shogran, but these specimens were reared from larvae feeding on *Picea excelsa* Link.

The female of *pindrowi* is distinguished from that of *polytoma* by the simple hindtibial spurs and from those of *indica* and *ghanii* by the lancet, which has the serrula of annulus 2 on about the same level as the remaining serrulae and has annuli 2 and 3 subparallel (fig. 1). Also, the orange coloration with part of the midtibia, hindtibula, and hindfemur black will separate *pindrowi*. The male penis valve is distinctive in being elongate (fig. 9), not triangularly shaped as in *indica* and *ghanni*.

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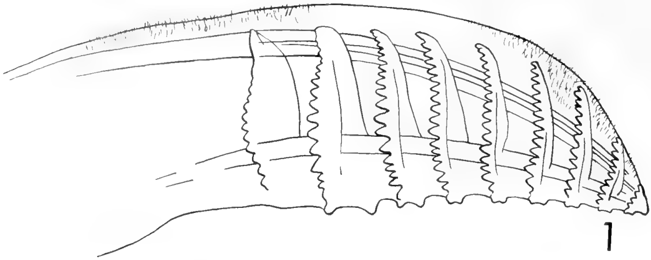
[1] Mail address: c/o U. S. National Museum, Washington, D. C. 20560.



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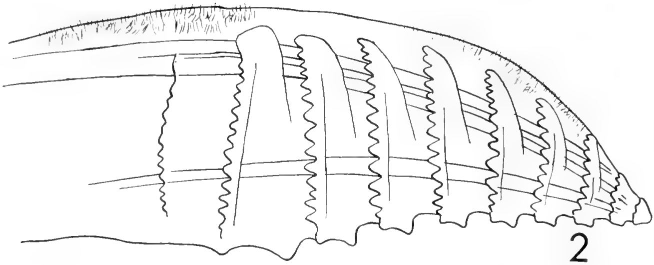

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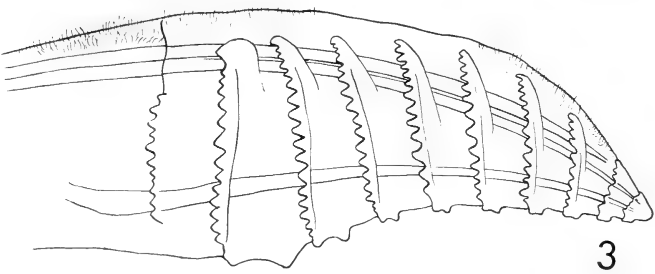

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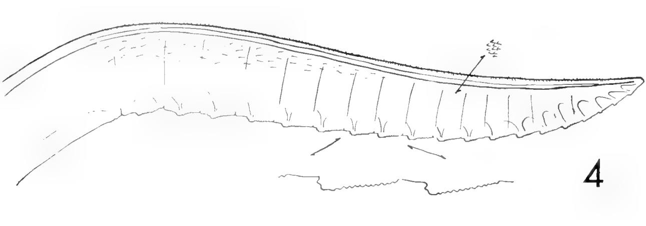

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Gilpinia indica (Cameron)

This species was known from only the male holotype, but I have associated the sexes on the receipt of reared material from Dr. Ghani. Cameron (1913) described this species from Dehra Dun, India. The specimens I have seen were reared from larvae on *Cedrus deodara* (Roxb.) Loud. from the following localities: PAKISTAN: Dawarian (A. K.), VII-19-69, VI-27-70; Thandiani, VIII-15-70. A description of the female and redescription of the male follow.

Female.—Length, 7.8 mm. Antenna and head black; anterior margin of clypeus, labrum, and maxillary and labial palpi whitish. Thorax black with tegula, prothorax, mesopleuron, and mesoscutellum whitish. Legs whitish to brown; base of each coxa, each femur, and apical third of middle and hindtibiae black. Abdomen mostly whitish with basal plates, lateral margins of tergites, apical segment, and sheath brownish to black. Wings hyaline.

Antenna with 18 segments, rami of central segments longer than their respective segment. Punctation of head and thorax and dullness of abdomen typical of genus. Hindtibial spurs both simple. Sheath broad, flattened at apex, scopa blunt, not expanded and with broad, elongate scopal pads. Lancet with 10 annuli; annuli 2 and 3 divergent; ventral margin of lancet concave, with serrula of second annulus distinctly lower than serrula of third annulus; distance between central serrulae much longer than breadth of adjacent serrulae (fig. 3).

Male.—Length, 4.5 mm. Black, with labrum, maxillary and labial palpi, extreme apex of each femur, each tibia and tarsus entirely, and apical margin of hypandrium brownish. Penis valve triangularly shaped, short and broad with apex acute and ventral margin slightly concave (fig. 10); harpe and parapenis similar to that of *ghanii* (fig. 7).

Larva.—Preserved specimens are mostly whitish with dorsal, supraspiracular, and subspiracular longitudinal black stripes. Segments of the thoracic legs are black and the head is reddish brown with a large spot on frons, a line extending from occiput to frons, eyespots, clypeus and labrum, and indefinite spots on the sides black.

Gilpinia ghanii, n. sp.

The coloration of this species is similar to that of *pindrowi* except for the larger black spots on the lateral lobes of the mesonotum and the entirely orange legs. The genitalia of both sexes will distinguish this species.

Female.—Length, 8.0 mm. Head black, with mouthparts, clypeus, and supraclypeal area white to orange and spot behind each eye brownish. Antenna black with first two segments whitish. Thorax white to yellowish with black covering most of each lateral lobe of mesonotum. Legs entirely orange. Abdomen orange,

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FIGS. 1–4. Female lancets: 1, *Gilpinia pindrowi* Benson; 2, *G. ghanii*, n. sp.; 3, *G. indica* (Cam.); 4, *Ardis ascula*, n. sp.

sheath black. Wings very lightly and uniformly infuscated; veins black with costa and ventral half of stigma brownish.

Antenna with 23 segments, rami of central segments slightly longer than their respective segment. Head and thorax heavily punctate, but shining between punctures. Hindtibial spurs both simple. Scopa of sheath broad and flat, not greatly expanded, with oval scopal pads. Lancet with 10 annuli; annuli 2 and 3 divergent; serrulae concave; serrula of second annulus lower than that of third annulus and serrula of third annulus lower than that of fourth annulus, serrulae of annuli beyond third about on same level; distance between serrulae shorter than breadth of adjacent serrulae (fig. 2).

Male.—Length, 6.4 mm. Black; labrum and maxillary and labial palpi whitish; legs yellow to orange with each coxa and outer surface of middle and hindfemora black. Antenna with 22 segments, segments bifurcate as for other species of genus. Penis valve short and broad, triangularly shaped with apex blunt and ventral margin straight and with spines extending along margin (fig. 8); harpe and parapenis as in figure 7.

Larva.—Preserved larval specimens are nearly entirely black with a lateral white stripe and with the inner surfaces of the prolegs whitish; various whitish spots are also on the dorsum and venter of the body and on each subspiracular lobe. Segments of thoracic legs are black. I have seen two specimens, one has a black head with area below antennae whitish, the other has a reddish-brown head, mottled with indefinite areas of black.

Holotype.—Female from Pakistan labeled "Larva feeding on needle of *P. smithiana*, C. I. B. C., SSA-7/69-1, Reshna, 21.VIII.69, 3029." U. S. N. M. type no. 71213.

Allotype.—Male, same data as for holotype, except for number "3030."

Paratypes.—PAKISTAN: data as for holotype (1 ♀); Reshna, 28-7-70, ex smoky black larva on *Picea smithiana*, SSA 6/70-1 (1 ♀); Reshna, 21-7-69, ex larva on *P. smithiana* (3 ♂♂, 1 ♀). In the U. S. National Museum, British Museum, and a male and female returned to Dr. Ghani.

Key to **Gilpinia** Species of Pakistan

1. Female 2
   Male 5
2. Inner hindtibial spur scalelike .... **G. polytoma** (Hartig)
   Both hindtibial spurs simple 3
3. Head, pectus, and mesonotum except for scutellum black .... **G. indica** (Cameron)
   Clypeus, supraclypeal area, and thorax orange or yellow, mesonotum at most with two black spots 4
4. Legs orange with apical half of mid- and hindfemora and mid- and hindtibiae black, hindtarsus mostly black; annuli 2 and 3 of lancet parallel (fig. 1) .... **G. pindrowi** Benson
   Legs entirely orange; annuli 2 and 3 of lancet divergent (fig. 2) .... **G. ghanii**, n. sp.

5. Penis valve markedly curved, slender, with not more than 6 small spines (fig. 6) .... **G. polytoma** (Hartig)
   Penis valve straighter, broader, with 20 or more spines 6
6. Penis valve elongate (fig. 9) .... **G. pindrowi** Benson
   Penis valve shorter, more triangular in shape 7
7. Apex of penis valve more pointed (fig. 10); each femur mostly black .... **G. indica** (Cameron)
   Apex of penis valve more rounded (fig. 8); each femur mostly yellowish, if black then only on outer surfaces .... **G. ghanii**, n. sp.

Tenthredinidae

Blennocampinae

Ardis asulca, n. sp.

Only three world species of *Ardis* are known, and all are associated with *Rosa* in which the larvae are shoot borers. This species from Pakistan is atypical in that it lacks a postorbital groove with deep pits, but all other adult characters place it in this genus as do characters of the larvae and habits of the species.

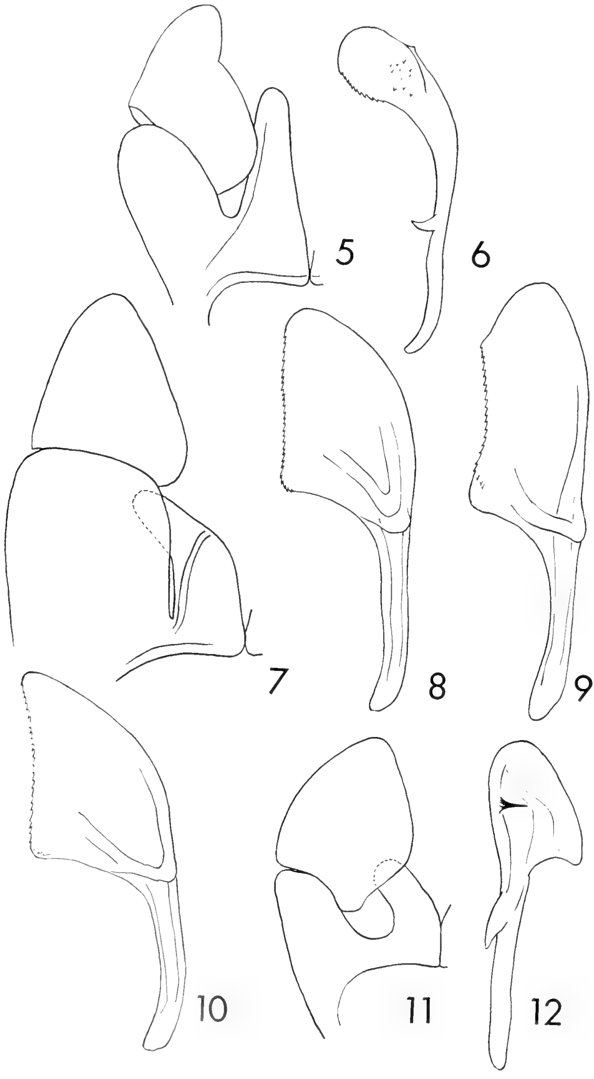
Female.—Length, 7.1 mm. Black, spot on outer surface of apex of front femur, outer surface of each front and middle tibia, and basal third of hindtibia whitish. Wings very lightly, uniformly infuscated.

Antenna slightly longer than head width; third segment longer than fourth segment. Malar space equal to half diameter of front ocellus. Clypeus very shallowly circularly emarginated. Genal carina absent; postorbital groove and pits absent. Prepectus absent. Tarsal claw with inner tooth and basal lobe. Front wing with vein 2A and 3A curved up at apex, but not meeting 1A; cell M present in hindwing. Sheath straight above, rounded below, with slender, cylindrical dorsoapical projection. Lancet with about 20 serrulae; each serrula low and flat, with one prominent anterior subbasal tooth and 10 to 15 fine posterior subbasal teeth (fig. 4).

Male.—Length, 5.1 mm. Color and structure similar to that of female. Harpe oblong; parapenis long, curved laterally (fig. 11); penis valve with short lateral spine (fig. 12).

Larva.—The mature larva is entirely whitish with the tenth tergum and a transverse plate on the ninth tergum black, the spiracles are very lightly winged, and the head is amber with indefinite brown areas on the vertex and between the eyes. The larva is very similar to the *Ardis* larvae described by Smith (1966, 1969), but the absence of a pair of subanal protuberances will distinguish it from *brunniventris* (Hartig) and *sulcata* (Cameron). Also the ninth and tenth terga are amber in those species. The absence of a pair of long subanal spines will separate the larva of *asulca* from that of *Cladardis elongatula* (Klug), also a shoot-borer in roses.

Holotype.—Female, from Pakistan, labeled "Larva boring in twigs of *Rosa* sp., Murree, 18-VI-68, C. I. B. C., T. B. M. 6/68-10, 2889." U. S. N. M. type no. 71214.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Allotype.—Male, same data as for holotype except dated 19-VI-68, and T. B. M. 6/68-12, 3023.

Paratype.—PAKISTAN: Murree, 10-VI-68, C. I. B. C., T. B. M. 6/68-10, 2892, larva boring twigs of *Rosa* sp. (1 ♀). Returned to Dr. Ghani.

Nematinae

Nematus (Pteronidea) melanaspis Hartig

Specimens of this species were collected from *Salix* sp. at Murree (7-V-64, 25-V-64, 4-VIII-64), and adults were reared from larvae feeding on the foliage of *Salix wallichiana* Anderss. at Murree (13-VI-70). *N. melanaspis* is found from Europe to Siberia, and this first record from Pakistan considerably extends its southern distribution. The only other *Nematus* species known from Pakistan is *oligospilus* Foerster. The black frons, postocellar area, mesonotum, and dorsum of the abdomen will distinguish *melanaspis* from *oligospilus*, these parts being mostly orange-yellow in the latter. *N. melanaspis* is in the group of *Nematus* species in which the sheath is short and rounded and the lancet is very short and triangular. Benson (1958) illustrated the lancets of *melanaspis* and *oligospilus*.

Nematus (Pteronidea) oligospilus Foerster

Benson (1963) first recorded this Holarctic species from Pakistan. As for *melanaspis*, the larvae feed on *Salix*.

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Reeks, W. A. 1941. On the taxonomic status of *Gilpinia polytoma* (Htg.) and

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Figs. 5–6. *Gilpinia polytoma* (Hartig): 5, harpe and parapenis; 6, penis valve. Figs. 7–8. *G. ghanii*, n. sp.: 7, harpe and parapenis; 8, penis valve. Fig. 9. *G. pindrowi* Benson, penis valve. Fig. 10. *G. indica* (Cam.), penis valve. Figs. 11–12. *Ardis ascula*, n. sp.: 11, harpe and parapenis; 12, penis valve.

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A NEW SPECIES OF LAELAPS FROM THE LEMMING MOUSE, SYNAPTOMYS COOPERI

(ACARINA: LAELAPIDAE)

DONALD W. LINZEY, *Department of Biological Sciences, University of South Alabama, Mobile, Alabama 36608*

and

D. A. CROSSLEY, JR., *Department of Entomology, University of Georgia, Athens, Georgia 30601*

ABSTRACT—*Laelaps* **stupkai**, n. sp. is described from the southern lemming mouse, *Synaptomys cooperi stonei* Rhoads, collected in the Great Smoky Mountains National Park, North Carolina.

Laelaps Koch is a genus of worldwide distribution, normally parasitizing myomorph rodents which inhabit moist situations. Recent collections of ectoparasites in the course of ecological studies on small mammals in the Great Smoky Mountains National Park have revealed the presence of a new species of *Laelaps*. The host for this mite was a southern lemming mouse, *Synaptomys cooperi stonei* Rhoads, taken near the southern limit of the geographical distribution of this genus. A search of the literature reveals few instances of the parasitism of *Synaptomys* by members of the genus *Laelaps*.

Laelaps stupkai Linzey and Crossley, n. sp.

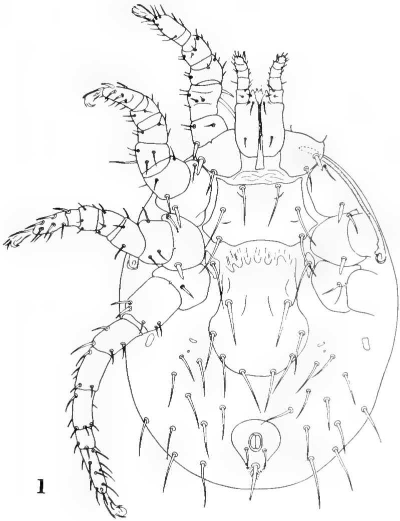
(Figs. 1 and 2)

Description based upon female; male unknown.

Diagnosis: *Laelaps sensu* Tipton 1960. Distance between first pair of epigynial setae much greater than distance between fourth pair of epigynial setae; length of adanal setae greater than ⅓ width of anal plate; length of postanal seta less than length of anal plate; first pair of sternal setae not reaching posterior margin of sternal plate; proximal seta of coxa I setiform, distal seta of coxa I spiniform; peritreme extending to middle of coxa I.

Idiosoma: 770μ long by 590μ wide.

Dorsum: Dorsal plate elliptical, covering most of dorsum, with about 33 pairs



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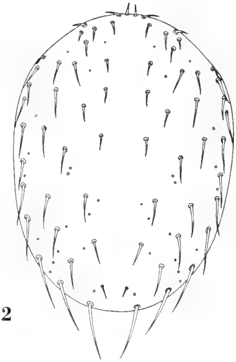

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FIGS. 1 & 2. *Laelaps stupkai* n. sp.: 1, ventral aspect of female; 2, dorsal plate of female.

of setae. Penultimate setae of row D shortened, others of normal length. Distribution of pores as shown in fig. 2.

Venter: Sternal plate well sclerotized, finely punctate but without reticulations; maximum length 145μ, maximum width 234μ; setae long, tapered, first pair reaching past bases of second pair but not to posterior margin; sternal pores distinct. Endopodal plates spindle-like, bearing setae resembling those of sternal plate, without pores. Epigynial plate well sclerotized; 250μ long by 220μ wide; setae tapered; distance between first pair of setae 113μ, distance between fourth pair of setae 65μ. Metapodal plates distinct. Anal plate 128μ long by 104μ wide; adanal setae weak, 40μ long, reaching to base of postanal seta; postanal seta strong, 70μ long. Soft integument of venter with 11 pairs of tapered setae. Peritreme reaching to middle of coxa I, peritremal plate not extending posteriorly.

Legs: Robust, shortened, with weak claws, leg IV the longest. Coxa I with setiform proximal seta, spiniform distal seta; coxa II with spiniform seta; coxa III with setiform anterior seta, spiniform posterior seta; coxa IV with setiform seta. Trochanter I with spiniform proximal seta. Femora I and II and genu I with elongate dorsal setae; other leg setae short.

Type Material: Holotype and two paratypes, all females, from a male *Synaptomys cooperi stonei* Rhoads. The host (DWL Mammal No. 265) was taken along U. S. Route 441 at Kanati Fork, a tributary of the Oconaluftee River, Great Smoky Mountains National Park, Swain County, North Carolina, elevation 2800 ft, on December 16, 1965, by the senior author and his wife, Alicia V. Linzey.

The holotype has been deposited in the U. S. National Museum, type No. 34-80. Paratypes have been deposited in the acarology collections of the University of Georgia and in the collections of the senior author at the University of South Alabama.

Remarks: This species is named in honor of Mr. Arthur Stupka in recognition of his immeasurable contribution to the knowledge of the natural history of the Great Smoky Mountains National Park where he served as chief naturalist and biologist for almost 29 years.

In Tipton's (1960) revision of the genus *Laelaps*, *L. stupkai*, n. sp. will key out to *nuttalli* Hirst. It differs from *nuttalli* in having the fourth pair of setae on the epigynial plate much closer together than the first pair of setae. *Laelaps nuttalli* exhibits some variation in this feature, but specimens from the southeastern United States examined by Tipton had the fourth pair of setae *further apart* than the first pair. Also, *Laelaps nuttalli* has about six pairs of setae on the soft integument of the venter, whereas *L. stupkai* has about 11 pairs. *Laelaps stupkai* differs from other *Laelaps* species reported from the southeastern United States, as follows: *Laelaps evansi* Tipton and *L. multispinosus* Banks both have minute adanal setae and two spinelike setae on coxa I; *L. stupkai* has normal adanal setae and one spinelike seta on coxa I. *Laelaps kochi* Oudemans has spiniform dorsal setae; those of *L. stupkai* are normal. *Laelaps oryzomydis* Pratt and Lane has a spinelike proximal seta and a setiform distal seta on coxa I; *L. stupkai* has a setalike proximal seta and a spinelike distal seta on coxa I.

So far as we can determine, this is only the third report of a *Laelaps* species from *Synaptomys cooperi*. Wilson (1957) and Whitaker and Wilson (1968) previously recorded *Laelaps alaskensis* Grant from *Synaptomys* in Indiana. *Laelaps alaskensis* differs from *L. stupkai* in possessing about 16 pairs of setae on the soft integument of the venter, versus 11 pairs in *stupkai*.

We thank Dr. Preston Hunter, University of Georgia, for assistance with this description.

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SYNONYMIES AND COMBINATIONS FOR MEXICAN SOLDIER FLIES (DIPTERA: STRATIOMYIDAE)[1]

M. W. McFADDEN, *Department of Entomology, Washington State University, Pullman, Washington 99163*

ABSTRACT—Synonymies and new combinations are given for 16 species of soldier flies from Mexico.

The following notes are based on types examined during a recent visit to the following institutions in Europe: British Museum (Natural History), London, Museum National d'Histoire Naturelle, Paris, Museo ed Instituto di Zoologia Sistematica dell'Università di Torino, Torino, Naturhistorisches Museum, Vienna and the Universitetets Zoologiske Museum, Copenhagen.

Detailed notes on types located in these institutions and lectotype designations will be made in other papers (McFadden, in press, A, B, & C). The purpose of the present paper is to provide a list of the proposed changes in synonymy and generic transfers to insure their availability for inclusion in the catalog of the Diptera of South America, Family Stratiomyidae, which is being prepared by Dr. M. T. James.

Acanthina inornata Williston, 1900:249 = *Artemita nana* (Bellardi), 1862:9. **New synonymy.**

Chrysochroma latifrons Williston, 1900:234 = *Microchrysa latifrons* (Williston). **New combination.**

Chrysochroma pulchra Williston, 1900:233 = *Sargus nigrifemoratus* (Macquart), 1847:47 (= *Himantoloba nigrifemorata*, **New combination**); **New synonymy.**

Chrysonotus aeneiventris Giglio-Tos, 1892:25 = *Himantoloba flavopilosa* (Bigot), 1879:227. **New synonymy.**

Cyphomyia bequaerti James, 1938:198 = *Cyphomyia simplex* Walker, 1860:268. **New synonymy.**

Dieuryneura obscura (Coquillett), 1902:98 = *Clitellaria stigma* Giglio-Tos, 1891:2 (= *Dieuryneura stigma* Giglio-Tos, **New combination**); **New synonymy.**

Histiodroma flaveola Bigot, 1879:205 = *Acrochaeta fasciata* Wiedemann, 1830:42. **New synonymy.**

Macrosargus smaragdiferus Bigot, 1879:226 = *Merosargus smaragdiferus* (Bigot). **New combination.**

Odonthomyia affinis Bellardi, 1859:35 = *Hedriodiscus euchlorus* (Gerstaecker), 1857:328. **New synonymy.**

Odonthomyia femorata Bellardi, 1859:37 = *Odonthomyia quadrimaculata* Bellardi, 1859:37 (= *Labostigmina quadrimaculata*, **New combination**); **New synonymy.**

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[1] Scientific paper 3591, College of Agriculture, Washington State University. Work was conducted under Project 1939. The author is indebted to the National Science Foundation Grant GB 15774 and a personal grant from the American Philosophical Society for partial financial support of this project.

Odontomyia flavifasciata Macquart, 1849:357 = *Hedriodiscus lefebvrei* (Macquart), 1838:189. **New synonymy.**

Ptecticus trivittatus Giglio-Tos, 1891:3 (not Say, 1829) = *Ptecticus gigliotosi* McFadden. **New name.**

Sargus sallei Bellardi, 1859:43 = *Sargus coarctatus* Macquart, 1838:203 = *Sargus notatus* Wiedemann, 1830:34 = *Sargus fasciatus* Fabricius, 1805:259. **New synonymy.**

Sargus splendens Bigot, 1879:224 = *Sargus aureus* Bellardi, 1859:42 = *Sargus speciosus* Macquart, 1846:56. **New synonymy.**

Stratiomys gerstaeckeri Bellardi, 1859:31 = *Stratiomys subalba* Walker, 1854:43 = *Stratiomys fasciata* (Fabricius), 1805:81 (= *Hoplitimyia fasciata* (Fabricius), **New combination**); **New synonymy.**

Stratiomys pinguis Walker, 1860:270 = *Stratiomys constricta* Walker, 1860:269. **New synonymy.**

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KEYS TO THE FAMILIES AND SUBFAMILIES OF THE NYMPHS OF NORTH AMERICAN HEMIPTERA-HETEROPTERA

RUSSELL M. DECOURSEY, *Biological Sciences Group, University of Connecticut, Storrs, Connecticut 06268*

ABSTRACT—Keys to nymphs of families and subfamilies of North American Hemiptera-Heteroptera are presented with 23 figures.

The present paper attempts to provide usable keys to nymphs for the families and subfamilies of North American Heteroptera-Hemiptera. It should be realized that in constructing keys to nymphs that the investigator is often handicapped by not having available representation of many genera and species. While material for most families has been reasonably adequate, material from the southern and western states has been relatively limited. The genera and sometimes species upon which the following keys are based are indicated in parentheses in the appropriate key couplet. These genera indicate that at least one species in the genus has been studied. Ordinarily a representative number of species were studied.

The keys are designed primarily for use with fifth and fourth instar nymphs, but it is hoped that they will frequently be effective with earlier instars.

In a few cases, specimens from foreign countries were used where native specimens were unavailable. Exotic species are so indicated.

Key to Families

1. Antennae usually concealed (except in Ochteridae), shorter than head; aquatic and semiaquatic 2
   Antennae exposed, longer than head; terrestrial and semiaquatic 9
2. Head overlapping anterior margin of pronotum; labium short, apparently unsegmented; fore tarsi flattened, palaeform. (Figs. 1 & 2) Water boatmen (*Hesperocorixa, Trichocorixa, Cymatia*) .... Corixidae
   Head inserted into pronotum; labium 3- or 4-segmented; fore tarsi not palaeform 3
3. One pair of widely separated abdominal scent gland openings present between second and third terga; fore tarsi reduced and without claws. Creeping water bugs (*Pelocoris, Ambrysus*) .... Naucoridae
   Dorsal abdominal scent gland openings absent 4
4. Hind tarsi without distinct claws; hind legs longer, resembling oars; posterior tibiae flattened. Backswimmers (*Notonecta, Buenoa*) .... Notonectidae
   Hind tarsi with two distinct claws; hind legs shorter, not resembling oars; posterior tibiae not flattened 5
5. Oval, highly convex forms, 2 mm or less in length .... Pleidae
   Elongate or flattened forms, larger, 3–10 mm in length 6
6. Abdomen bearing a cylindrical, caudal, respiratory siphon. Waterscorpions (*Ranatra, Nepa*) .... Nepidae
   Abdomen without a caudal respiratory siphon, or if present, it is short and flat 7
7. Labium elongate, slender, reaching hind coxae; fore legs not raptorial. Small shore bugs. Length 2½–3 mm (*Ochterus*) .... Ochteridae
   Labium short, stout, reaching caudad only to fore tarsi; fore legs raptorial 8
8. Hind tibiae and tarsi with fringe of long swimming setae; eyes laterally protuberant. Giant water bugs (*Lethocerus, Belostoma*) .... Belostomatidae
   Hind tibiae and tarsi without fringe of long, swimming setae; eyes dorsally protuberant. Toad bugs (*Gelastocoris, Nerthra*) .... Gelastocoridae
9. Claws preapical 10
   Claws apical 11
10. Distance between fore and middle coxae greater than length of labium. Water striders (*Gerris, Metrobates, Rheumatobates, Halobates*) .... Gerridae
    Distance between fore and middle coxae less than length of labium. Broad-shouldered water striders and ripple bugs (*Rhagovelia, Microvelia, Velia*) .... Veliidae
11. Prosternum with a cross-striated median groove for the reception of the tip of the labium. (Fig. 4) Assassin bugs .... Reduviidae
    Prosternum without cross-striated median groove 12
12. With less than three paired abdominal scent gland openings 13
    With three or four paired abdominal scent gland openings 31
13. Without or with only one scent gland opening in intersegmental suture between abdominal terga 14
    With two scent gland openings in intersegmental sutures between abdominal terga 22
14. Antennal or genal combs (Ctenidia) of stiff, thick setae present; eyes

absent. (Figs. 19 and 22) Bat bugs. (Ectoparasites of tropical and subtropical bats) (*Hesperoctenes*) .... Polyctenidae

Antennal or genal combs absent; eyes present 15

15. Head as long as entire thorax; eyes located about midlength of head. Water measurers (*Hydrometra*) .... Hydrometridae

Head shorter than thorax; eyes located at base of head 16

16. A single median, dorsal abdominal scent gland opening present 17

Two dorsal scent gland openings side by side 18

17. Underside of head with prominent groove between the bucculae; body covered with a velvety setaceous pile; femora and tibiae lacking strong, black setae; length 1.5–2 mm. Velvet water bugs (*Hebrus*, *Merragata*) .... Hebridae

Head without a groove between the bucculae; body not covered with velvet pile; femora and tibiae with sparse but strong black setae. Water treaders (*Mesovelia*) .... Mesoveliidae

18. Labium 4-segmented 19

Labium appearing 3-segmented 20

19. Fore tibiae enlarged, widest at distal end; head elongate with constriction behind eyes. (Fig. 5) Unique-headed bugs (*Systelloderes*) .... Enicocephalidae

Fore tibiae not enlarged apically; head not elongate, lacking a constriction behind the eyes. Plant bugs .... Miridae

20. Abdominal scent gland, if present, opening between terga 6 and 7; eyes extending backward over anterior angles of pronotum; length 1.5–2 mm. (Fig. 21) Jumping ground bugs (Probably *Humpatanannus*, South Africa) .... Schizopteridae

Scent gland openings between terga 3 and 4; (Fig. 9) eyes not extending backward over anterior angles of pronotum 21

21. Fore femora possessing strong spines; labium short, stout, setaceous, not reaching hind coxae (*Valleriola*) South Africa .... Leptopodidae

Fore femora without strong spines; labium long, slender, reaching hind coxae and not setaceous. Shore bugs .... Saldidae

22. Dorsal abdominal scent glands opening between terga 3 and 4 and between 4 and 5 23

Dorsal scent glands opening between abdominal terga 4 and 5 and between 5 and 6 27

23. Juga considerably exceeding tylus; bucculae reduced. Ash-gray leaf bugs (*Piesma*) .... Piesmatidae

Tylus exceeding juga, or the two subequal; bucculae not reduced 24

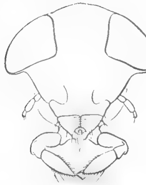
24. Abdominal scent gland openings about half as far apart as the width of the interocular space .... Lygaeidae (in part)

Abdominal scent gland openings close together, less than half the width of the interocular space 25

25. Body spinous, scent gland areas large, evident. Lace Bugs (*Corythucha*, *Stephanitis*) .... Tingidae

Body without spines; scent gland areas minute 26

26. Antennae longer than body and clavate; hind legs slender, longer than length of abdomen; femora slightly enlarged distally; length 7–10 mm.



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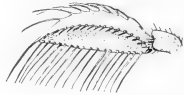

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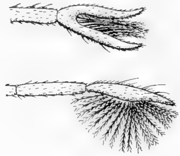

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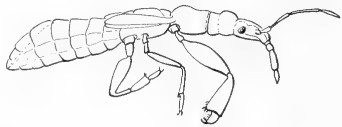

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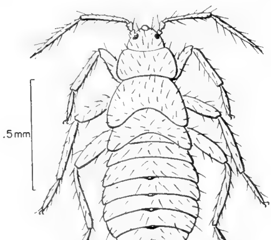

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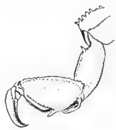

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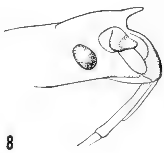

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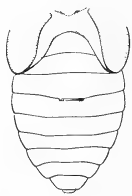

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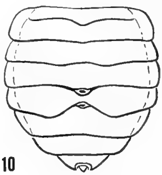

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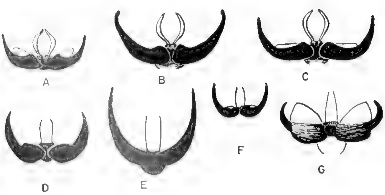

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FIG. 1. Head of *Hesperocorixa*, Corixinae, showing labium with transverse sulcations. Fig. 2. Flat, palaeform fore tarsis of Corixidae. Fig. 3. Mesotarsis of *Rhagovelia*, Veliidae, with cleft containing plumose setae. Fig. 4. Head of *Sirthenia*, Reduviidae, illustrating prosternal, cross-striated, median groove. Fig. 5.

Stilt bugs (*Neides, Berytinus, Jalysus*) .... Berytidae
Antennae not longer than body and not clavate; hind legs shorter than length of abdomen; length 2 mm. (Fig. 20) Royal Palm bugs (*Xylastodoris*) .... Thaumastocoridae

27. Labium 3-segmented; fore tarsi concealed in tibial groove or absent; tibiae curved in apposition to the enlarged femora. (Fig. 7) Ambush bugs (*Phymata*) .... Phymatidae
Labium 4-segmented; fore tarsi well developed and not concealed in tibial groove 28

28. Antennae inserted below a hypothetical line extending from the middle of the eye to the anterior end of the bucculae .... Lygaeidae (in part)
Antennae inserted above such a line as indicated above 29

29. Posterior border of fifth abdominal tergite sinuate, the tergite constricted between the two scent gland openings. (Fig. 10) .... Rhopalidae
Posterior border of fifth abdominal tergite straight, the tergite not constricted 30

30. Head not as wide as posterior width of pronotum; bucculae long, extending posteriorly beyond bases of antennae .... Coreidae
Head as wide as pronotum; bucculae short, not extending posteriorly beyond bases of antennae .... Alydidae

31. Labium apparently 3-segmented 32
Labium 4-segmented 34

32. With four scent gland openings between abdominal terga 3–4, 4–5, 5–6 and 6–7; head somewhat conical. Length 1–2 mm. (Fig. 6) Jumping ground bugs (*Cryptostemma, Ceratocombus*) .... Dipsocoridae
With three dorsal abdominal scent gland openings 33

33. Wing pads not present even in later instars; lateral anterior border of pronotum prolonged anteriorly on either side of base of head. Length of fifth stage nymph 5–6 mm. Bed bugs (*Cimex*) .... Cimicidae
Wing pads present in later instars; pronotum not prolonged anteriorly on either side of base of head. Minute pirate bugs (*Orius, Anthocoris, Tetraphleps, Elatophilus, Acompocoris, Melanocoris, Asthenidea, Xylocoris*) .... Anthocoridae

34. Labium long, slender, arising from anterior part of head; not located in a rostral groove in the gular region; antennal segments long, slender. Damsel bugs (*Nabis, Pagasa*) .... Nabidae
Labium short, stocky, located in a rostral groove in the gular region; Antennal segments short, thickened 35

35. Labium not reaching mesocoxae; head wide, flat; body heavily sclerotized and flattened; dark brown or dull colored black bugs living under bark;

←

Systelloderes, Enicocephalidae. Fig. 6. *Ceratocombus*, Dipsocoridae. Fig. 7. Foreleg of *Phymata*, Phymatidae. Fig. 8. Head of *Neides*, Berytidae. Fig. 9. Abdomen of *Pentacora*, Saldidae. Fig. 10. Abdomen of *Arhyssus*, Rhopalidae. Fig. 11. Tarsal claws of Miridae: A, *Halticus*, Orthotylinae; B, *Stenodema*, Mirinae; C, *Phytocoris*, Mirinae; D, *Deraeocoris*, Deraeocorinae; E, *Fulvius*, Cylapinae; F, *Criocoris*, Phylinae; G, *Monalocoris*, Bryocorinae.

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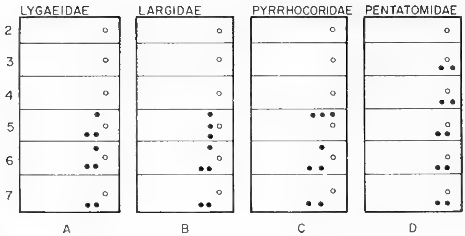

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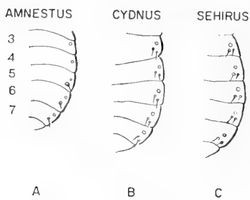

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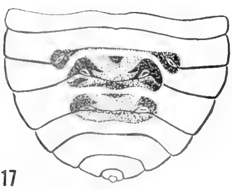

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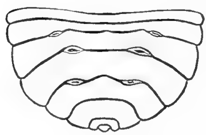

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no lateral abdominal trichobothria present. Flat bugs (*Aradus, Mezira, Aneurus*) .... Aradidae

Labium reaching mesocoxae or longer; head and body not flattened; lateral abdominal trichobothria present 36

36. Trichobothria of 5th abdominal sternite arranged in a longitudinal row of three, mesad of spiracle on either side of sternite. (Fig. 14 B) Brightly colored, metallic blue (*Largus*) .... Largidae

Trichobothria of 5th abdominal sternite not so arranged; body not metallic blue color 37

37. Trichobothria on 5th abdominal sternite arranged in transverse row of three, anterior to spiracle on either side of sternite. (Fig. 14 C) Nymphs commonly red in color. Red bugs and cotton stainers (*Dysdercus*) .... Pyrrhocoridae

Trichobothria on 5th abdominal sternite not arranged in rows of three 38

38. Abdomen with lateral abdominal plates; abdomen flattened, wider than thorax; one or two trichobothria arranged close to spiracle; sutures between abdominal sterna not curved anteriorly; all spiracles ventral 39

Abdomen without lateral plates; abdomen not flattened or greatly wider than thorax; trichobothria on 5th abdominal sternite arranged in groups of three, mediad of spiracle. (Fig. 14 A) Suture between sterna 4 and 5 curving anteriorly and not reaching lateral margin, or if not curved, then spiracles dorsal .... Lygaeidae (in part)

39. Openings of anterior scent glands not distinctly wider than those of succeeding glands except in Acanthosominae (*Elasmucha*). Ventral plate of prothorax not expanded and recurved medially 40

Openings of anterior dorsal abdominal scent glands wider (farther apart) than those of succeeding glands. Ventral plate of prothorax expanded and recurved medially (Also considered by some to be a subfamily of the Pentatomidae) .... Scutelleridae

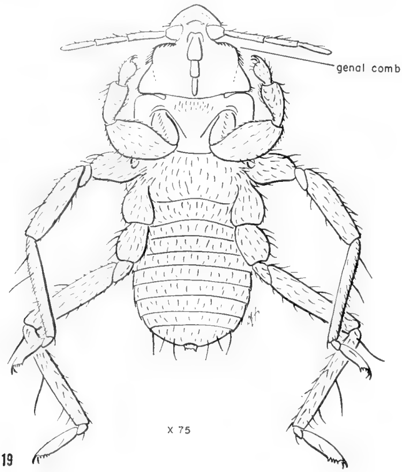
40. Anterior scent gland mediodorsal plate more narrow in anterior-posterior axis than second scent gland plate .... Pentatomidae

Anterior scent gland mediodorsal plate about the same anterior-posterior width as second scent gland plate 41

41. Area of non-punctate cuticula located immediately behind eyes on ventral surface of head. Anterior tibiae cylindrical with long slender setae (*Allocoris, Corimelaena, Galgupha*) .... Thyreocoridae

←

FIG. 12. *Aradus*, Aradidae. Fig. 13. *Mezira*, Aradidae. (Figs. 12 and 13 redrawn from Usinger and Matsuda, 1959. Courtesy of "The Trustees, British Museum, Natural History.") Fig. 14. Chart showing position of trichobothria (solid circles) in relation to spiracles (open circles): A, most Lygaeidae; B, Largidae; C, Pyrrhocoridae; D, Pentatomidae. (Note especially the arrangement in the 5th abdominal sternites. After Schaefer, 1966.) Fig. 15. Foreleg of *Amnestus*, Cydnidae. Fig. 16. Abdominal segments in the Cydnidae showing position of trichobothria in relation to spiracles: A, *Amnestus*; B, *Cydnus*; C, *Sehirus*. (After Froeschner, 1960.) Fig. 17. The recurved location of the anterior abdominal scent gland opening in the Pachycorinae, Scutelleridae. Fig. 18. The location of the anterior abdominal scent gland openings in the Eurygasterinae, Scutelleridae.



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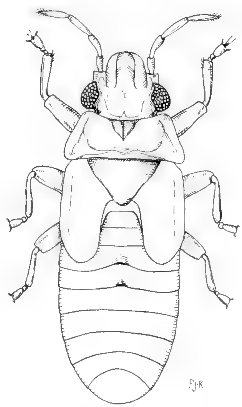

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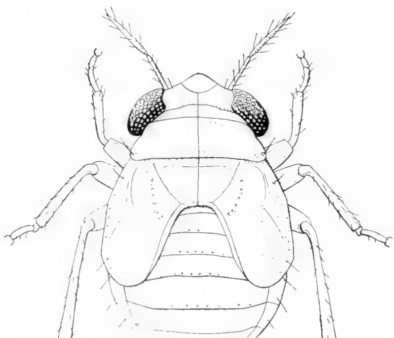

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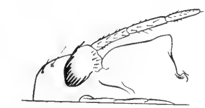

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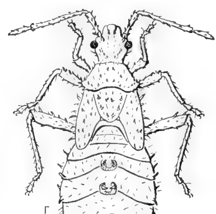

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FIG. 19. *Hesperoctenes*, Polyctenidae, ventral view of penultimate instar showing genal comb. Fig. 20. *Xylastodoris*, Thaumastocoridae. Fig. 21. *Humpatanannus*, Schizopteridae (South Africa). Fig. 22. *Hesperoctenes*, Polyctenidae, antennal comb of antepenultimate instar. (After Ferris and Usinger, 1939.) Fig. 23. *Mevaniomorpha*, Pseudophloeinae (South Africa).

No cuticular area behind eyes on ventral surface of head. Anterior tibiae flattened and with short coarse spines. (Fig. 15) (*Cydnus*, *Amnestus*, *Sehirus*) (The fore tibiae in the Sehirinae are not modified for digging) .... Cydnidae

Keys to Subfamilies

Corixidae

1. Labium with transverse sulcations; (Fig. 1) thick setae partially covering mesonotum and extending along inner margin of wing pads; anterior abdominal scent gland opening on tergite three, small, not well developed (*Hesperocorixa*, *Trichocorixa*) .... Corixinae
   Labium lacking transverse sulcations; long thick setae on both meso- and metanota; anterior abdominal scent gland opening well developed, clearly double (*Cymatia bonsdorffi*) (Sahlberg) (Europe) .... Cymatiinae

Naucoridae

1. Head not deep set in anterior margin of pronotum (*Pelocoris*) .... Naucorinae
   Head deep set into anterior margin of pronotum (*Ambrysus*) .... Ambrysinae

Notonectidae

1. Wing pads setaceous; interocular space at vertex, wider than width of eye; mesofemur short, thick, with short anteapical spine (*Notonecta*) .... Notonectinae
   Wing pads glabrous; interocular space at vertex, narrower than width of eye in later instars; mesofemur long, slender without anteapical spine (*Buenoa*) .... Anisopinae

Nepidae

1. Respiratory tube longer than thorax in 5th instar; body long, cylindrical; anterior femora long, slender; hind coxae narrowly separated (*Ranatra*) .... Ranatrinae
   Respiratory tube short, shorter than length of thorax in 5th instar; body flat, oval; anterior femora short, stout, not much longer than tibiae; hind coxae widely separated (*Nepa*) .... Nepinae

Gerridae

1. Body comparatively long and slender; inner margins of eyes concave or sinuate in posterior half (*Gerris*) .... Gerrinae
   Body short, stocky; inner margins of eyes rounded, not concave or sinuate in posterior half (*Halobates*, *Trepobates*, *Metrobates*, *Rheumatobates*) .... Halobatinae

Veliidae

1. Fourth antennal segment longest. Small forms, length 1–1.75 mm (*Microvelia*) .... Microveliinae
   First antennal segment longest. Larger forms 2
2. Mesotarsi with deep cleft containing plumose setae. Length 3.5–4 mm.

(Fig. 3) (Rhagovelia) .... Rhagoveliinae
Mesotarsi without deep cleft and without plumose setae. Length 5–5.25 mm (*Velia*) .... Veliinae

Reduviidae

1. Fore coxae elongated, extending beyond apex of head in later instars. Thread-legged bugs (*Emesaya, Metapterus, Gardena*) .... Emesinae
   Fore coxae shorter, not extending beyond apex of head 2
2. No dorsal scent gland openings present; second segment of labium bulbous; labium with stiff setae projecting toward head and prothorax (*Oncerotrachelus*) .... Saicinae
   Dorsal abdominal scent gland openings present; second segment of labium not bulbous; labium not armed with stiff setae projecting toward head 3
3. Second antennal segment nearly twice as long as first 4
   Second antennal segment shorter than first 9
4. Anterior coxae nearly twice as long as wide; first segment of labium shorter than second (*Melanolestes, Sirthenia, Rasahus*) .... Piratinae
   Anterior coxae about as long as wide; first segment of labium longer than second 5
5. Second segment of antennae with numerous subsegments; proximal segments of posterior tarsi about half as long as distal segments (*Hammacerus*) .... Hammacerinae
   Second segment of antennae not composed of numerous subsegments; Proximal segments of posterior tarsi about one fourth as long as distal segments 6
6. Abdominal scent gland openings located at the anterior margins of 5th and 6th terga. No spiracular orifices visible on mesothorax (*Rhiginia*) .... Ectrichodiinae
   With three abdominal scent gland openings or none; spiracular orifices visible and well developed laterally on mesothorax 7
7. Abdominal scent gland openings on anterior borders of 4th, 5th and 6th terga or absent; second segment of labium usually longer than first 8
   Abdominal scent gland openings between terga 3 and 4, and between 4 and 5; segment two of labium usually shorter than first or subequal (*Pygolampis, Oncocephalus, Narvesus*) .... Stenopodinae
8. Abdominal scent gland openings absent; head long, extending noticeably forward from eyes and not deflexed anteriorly; labium long, straight and held close to head (*Triatoma*) .... Triatominae
   Abdominal scent gland openings present between terga 3 and 4, 4 and 5, and 5 and 6 but sometimes small; head shorter, deflexed; labium curved and not held close to head (*Reduvius*) .... Reduviinae
9. Anterior tarsi reduced and depressed into a tibial groove when at rest; anterior tibiae enlarged distally; head, body and legs markedly setaceous (*Apiomerus*) .... Harpactorinae (in part)
   Anterior tarsi not reduced or depressed into tibial groove; anterior tibiae not enlarged distally; head, body and legs not markedly setaceous (*Zelus, Pselliopus, Arilus, Fitchia, Sinea, Acholla*) (After Fracker and Usinger, 1949) .... Harpactorinae (in part)

Miridae

1. Head flattened against pronotum, broadly truncate at apex and strongly deflexed; length 2 mm (*Letaba*) ? South Africa .... Isometopinae
   Head not flattened, not truncate distally 2
2. Arolia thick, not bristle-like; convergent distally, arising between claws. (Fig. 11 A,B,C) (In some dried, pinned nymphs of Mirinae, the arolia may be essentially parallel.) (24 genera studied) .... Orthotylinae and Mirinae
   Arolia represented by paired, bristle-like setae 3
3. Suture between abdominal terga 3 and 4 with thickened margin on either side of scent gland; large erect black setae on body and in rows on each abdominal tergite; claws large with cleft near base. (Fig. 11D) (*Deraeocoris*) .... Deraeocorinae
   Suture between terga 3 and 4 on either side of scent gland not different from other abdominal segmental sutures; body and abdominal terga not covered with large erect black setae. Claws without cleft near base 4
4. Pseudarolia absent; anterior margin of pronotum flattened, collar-like; anterior part of pronotum strongly convex dorsally on either side; claws long, slender. (Fig. 11E) (*Fulvius*) .... Cylapinae
   Pseudarolia present, sometimes minute; anterior margin of pronotum not collar-like, or if so, pseudarolia large and conspicuous; no convexities on anterior part of pronotum 5
5. Tibiae with large erect spines in addition to shorter setae; tarsal segments subequal in width, usually more slender than distal end of tibia. Pseudarolia arising from inner margin of claw. (Fig. 11F) (*Amblytylus, Criocoris, Chlamydatus, Dicyphus, Plagiognathus*) .... Phylinae
   Tibiae without large spines; distal tarsal segments thicker than proximal segments and as thick as the distal ends of the tibiae; pseudarolia arising from basal surface of claw. (Fig. 11G) (*Monalocoris*) .... Bryocorinae

Lygaeidae

1. Suture between abdominal sterna 4 and 5 straight and reaching connexivum; two pairs of scent gland pores present on dorsum of abdomen (rarely one, *Cymodema*) 2
   Suture between abdominal sterna 4 and 5 curving anteriorly, not reaching connexivum; or, if suture straight, then three pairs of abdominal scent gland pores (between tergites 3 & 4, 4 & 5, and 5 & 6. (in Heterogastrinae, no actual pore present between tergites 3 & 4, but a large, dark, sclerotized plate is present 8
2. Dorsal scent gland pores present between abdominal tergites 3 & 4, and 4 & 5. (rarely only one, *Cymodema*) (*Cymus, Arphnus, Cymodema*) .... Cyminae
   Dorsal scent gland pores present between abdominal terga 4 & 5 and 5 & 6 3
3. Abdominal spiracles 7 and 8 dorsal 4
   Abdominal spiracles 7 and 8 ventral 5
4. Each pair of dorsal scent gland pores surrounded by a distinct subcircular, dark, sclerotized plate; color of wing pads, solid brown (*Lygaeus, Oncopeltus*) .... Lygaeinae

Each pair of dorsal scent gland pores with at most a very thin dark ring around each individual opening; wing pads mottled or striped (*Nysius, Ortholomus*) .... Orsillinae

5. Spiracles on abdominal segments 3 and 4 dorsal; fore femora rarely incrassate or armed beneath 6

Spiracles 3 and 4 ventral; fore femora incrassate and armed beneath 7

6. Spiracles on abdominal segments 5 and 6 ventral; spiracle absent on 8; sutures between abdominal terga 4 & 5 and 5 & 6 curving strongly caudad from lateral margins to meson; abdominal tergum 7 narrow and unsclerotized (*Geocoris, Hypogeocoris*) .... Geocorinae

Spiracles 5 and 6 dorsal; spiracles present on 8; sutures between abdominal terga 4 & 5, and 5 & 6 straight, or only slightly curved caudad to the meson; abdominal tergum 7 broad, with mesal sclerotized plate (*Blissus, Ischnodemus*) .... Blissinae

7. Epicranial arms not meeting posteriorly, widely separated at posterior margin of head; spiracle 2 dorsal; fore femora but slightly swollen, with one spine near apex; abdominal segment 8 unsclerotized and colored like segment 7 (*Crophius*) .... Oxycareninae

Epicranial arms meeting posteriorly; spiracle 2 ventral; fore femora incrassate and armed beneath with many spines; abdominal segment 8 covered above and below with dark, sclerotized plates (*Phlegyas, Oedancala*) .... Pachygronthinae

8. All abdominal spiracles dorsal; epicranial stem absent (*Kleidocerys*) .... Ischnorhynchinae

Abdominal spiracles 5 to 8 ventral; epicranial stem present, though sometimes very short 9

9. Suture between abdominal sterna 4 & 5 straight, reaching connexivum. No actual opening but a large black sclerotized spot on tergal area 3–4 (*Heterogaster*) .... Heterogastrinae

Suture between sterna 4 & 5, with a few exceptions, curving anteriorly and not reaching lateral margin, or, if suture straight, then with scent gland openings between 3 & 4, 4 & 5, and 5 & 6. (In species with openings only on terga 4 & 5, and 5 & 6, then no dark sclerotized spot on 3–4 area) (*Emblethis, Heraeus, Ligyrocoris, Myodocha, Pachybrachius, Peritrechus, Sphaerobius*) (After Sweet and Slater, 1961) .... Rhyparochrominae

Berytidae

1. Head elongate; vertex extending anteriorly in an elongated process over tylus (Fig. 8) (*Neides, Berytinus*) .... Neidinae

Head less elongate; vertex not extending anteriorly in an elongated process, but small elevated processes or knobs may be present (*Jalysus*) .... Metacanthinae

Rhopalidae

1. Head greatly constricted behind eyes; lateral margin of pronotum without a distinct notch just posterior to anterior collar (*Arhyssus, Niesthrea, Harmostes, Stictopleurus*) .... Rhopalinae

Head not greatly constricted behind eyes; lateral margin of pronotum with a distinct notch just posterior to anterior collar (*Leptocoris*) .... Serinethinae

COREIDAE

1. Dorsal surface of head, thorax, wing pads and abdominal segments covered with small tubercles, each bearing a short seta (*Brotheolus viridis* Distant), or with relatively tall tubercles bearing single setae (*Mevaniomorpha hystrix* Gerstaecker), (South Africa) (Fig. 23) .... Pseudophloeinae
(Note: *Euthochtha* of the Coreinae will key out here. It may be separated from the Pseudophloeinae by its expanded third antennal segment and its large lateral spines)
Dorsal surface of head and body not covered with tubercles each bearing a seta (except in *Euthochtha*) 2
2. Hind femora strongly curved with distal half greatly enlarged; head and body covered with dense white setae .... Merocorinae
Hind femora not strongly curved or greatly enlarged distally; head and body not covered with dense white setae (*Anasa, Acanthocephala, Chariesterus, Euthochtha, Leptoglossus, Mozena, Catorhintha, Chelinidea*) .... Coreinae

ALYDIDAE

1. Hind femora armed beneath with spines; head constricted behind eyes; juga not extending beyond tylus (*Alydus*) .... Alydinae
Hind femora not armed beneath with spines; head not constricted behind eyes; juga extending well beyond tylus 2
2. Juga horizontally bifid; second labial segment longer than the first and longer than the combined length of 3rd and 4th segments; 3rd segment very short, less than half the length of the 4th (*Protenor*) .... Micrelytrinae
Juga not bifid; second labial segment about subequal to first and shorter than the combined length of the 3rd and 4th segments; the 3rd and 4th segments subequal (*Stenocoris*) .... Leptocorisinae

ANTHOCORIDAE

1. Third and fourth segments of antennae short, thick, and as wide or wider than segments one and two; antennal setae short; fore femora normal (*Orius, Anthocoris, Tetraphleps, Elatophilus, Acompocoris, Melanocoris*) .... Anthocorinae
Third and fourth segments of antennae longer and more slender than segments one and two; setae on antennal segments three and four long; fore femora enlarged (*Asthenidea, Xylocoris*) .... Lyctocorinae

NABIDAE

1. Apical collar of pronotum absent or greatly reduced; labium short and thick; fore femora stout (*Pagasa*) .... Prostemminae
Apical collar of pronotum well developed; labium long and slender; fore femora longer and only moderately enlarged (*Nabis*) .... Nabinae

Aradidae

1. Three well developed dorsal abdominal scent gland openings between tergites 3-4, 4-5 and 5-6. Glabrous areas mesad of lateral plates in longitudinal rows, two in the outer or lateral row and one mesad in segments 3–7. (Fig. 12) (*Aradus*) .... Aradinae
   One well developed dorsal abdominal scent gland opening between tergites 3 and 4 but strongly displaced posteriorly except in Aneurinae. The second gland opening poorly developed and the third obsolete. Glabrous areas mesad of lateral plates, in longitudinal rows, two in the outer or lateral row and two in the mesal row in segments 3–7. (Fig. 13) 2
2. Labium arising from an open, oval atrium. Dorsal abdominal scent gland opening between tergites 3 and 4 usually not displaced posteriorly or only slightly displaced (*Aneurus*) .... Aneurinae
   Labium arising from a longitudinal cleft. Dorsal scent gland opening between abdominal tergites 3 and 4 strongly displaced posteriorly, close to posterior margin of 4th tergite 3
3. Body surface usually covered with a pale patterned incrustation. Second scent gland opening smaller but evident (No available specimens) .... Carventinae
   Body surface not covered with a pale patterned incrustation. Second scent gland opening usually not well developed (*Mezira*) (After Usinger and Matsuda, 1959) .... Mezirinae

Scutelleridae

1. Paired anterior abdominal scent gland openings located in posterior lateral expansions of mediodorsal plate so that they appear strongly recurved and lateral to the pores of the second scent gland. (Fig. 17) Ventral abdominal plates on segments four and five with stridulatory areas (*Homaemus, Tetyra*) .... Pachycorinae
   Anterior scent gland openings located in slightly enlarged lateral expansions but not strongly recurved posteriorly. (Fig. 18) Ventral abdominal plates without stridulatory areas (*Eurygaster*) (After Lattin, in litt.) .... Eurygasterinae

Pentatomidae

1. One well-developed trichobothrium located posterior to spiracles on segments 3–7 inclusive (*Amaurochrous*) .... Graphosomatinae
   Two trichobothria located transversely posterior to spiracles on segments 3–7 inclusive. (Fig. 14D) 2
2. Distance between lateral edges of anterior scent gland openings not distinctly greater than that of median and posterior scent glands 3
   Distance between lateral edges of anterior scent gland openings distinctly greater than that of median and posterior scent glands (*Elasmucha*) .... Acanthosominae
3. First segment of labium stout with free forward movement, only the base imbedded between the bucculae; groove between bucculae shorter than first segment of labium. Second segment of labium nearly as wide as the first. (*Euthyrhynchus, Stiretrus, Perillus, Apateticus, Podisus*) .... Asopinae

First segment of labium slender, imbedded between the bucculae; groove between bucculae as long as first segment of labium. Second segment of labium more slender than the first (21 genera studied. See DeCoursey and Allen, 1968) .... Pentatominae

Cydnidae

1. Abdominal sternites with one trichobothrium posterior to spiracle on segments 5–7 only. (Fig. 16A) (*Amnestus*) .... Amnestinae
   Abdominal sternites with two trichobothria posterior to spiracle 2
2. Paired trichobothria arranged obliquely posterior to spiracle (Fig. 16B). A row of submarginal setae or setigerous punctures on the pronotum (*Cydnus*) .... Cydninae
   Paired trichobothria arranged transversely posterior to spiracle. (Fig. 16C) No submarginal setae or setigerous punctures on the pronotum (*Sehirus*) (After Froeschner, 1960) .... Sehirinae

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THE NAME TETRASTICHUS INCERTUS (RATZEBURG) AS EMPLOYED FOR AN INTRODUCED PARASITE OF THE ALFALFA WEEVIL, HYPERA POSTICA (GYLLENHAL)

(Hymenoptera: Eulophidae)

B. D. Burks, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—A defense of the use of the name *Tetrastichus incertus* (Ratzeburg) for an imported parasite of the alfalfa weevil in North America is presented.

In his Notes on Tetrastichini, Kurdjumov (1913) briefly recharacterized *Eulophus incertus* Ratzeburg and transferred it to the genus *Tetrastichus.* It is known that Kurdjumov studied the Ratzeburg collection, but it is not known that he saw the type of the species *incertus.* It is probable that he did, but it is not certainly so.

In 1922 a *Tetrastichus* parasite of the alfalfa weevil was collected in Italy for importation into the United States. Specimens of it were submitted to A. B. Gahan, and he, using Kurdjumov's paper and Ratzeburg's original description, identified it as *T. incertus* (Ratzeburg). Part of this original series is still in the U. S. National Museum collection. Mr. Gahan himself studied the Ratzeburg collection in 1927, but by then the type of *incertus* was missing. He continued to identify this parasite of the alfalfa weevil as *incertus* Ratzeburg in subsequent lots, and sample specimens from most of these are preserved in the U. S. N. M. collection. After Mr. Gahan's retirement in 1951, other taxonomists continued to apply the name *incertus* to this parasite, in almost all cases retaining specimens for the collection. This has continued up to the present. Consequently the usage of the name *incertus* in North America is thoroughly documented by reference material in the U. S. N. M. The name certainly has been applied to only one species in North America.

During the time since its introduction into North America, the name *incertus* has been used consistently in North American publications for the same parasite of the alfalfa weevil. This has been in literature published from 1924 (Chamberlin) to the present (Horn 1970, Mailloux and Pilon 1970).

The taxonomy of this species has, however, become confused. Erdös (1954) redefined the species he identified as *incertus* Ratzeburg and designated it type-species of the genus *Baryscapus* Foerster. The latter action was, of course, invalid since another species had long since been

[1] Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

legitimately designated type-species of *Baryscapus* (Gahan and Fagan 1923). Nevertheless, the characters Erdös gave for the species *incertus* are in agreement with those of the male of the species that is being identified as *incertus* in North America. There is no conflict here about the identity of the species *incertus* Ratzeburg. There is material of *incertus* determined by Erdös in the U. S. National Museum.

Domenichini (1965), however, attempted to make a distinction between the *incertus* of Ratzeburg and *incertus* of Erdös. He declared that *incertus* Ratzeburg was a *nomen dubium*. He did this because the type was lost, the original description was brief, and the name, in his opinion, had probably been applied to diverse species by North American authors.

He then declared that *incertus* of Erdös was a "good species" and renamed it *Tetrastichus erdoesi* Domenichini. This name is nomenclatorially available through having a bibliographic reference to Erdös's paper. But the *incertus* of Erdös is only the male of the species that is being identified as *incertus* in North America. In a later publication, Domenichini (1966) rejected all usage of *incertus*, stating that *incertus* Ratzeburg was not the *incertus* of American authors nor of Erdös. Yet it cannot be demonstrated that *incertus* has been misidentified by either the American authors or Erdös. The species called *incertus* by Kurdjumov, by Mr. Gahan and other American taxonomists, and by Erdös is in fact the same species, and it certainly agrees with the original description and with specimens from Germany that are in the U. S. National Museum. Further, Kurdjumov's characterization may have been based on a study of the type. At any rate Kurdjumov's characterization of the species *incertus* has been followed consistently from 1913 to the present, and a large volume of literature has accumulated using this name.

Domenichini's other reasons for rejecting the name *incertus* are not serious objections. The fact that a type is missing is not enough in itself to cause a species name to be discarded. Thousands of species for which no types exist are now being recognized. Brevity in a description is, also, not a legitimate reason for rejecting a species name. The descriptions of many well known species are extremely short. And it cannot be demonstrated that the name *incertus* has been applied to diverse species, at least during the last 50 years here in North America. The name *incertus* has been applied to only one species, with that usage abundantly documented by preserved specimens.

In view of the fact that the name *Tetrastichus incertus* (Ratzeburg) is in agreement with the original description and has been consistently applied to a single species of parasite of the alfalfa weevil in North America for a period of almost half a century and that this name has been used in publications on biological control of the alfalfa weevil for almost as long a period, North American workers should not abandon it. Instead they should consider *T. erdoesi* Domenichini a synonym.

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AN ANNOTATED CHECK LIST OF COSTA RICAN COCKROACHES (DICTYOPTERA: BLATTARIA)

FRANK W. FISK, *Department of Entomology, Ohio State University, Columbus, Ohio 43210*

ABSTRACT—This check list of Costa Rican cockroaches gives specific locality records for all but the most abundant species. It also notes, for most collection records, where the actual specimens are housed. Twenty-nine species are recorded for Costa Rica for the first time. The total list includes 115 named species or subspecies plus 35 new or unidentified species which are not named.

Recent interest in the fauna and flora of Costa Rica, stimulated in part by the activities of the Organization for Tropical Studies, has made the publication of taxonomic studies relating to that Central American country particularly desirable. Previous to the present paper the most recent listing of Costa Rican cockroaches was included in the notes on Orthoptera by Rehn (1905), in which 38 species were recorded. In an earlier report Biolley (1900) listed 35 valid species, a remarkable increase over the 12 cockroach species noted by Tristán (1896).

The objective of this listing is to provide locality data for all species of cockroaches collected in Costa Rica. This information was derived from both searching the literature and examining material at the U. S. National Museum (USNM), the Academy of Natural Sciences Philadelphia (ANSP), the University of Michigan Museum of Zoology (UMMZ) and certain private collections. Where a given species has been recorded more than once from the same locality only a single listing has been selected to represent that locality in order to avoid duplication. Localities are arranged according to province. The 7 provinces are noted by 4-letter symbols as follows: ALAJ—Alajuela, CART—Cartago, GCTE—Guanacaste, HERD—Heredia, LIMN—Limón, PUNT—Puntarenas and SJOS—San Jose. Collection dates are noted by month and year where possible. Lack of a date indicates an old record. The museum or collection where the recorded specimen may now be found is indicated where possible. The 4-letter symbols for these collections are listed by Arnett and Samuelson (1969) with the following additions: AWCR—Prof. Alvero Wille collection, Universidad de Costa Rica; DCRC—Dr. David C. Rentz collection—now at ANSP; FWFC—Prof. Frank W. Fisk collection, at The Ohio State University; IEMS—Instituto Entomologia Madrid, Spain; RZCR—Prof. Rodrigo Zeledon collection, Universidad de Costa Rica.

The locality records named in the list represent the efforts of some 50 collectors but only a relatively few persons provided most of the material. The specimens recorded by Rehn (1903) at USNM were collected by Schild and Burgdorf before 1900, but Rehn's (1905) paper lists material collected by P. Biolley and J. F. Tristán and deposited at ANSP. J. A. G. Rehn, himself, collected in Costa Rica in the 1920's while H. R. Roberts has collected for ANSP more recently. The names of Cartwright, Underwood and C. H. Ballou appear on early USNM material, while S. S. and W. D. Duckworth provided much recent material. T. H. Hubbell, I. J. Cantrall and T. J. Cohn have collected for UMMZ. Carlos E. Valerio of Costa Rica assisted the author in collecting a portion of the FWFC material as well as providing independently captured specimens to AWCR, FWFC and RZCR. All of the Virginia Polytechnic Institute (VPIC) material was collected by Prof. Michael Kosztarab.

Current names and partial synonymy for the taxa listed follow K. Princis' recent catalog of Blattariae (1963, 1964, 1965a, 1966, 1967, 1969). Princis lists 64 species from "Kostarika," while 11 other species noted by him as circumtropical, tropical or Central American are listed below with specific Costa Rican localities. However, the arrangement of genera and higher categories follows the McKittrick (1964) system as extended by Roth (1969) and others. Following each species name in the check list are listed selected references in which locality records will be found. If no reference is noted then the species has not previously been recorded from Costa Rica.

The assistance of Dr. Ashley B. Gurney, Systematic Entomology Laboratory, U. S. Department of Agriculture (at U. S. National Museum) is gratefully acknowledged. His identification of several specimens has made it possible to report many new records among the 115 named species. Through our joint effort one new Costa Rican species, *Xestoblatta cantralli* Fisk and Gurney, has been named and we are hopeful that several more will follow from among the 35 new or unidentified species in the list. Finally, this list must increase as more material is collected or recorded.

Blattidae

Lamproblattinae

Lamproblatta albipalpus Hebard 1919.
ALAJ: Quesada '66 (FWFC). CART: Turrialba '66 (FWFC). GCTE: H. Ciruelas I/70 (VPIC); Playa del Coco (AWCR); Tilaran '66 (FWFC). LIMN: La Lola, near Madre de Dios '61 (UMMZ); Pto. Limón VII/66 (UMMZ). PUNT: Parrita '66 (FWFC). SJOS: San Jose '64 (FWFC).

Blattinae

Neostylopyga rhombifolia (Stoll 1813).—Princis (1966) "circumtropical."
PUNT: San Isidro, near Puntarenas (RZCR); Puntarenas '66 (FWFC).

Periplaneta americana (L. 1753).—Princis (1966) "circumtropical."
Common in urban areas.

Periplaneta australasiae (Fabricius 1775).—Princis (1966) "circumtropical."
Common in urban areas.

Periplaneta brunnea Burmeister 1838.—Princis (1966) "tropical."
GCTE: Tilaran '64 (FWFC).

Polyzosteriinae: Eurycotini

Eurycotis biolleyi Rehn 1918.—Princis (1966).
Common.

Eurycotis mexicana (Saussure 1862) ?—Biolley (1900).—Princis (1966) "limited to Mexico."
SJOS: San Jose (Biolley).

Eurycotis mysteca (Saussure 1862) ?—Biolley (1900).—Princis (1966) "limited to Mexico."
HERD: Rancho Flores, foothills of Volc. Barba (Biolley).

Eurycotis n. sp.
ALAJ: Chachagua '66 (FWFC); Quesada '66 (FWFC). CART: Turrialba X/61 (UMMZ). GCTE: Tilaran '66 (FWFC). LIMN: La Emilia IX/27 (ANSP); La Lola, Madre de Dios X/61 (UMMZ). PUNT: San Vito III/69 (DCRC).

Pelmatosilpha rotundata Scudder 1900.—Gurney (1965).—Princis (1966). GCTE: Tilaran VI/68 (FWFC).

Polyphagidae
Holocompsinae

Holocompsa azteca Saussure 1862.—Biolley (1900).
SJOS: San Jose (motionless on walls: Biolley); Lourdes M. B., near San Jose '62 (RZCR).

Holocompsa nitidula (Fabricius 1781) (= *cyanea* Saussure 1864).—Rehn (1905).—Princis (1963) "circumtropical."
ALAJ: Rio Surubres at San Mateo (ANSP).

Zetha simonyi (Krauss 1892), (= *Holocompsa simonyi* Krauss 1892), (= *H. chavesi* Bolivar 1894).
SJOS: Cd. Universitaria '61 (RZCR).

Latindiinae

Buboblatta armata (Caudell 1914) (= *Latindia armata* Caudell 1914).
CART: Turrialba II/65 (USNM). HERD: La Selva '64 (UMMZ). PUNT: San Vito II/70 (VPIC).

Latindia dohrniana Saussure & Zehntner 1894.
ALAJ: Quesada VII/66 (FWFC). GCTE: Arenal VII/66 (FWFC). SJOS: 16 Km. No. of Quepos VIII/66 (FWFC).

Paralatindia azteca (Saussure 1868).
ALAJ: Zarcero VII/66 (FWFC).

Blattellidae
Anaplectinae

Anaplecta bivittata Brunner 1865.
CART: Turrialba III/65 (USNM). GCTE: Arenal VII/66 (FWFC).

Anaplecta fallax Saussure 1862 (= *decipiens* S. & Z. 1893).—Rehn (1905).—Princis (1965a).
GCTE: Arenal VII/66 (FWFC). SJOS: La Palma (decayed leaves) (ANSP); Rio Surubres at San Mateo (under stones) (ANSP).

Anaplecta hemiscotia Hebard 1920.
CART: Tapanti '66 (UMMZ). PUNT: San Vito III/69 (DCRC).

Anaplecta mexicana Saussure 1868.—Calvert & Calvert (1917).—Hebard (1924).—Princis (1965a).
CART: Tapanti VII/66 (FWFC). GCTE: Arenal VII/66 (FWFC). LIMN: La Emilia (from epiphytes) '09 (ANSP). SJOS: La Palma (ANSP).

Anaplecta mexicana subspecies *gemma* Hebard (= *gemma* Hebard 1920).
CART: Rio Navarro VII/27 (ANSP); Tapanti VII/66 (FWFC); Turrialba II/65 (USNM). HERD: Finca Starke, near Pto. Viejo II/66 (ANSP). LIMN: La Emilia VIII/23 (ANSP). PUNT: San Vito III/69 (DCRC).

Anaplecta sp., probably *guamina* Hebard 1920.
LIMN: Los Diamantes '67 (UMMZ); Pto. Limón '66 (UMMZ).

Anaplecta sp., probably *nahua* Saussure 1868.
PUNT: 6 Km. So. of San Vito '67 (FWFC).

Anaplecta sp.
CART: Tapanti (AWCR). LIMN: Waldec (AWCR). SJOS: Cd. Universitaria (RZCR); San Pedro (AWCR).

Nyctiborinae

Megaloblatta blaberoides (Walker 1871) (= *rufipes* Dohrn 1887).—Biolley (1900).—Hebard (1920).—Princis (1967).

LIMN: Jimenez (Biolley); Parismina (Biolley). PUNT: San Vito III/69 (DCRC). SJOS: Guaitil de Pirris (Biolley).

Muzoa madida Rehn 1930.—Rehn (1930).

LIMN: La Emilia (dense forest) '27 (ANSP); Rio Reventazon, near Santa Clara (Biolley) (ANSP).

Nyctibora azteca (Saussure & Zehntner 1893).

GCTE: Union of Rio Blanca & Rio Tempisque '60 (RZCR). SJOS: San Jose '65 (RZCR).

Nyctibora noctivaga Rehn 1902.

ALAJ: Orotina X/15, A. Alfaro (USNM). From C. R. intercepted in Plant Quarantine, Boston, Mass. 1925 (USNM).

Nyctibora spp.

Three n. spp. from C. R. are under study at USNM.

Paratropes bilunata Saussure & Zehntner 1893.—Biolley (1900).—Hebard (1920).—Princis (1967).

ALAJ: San Carlos. CART: Turrialba. GCTE: H. Miravalles (Biolley).

Paratropes biolleyi Saussure & Zehntner 1893.—Biolley (1900).—Rehn (1903).—Princis (1967).

ALAJ: Ojo de Agua (RZCR); San Carlos (USNM). CART: Turrialba (USNM). SJOS: San Jose (Biolley).

Paratropes mexicana (Brunner 1865).

ALAJ: Alajuela VII/62 (AWCR).

Paratropes sp. (nymphs)

PUNT: near Rincón, Osa III/69 (DCRC).

Blattellinae

Blattella germanica (L. 1767).—Rehn (1903).—Princis (1969) "cosmopolitan." Common in urban areas.

Chromatonotus infuscatus (Bruner 1906).

CART: Turrialba III/65 (USNM).

Ischnoptera bergrothi (Griffini 1896).—Hebard (1920).—Princis (1965b).

SJOS: Carillo VIII/03 (ANSP).

Ischnoptera inca Saussure & Zehntner 1893.—Hebard (1920).—Princis (1969).

SJOS: Conrejal de Aserri V/06 (ANSP).

Ischnoptera mirella Hebard 1920. Previously recorded only from unique male collected in Panama (Hebard, 1920).

CART: Turrialba II/65 (USNM), 1 male, S. S. & W. D. Duckworth collectors.

Ischnoptera rufa debilis Hebard 1916 (= *I. consobrina*, var. *minor* Saussure 1900).—Hebard (1916c).—Princis (1969).

CART: Corallilo, near Volc. Irazu III/24 (ANSP); Pacayas III/06 (ANSP); Volc. Irazu II/02 (ANSP). HERD: San Rafael IV/65 (AWCR). SJOS: San Jose de la Montana (AWCR); Santa Maria de Dota I/07 (ANSP); Tablazo IX/06 (ANSP).

Ischnoptera rufa occidentalis Saussure 1862 (= *I. consobrina* Saussure 1862).—Hebard (1920).

ALAJ: Alajuela (AWCR). CART: Cartago (AWCR); Turrialba III/65 (USNM). HERD: Heredia (AWCR). LIMN: Pto. Limón '66 (UMMZ). SJOS: Carillo VIII/03 (ANSP); Pozo Azul on Rio Pirris (ANSP); San Jose (AWCR); San Pedro (AWCR).

Ischnoptera rufa rufa De Geer 1773.

CART: Cartago VII/66 (UMMZ); Cerro de la Muerte (AWCR); Tapanti VII/66 (UMMZ); Turrialba '61 (UMMZ). LIMN: La Lola VII/66 (UMMZ); Pto. Limón '64 (FWFC). PUNT: San Vito III/70 (DCRC). SJOS: Cd. Universitaria (AWCR); San Jose (AWCR).

Ischnoptera n. sp.

CART: El Alto de Ochomogo XII/69 (USNM). PUNT: San Vito II/70 (VPIC).

Nelipophygus n. sp.

CART: Turrialba II/65 (USNM).

Nesomylacris n. sp.

CART: Santa Cruz, 13 Km NW Turrialba X/61 (UMMZ); Turrialba IX/61 (UMMZ). HERD: near Volc. Barba VII/66 (FWFC).

Pseudomops crinicornis (Burmeister 1838).—Rehn (1903).

ALAJ: San Carlos (USNM).

Pseudomops discicollis (Burmeister 1838) (= *discoidalis* (Burmeister 1838)).—Rehn (1903).—Princis (1969).

ALAJ: San Carlos (USNM).

Pseudomops gratus Rehn 1903.—Rehn (1903, 1905).—Princis (1969).

ALAJ: San Carlos (USNM). CART: Rio Reventazon, near Santa Clara (ANSP).

LIMN: Suretka V/24 (USNM).

Pseudomops praeclarus Rehn 1928.—Rehn (1928).—Princis (1969).

ALAJ: San Mateo (USNM). CART: Turrialba (ANSP). LIMN: Batán (Bataan) '56 (USNM); Suretka (ANSP).

Pseudomops septentrionalis Hebard 1917 (= *oblongata* of authors, not Linn. 1758).—Rehn (1933).—Princis (1969).

ALAJ: San Carlos (USNM).

Pseudomops sp.

CART: Tapanti IX/65 (AWCR).

Xestoblatta buscki Gurney 1939

GCTE: Tilaran VII/66 (FWFC).

Xestoblatta cantralli Fisk & Gurney 1968.—Fisk & Gurney (1968).—Princis (1969).

CART: Turrialba '51 (USNM). HERD: Finca La Selva '64 (UMMZ). LIMN: La Lola, near Madre de Dios '61 (UMMZ); Los Diamantes, E. of Guapiles '67 (UMMZ).

Xestoblatta hamata (Giglio-Tos 1898)

CART: Turrialba IX/61 (UMMZ).

Xestoblatta hoplites Hebard 1921.—Hebard (1921).—Gurney (1939).—Princis (1969).

ALAJ: Rio Machuca, near San Mateo I/07 (ANSP). CART: Turrialba '61 (UMMZ). SJOS: San Jose (AWCR). "Costa Rica" (USNM).

Xestoblatta n. sp., near *hamata.*

HERD: Finca La Selva I/70 (VPIC).

PLECTOPTERINAE

Asemoblattana nana (Hebard 1921) (= *Asemoblatta nana* Hebard). Previously recorded only from unique male collected in Colombia (Hebard 1921).

HERD: near Sacramento, Southern slope of Volc. Barba, elev. 2400 M. I/69 (male & female FWFC) (1 male USNM), Carlos E. Valerio collector.

Cahita nahua (Saussure 1868) (= *Ischnoptera nahua* Saussure 1868).—Tristán (1896).—Rehn (1937).—Princis (1969).

GCTE: La Cruz '61 (UMMZ); San Antonio de Nicoya '29 (ANSP). SJOS: Rio Tiribi, San Jose (Tristán).

Caloblatta bicolor Saussure 1893.—Saussure & Zehntner (1893).—Princis (1965a).

CART: Tapanti (AWCR). GCTE: Belen (AWCR). SJOS: Cd. Universitaria (AWCR); San Pedro (AWCR).

Caloblatta tricolor Saussure 1893 ?—Princis (1965a).

Questionable for Costa Rica. No locality record can be found.

Cariblatta imitans Hebard 1916.

GCTE: La Cruz X/61 (UMMZ); Tilaran VII/66 (FWFC).

Cariblatta sp., near *fossicauda* Hebard 1916.

SJOS: Playon, near Parrita (on bananas) VIII/66 (FWFC).

Cariblattoides sp., near *instigator* Rehn and Hebard 1927.

ALAJ: Quesada VII/66 (FWFC). LIMN: La Emilia IX/27 (ANSP).

Ceratinoptera nahua (Saussure 1868) (= *Paraceratinoptera nahua* Saussure 1868).—Hebard (1916a).—Princis (1969).

SJOS: Pozo Azul de Pirris (ANSP).

Ceratinoptera n. sp.

ALAJ: Quesada VII/66 (FWFC). CART: Turrialba VII/64 (USNM). GCTE: Arenal VII/66 (FWFC). LIMN: La Lola '61 (UMMZ). SJOS: Pozo Azul de pirris VIII/27 (ANSP); 16 Km. No. of Quepos VIII/66 (FWFC).

Chorisoneura flavipennis Saussure & Zehntner 1893.—Rehn (1903).—Rehn (1905).—Princis (1965a).

CART: Turrialba (USNM). SJOS: La Palma (ANSP); Rio Surubres at San Mateo (ANSP).

Chorisoneura gemmicula Hebard 1920.

CART: Turrialba IV/57 (USNM). LIMN: Batán (Bataan) VI/51 (USNM).

Chorisoneura panamae Hebard 1920.

GCTE: Tilaran VII/66 (FWFC).

Chorisoneura pellucida (Saussure 1864). Listed as *Chorisoneura diaphana* Princis by Princis (1965a).

CART: Turrialba III/65 (USNM). LIMN: Waldec VII/36 (USNM).

Chorisoneura specilliger Hebard 1920.

SJOS: Rio Surubres (USNM).

Chorisoneura translucida (Saussure 1864).—Hebard (1919).—Princis (1965a).

CART: Turrialba III/65 (USNM). PUNT: Rincón, Osa XI/64 (UMMZ). SJOS: 14.5 Km. No. of Quepos VIII/66 (FWFC); 15 Km. SW. San Isidro del General VII/64 (UMMZ).

Chorisoneura n. sp.

SJOS: San Pedro V/36 (USNM).

Chorisoneura sp.

CART: Turrialba II/65 (USNM).

Chorisoneura sp., near *panamae* Hebard.
CART: III/65 (USNM).

Dendroblatta sobrina Rehn 1916.—Hebard (1920).—Princis (1969).
GCTE: H. Ciruelas, near Cañas I/70 (VPIC). SJOS: Pozo Azul V–VI/02 (ANSP).

Euphyllodromia angustata (Latrielle 1811).—Rehn (1903).—Princis (1969).
Recorded from forest areas in all 7 provinces.

Euphyllodromia liturifera (Walker 1871) (= *E. decastigmata* Hebard 1920).
SJOS: 15 Km. No. of Quepos VIII/66 (FWFC).

Euphyllodromia peruana (Saussure 1864).—Rehn (1903).—Rehn (1905).
ALAJ: San Carlos (USNM). CART: Rio Reventazon, near Santa Clara (ANSP). LIMN: Zent '24 (USNM).

Euphyllodromia sp.
LIMN: Homberg Farm '38 (AWCR); Waldec '42 (AWCR).

Euthlastoblatta n. sp. "A."
SJOS: 16 Km. No. of Quepos '66 (FWFC). (Specimens from other localities in ANSP).

Euthlastoblatta n. sp. "B."
CART: Tapanti VII/66 (FWFC). SJOS: Rio Virilla (San Jose) VII/66 (FWFC).

Imblattella brunneriana (Saussure 1868) (= *Blatta brunneriana* Saussure 1868).—Calvert & Calvert (1917).—Princis (1969).
CART: Peña Blanca, near Cachi (ANSP).

Imblattella sp., near *brunneriana* (Saussure).
HERD: Finca La Selva (rain forest) I/70 (VPIC).

Imblattella fratercula (Hebard 1916) (= *Neoblattella fratercula* Hebard 1916).—Princis (1969).
ALAJ: Fortuna, San Carlos (RZCR). LIMN: Pto. Limón '66 (UMMZ). SJOS: Playon, near Parrita '66 (FWFC).

Imblattella impar (Hebard 1920) (= *Neoblattella impar* Hebard 1920).
CART: Turrialba X/61 (UMMZ). HERD: Finca La Selva I/70 (VPIC). PUNT: Rincón, Osa '67 (FWFC). SJOS: Damas, near Parrita V/65 (AWCR); Playon, near Parrita '66 (FWFC); 15 Km. No. of Quepos '66 (FWFC).

Latiblattella angustifrons Hebard 1920.—Princis (1965b, 1969).
CART: Turrialba IX/61 (UMMZ). GCTE: Arenal '66 (FWFC); Tilaran '66 (FWFC), La Cruz III/51 (IEMS). LIMN: Pto. Limón '66 (UMMZ). PUNT: Mata de Limón VIII/66 (FWFC). SJOS: San Jose (RZCR).

Latiblattella bradleyi Hebard 1933.—Hebard (1933).
LIMN: Guapiles '23 (ANSP); La Emilia '27 (ANSP).

Latiblattella inornata Hebard 1920.—Hebard (1920).
LIMN?: "Costa Rica, probably Limón" (from steamship) X/13.

Latiblattella pavida (Rehn 1903).—Rehn (1903).—Princis (1969).
LIMN: Pto. Limon '64 (FWFC). SJOS: Piedras Negras (USNM).

Latiblattella spectativa (Rehn 1903).—Rehn (1903).—Princis (1969).
ALAJ: San Carlos (USNM). SJOS: Cd. Universitaria X/62 (USNM).

Latiblattella vitrea (Brunner 1865).—Biolley (1900).—Princis (1969).
SJOS: San Jose (Biolley).

Latiblattella zapoteca (Saussure 1862).—Biolley (1900).—Rehn (1905).—Princis (1969).

ALAJ: Rio Surubres, San Mateo (ANSP). CART: Turrialba (Biolley). HERD: Finca Starke, near Pto. Viejo II/66 (ANSP).

Latiblattella n. sp.

CART: Tapanti '66 (FWFC). GCTE: Tilaran '66 (FWFC). SJOS: Aserri '66 (FWFC).

Macrophyllodromia maximiliani (Saussure 1873).—Princis (1969).

PUNT: Rincón, Osa (Insecticide Plot #36) II/65 (ANSP). SJOS: Playon, near Parrita (AWCR).

Nahublattella fraterna (Saussure & Zehntner 1893) (= *Blatta fraterna* S. & Z. 1893).—Princis (1965b, 1969).

CART: Turrialba IX/61 (UMMZ). GCTE: La Cruz III/51 (IEMS). LIMN: Pto. Limón VII/66 (UMMZ).

Nahublattella nahua (Saussure 1868) (= *Blatta nahua* Saussure 1868).—Biolley (1900).—Rehn (1903).—Princis (1969).

Recorded from 10 localities in 6 provinces, all except GCTE.

"*Neoblattella*" n. sp. B

CART: Turrialba III/65 (USNM). LIMN: Waldec VII/35 (USNM).

"*Neoblattella*" n. sp. R

PUNT: San Vito III/69 (DCRC).

"*Neoblattella*" n. sp. V

CART: Turrialba II/65 (USNM).

"*Neoblattella*" n. sp. W

SJOS: 15 Km. No. of Quepos '65 (USNM).

"*Neoblattella*" n. sp. X

PUNT: 3.5 mi. So. of Rincón, Osa III/69 (DCRC).

Plectoptera hastifera Rehn 1903.—Rehn (1903).—Princis (1965a).

CART: Turrialba (USNM).

Plectoptera picta Saussure & Zehntner 1893.—Rehn (1903).—Princis (1965a).

CART: El Alto de Ochomogo VIII/27 (ANSP); Tapanti '66 (FWFC); Tucurrique (USNM).

Plectoptera pulicaria Saussure & Zehntner 1893.—Rehn (1903).—Princis (1965a).

CART: Turrialba (USNM).

Rhytidometopum n. sp.

SJOS: Playon, near Parrita VIII/66 (FWFC).

Riatia flabellata (Saussure & Zehntner 1893) (= *Anaplecta flabellata* S. & Z. 1893).—Rehn (1903).—Princis (1965a).

CART: Tucurrique (USNM). SJOS: Finca Castilla '40 (AWCR); Piedras Negras (USNM).

Riatia fulgida (Saussure 1862) (= *Anaplecta fulgida* Saussure 1862).—Rehn (1903).—Princis (1965a).

SJOS: La Palma VIII/23 (ANSP); Piedras Negras (USNM).

Supella longipalpa (Fabricius 1798) (= *supellectilium* (Serville 1839)).—Princis (1969) "circumtropical."

LIMN: Pto. Limón (RZCR). SJOS: Cd. Universitaria (RZCR); San Jose (AWCR).

BLABERIDAE

BLABERINAE

Archimandrita marmorata (Stoll 1813).—Tristán (1896).—Calvert & Calvert (1917).—Princis (1963).

ALAJ: Alajuela (AWCR); Atenas II/70 (VPIC); La Garite (AWCR). HERD: San Antonio Belen (AWCR). GCTE: Bebedero (Tristán); Santa Cruz (ANSP); Tilaran '64 (FWFC). SJOS: Monte Redondo (Tristán); San Jose (AWCR).

Archimandrita tessellata Rehn 1903.—Rehn (1903).—Hebard (1920).—Princis (1963).

ALAJ: Alajuela (AWCR); San Carlos (USNM). GCTE: 11 Km. So. of Cañas Taboga III/69 (DCRC); Puerto Humo '64 (FWFC). HERD: San Antonio Belen (AWCR). PUNT: Golfito (AWCR). SJOS: Monte Redondo (ANSP); Pozo Azul (AWCR); San Jose (Escazu) '64 (FWFC); Tarbaca (ANSP).

Blaberus colosseus (Illiger 1801) (= *B. giganteus* (L. 1758), in part).—Hebard (1916b).—Roth (1969).

ALAJ: Alajeula (AWCR); San Carlos (USNM). CART: Cartago (AWCR); Turrialba '61 (UMMZ). GCTE: Tilaran '63 (FWFC). HERD: La Selva II/67 (ANSP). PUNT: Rincón, Osa III/69 (DCRC). SJOS: San Jose (AWCR).

Blaberus craniifer Burmeister 1838 (= *B. trapezoideus* Burmeister 1838).—Tristán (1896).—Biolley (1900).—Rehn (1903).—Roth (1969).—Princis (1963).

ALAJ: Bebedero (Tristán); San Carlos (USNM); Santa Clara (Biolley) (ANSP). CART: Turrialba (Biolley) (ANSP).

Blaberus discoidalis (Serville 1839).—Roth (1969).

HERD: Heredia (AWCR). LIMN: Pto. Limón '64 (FWFC). PUNT: Puntarenas '64 (FWFC). SJOS: Cd. Universitaria (AWCR); Moravia (AWCR); San Jose (AWCR).

Eublaberus distanti (Kirby 1903) (= *Blaberus biolleyi* Rehn 1905).—Rehn (1905).—Princis (1963).

LIMN: Rio Reventazon, Plains of Santa Clara (ANSP). PUNT: Rincon, Osa II/69 (DCRC).

Eublaberus posticus (Erichson 1848) (= *Blaberus thoracicus* S. & Z. 1894).—Rehn (1905).—Princis (1963).

HERD: Pto. Viejo (AWCR). LIMN: Rio Reventazon, Plains of Santa Clara (ANSP). SJOS: San Jose (AWCR).

Hyporhicnoda carinata (Biolley 1900).—Biolley (1900).—Princis (1967).

ALAJ: Las Delicias, Santa Clara (Biolley). CART: Turrialba (Biolley). HERD: La Virgen, Rio Sarapiqui (Biolley).

Hyporhicnoda reflexa (Saussure & Zehntner 1893) (= *Rhicnoda reflexa* S. & Z. 1893).—Hebard (1920).—Princis (1967).

GCTE: Tilaran '64 (FWFC). PUNT: Ujarras de Terraba, head of Rio Ceibo (USNM). SJOS: 15 Km. No. of Quepos (AWCR); San Jose (AWCR).

Hyporhicnoda sp.

GCTE: Tilaran '66 (USNM). LIMN: La Lola, Madre de Dios '61 (UMMZ).

Phoetalia pallida (Brunner 1865) (= *Leurolestes pallidus* (Brunner) in Hebard (1921)).—Princis (1967) "circumtropical."

SJOS: San Jose '61 (RZCR).

ZETOBORINAE: PHORTIOECINI

Capucina patula (Walker 1871) (= *C. cucullata* Saussure 1893).—Biolley (1900).—Rehn (1903).—Princis (1963).

ALAJ: Las Delicias, Santa Clara (Biolley). CART: Juan Viñas (Biolley); Turrialba (Biolley). GCTE: Tilaran '66 (FWFC). HERD: Carillo (USNM); La Virgen, Rio Sarapiqui (Biolley). LIMN: Pto. Limón (AWCR). SJOS: 15 Km. No. of Quepos '66 (FWFC); San Jose, Rio Virilla (Biolley).

Lanxoblatta n. sp.

PUNT: San Vito II/70 (VPIC).

Phortioeca phoraspoides (Walker 1871) (= *Zetobora sublobata* S. &. Z. 1893).—Biolley (1900).—Rehn (1903).—Princis (1964).

ALAJ: Quesada '66 (FWFC); Las Delicias, Santa Clara (Biolley); San Carlos (USNM). CART: Turrialba (Biolley). GCTE: Arenal '66 (FWFC); Tilaran '64 (FWFC). HERD: Pto. Viejo (AWCR). SJOS: 16 Km. No. of Quepos '66 (FWFC).

EPILAMPRINAE

Audreia carinulata (Saussure 1895) (= *Calolampra carinulata* Saussure 1895).—Biolley (1900).—Princis (1967).

ALAJ: near Volcan Poas '66 (FWFC). HERD: Barba (Biolley); La Selva II/67 (ANSP). SJOS: El Cañon '66 (FWFC); La Palma '66 (FWFC); Tablazo (ANSP); Tarbaca (Biolley).

Audreia cicatricosa (Rehn 1903).[1] (= *Calolampra cicatricosa* Rehn 1903).—Rehn (1903).—Princis (1967).

ALAJ: San Carlos (USNM). PUNT: Rincón, Osa II/65 (ANSP).

Audreia gatunae Hebard 1920.[1]

PUNT: Rincón, Osa III/69 (DCRC). SJOS: Damas, near Parrita (AWCR); Pozo Azul (AWCR); 14 Km. No. of Quepos VIII/66 (FWFC).

Audreia n. sp.[1]

HERD: Finca La Selva I/70 (VPIC). PUNT: San Vito '67 (USNM).

Cariacasia capucina Rehn 1928.—Rehn (1928).—Princis (1963).

HERD: Carillo IX/03 (ANSP).

Epilampra abdomen-nigrum (DeGeer 1773) (= *E. maya* Rehn 1902).—Biolley (1900).—Princis (1967).

CART: Tapanti '41 (AWCR); Turrialba (Biolley). HERD: Pto. Viejo IV/69 (DCRC). SJOS: Cd. Universitaria (RZCR); San Jose, Rio Virilla '64 (FWFC).

Epilampra azteca Saussure 1868.

HERD: Finca La Selva I/70 (VPIC). PUNT: San Vito III/69 (DCRC).

Epilampra columbiana Saussure 1895.—Biolley (1900).

CART: San Isidro del Coronado (RZCR); Tapanti (AWCR). HERD: Volcan Barba (Biolley). PUNT: San Vito III/69 (DCRC). SJOS: Cd. Universitaria (RZCR); La Palma (Biolley); San Isidro del General (Biolley).

Epilampra mexicana Saussure 1862.

GCTE: Tilaran '66 (FWFC). HERD: Heredia (AWCR). SJOS: San Isidro del General '60 (USNM).

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[1] Unpublished work on the Epilamprinae by L. M. Roth indicates that these species probably belong in the genus *Epilampra*.

Epilampra shelfordi Hebard 1919. Previously recorded only from 2 specimens collected in Colombia (Hebard, 1919, 1929).

ALAJ: Colonia Trinidad, Chachagua VIII/66 (FWFC).

Epilampra n. sp.

HERD: Pto. Viejo, Rio Sarapiqui (pebble beach) II/67 (ANSP).

Litopeltis biolleyi (Saussure 1895) (= *Calolampra biolleyi* Saussure 1895).—Tristán (1896).—Biolley (1900).—Rehn (1928).—Princis (1963).

ALAJ: Las Delicias, Santa Clara (Biolley). CART: Azahar de Cartago (Biolley). HERD: Barba (Biolley). PUNT: Rincón, Osa II/67 (FWFC); San Vito III/69 (DCRC). SJOS: Cd. Universitaria IV/64 (RZCR); La Estrella (Candelaria Mts.) (ANSP); Monte Redondo '03 (ANSP); Navarro '27 (ANSP); 14 Km. No. of Quepos VIII/66 (FWFC); San Jose (La Uruca) (Tristán); Tablazo '06 (ANSP); Tarbaca '02 (ANSP).

Litopeltis bispinosa (Saussure 1893) (= *Calolampra bispinosa* Saussure 1893). CART: Turrialba III/65 (USNM). PUNT: San Vito III/69 (DCRC). SJOS: San Isidro del General '66 (UMMZ).

Litopeltis calverti Rehn 1928.—Rehn (1928).—Princis (1963).

CART: Rio Reventazon at Cachi III/10 (ANSP).

Litopeltis deianira Rehn 1928.—Rehn (1928).—Princis (1963).

CART: between Cervantes & Pacayas '23 (ANSP); Pacayas, slope of Volcan Irazu IX/23 (ANSP).

Litopeltis musarum Rehn 1928.—Rehn (1928).—Princis (1963).

SJOS: Atalanta, Estrella Valley IX/27 (ANSP).

Litopeltis oreas Rehn 1928.—Rehn (1928).—Princis (1963).

SJOS: Santa Maria de Dota '09 (ANSP).

Litopeltis votos Rehn 1928 (= *Ischnoptera inaequalis* S. &. Z. 1893).—Rehn (1903).—Rehn (1928).—Princis (1963).

ALAJ: San Carlos (USNM).

Panchlorinae

Achroblatta luteola (Blanchard 1843).—Rehn (1903).—Princis (1963).

ALAJ: Zarcero (USNM). CART: Turrialba II/65 (USNM). HERD: Carillo (USNM); Rio Frio I/70 (VPIC); Rio Sarapiqui '65 (RZCR).

Biolleya alaris Saussure 1897.—Biolley (1900).—Princis (1963).

HERD: Volcan Barba III/96 (Biolley). SJOS: La Palma II/96 (Biolley); near San Jose (Biolley).

Panchlora acolhua Saussure & Zehntner 1893.—Rehn (1903).—Princis (1964).

SJOS: Piedras Negras (USNM).

Panchlora exoleta Burmeister 1838 (= *P. punctum* S. & Z. 1893).—Rehn (1903).—Princis (1964).

ALAJ: San Carlos (USNM).

Panchlora nigriventris Shelford 1912.—Biolley (1900).—Princis (1964).

CART: Azahar de Cartago (Biolley). SJOS: Los Frailes (Biolley); near San Jose (Biolley); Tablazo (Biolley).

Panchlora nivea (L. 1758) (= *P. peruana* Saussure 1864, in part).—Saussure & Zehntner (1893).—Rehn (1903).—Princis (1964), "Central America."

Recorded from several localities in CART, GCTE, HERD, LIMN and SJOS. First record from CART: Cachi by S. & Z. (1893).

Panchlora sp.

GCTE: La Pacifica, 5 Km. NW of Cañas I/70 (VPIC). HERD: Rio Frio I/70 (VPIC). PUNT: San Vito II/70 (VPIC).

Pelloblatta lata Rehn 1903.—Rehn (1903).—Princis (1965a).

ALAJ: San Carlos (USNM).

Pycnoscelinae

Pycnoscelus surinamensis (L. 1758).—Biolley (1900).—Princis (1964) "circumtropical."

Abundant.

Oxyhaloinae

Leucophaea maderae (Fabricius 1781).—Princis (1965a) "circumtropical."

ALAJ: Alajuela (AWCR). HERD: Heredia (AWCR). SJOS: Cd. Universitaria (RZCR); San Jose '64 (FWFC).

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NOTICE TO CONTRIBUTORS

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THE APPLICATION OF THE NAME NEOPIMPLA

(HYMENOPTERA: ICHNEUMONIDAE)

The generic name *Neopimpla* was validated by Ashmead in 1900 by its inclusion in a key to the ichneumonid genera (Proc. U. S. Natl. Mus. 23:56). In this publication Ashmead stated that the type species is "*Neopimpla abbottii* Ashmead, manuscript," from "Africa." *Neopimpla* has never been identified since this first description.

It may be assumed that Ashmead's specimen of this genus was, at that time, in the U. S. National Museum in Washington. Both Mr. R. A. Cushman and the present author have searched for this specimen several times but have not found it. Cushman published that the specimen was lost in 1942 (Proc. U. S. Natl. Mus. 92:286) and I published the same finding in 1957 (Proc. Ent. Soc. Washington 59:112).

It would be best if the generic name *Neopimpla* and the specific name *abbottii* were applied somewhere, rather than left unidentified. A careful reading of Ashmead's key and consideration of what he may have been describing, leads me to suppose that the most likely thing that he was describing is the female of *Caenopimpla crassa* Morley, 1926. To pin down the name, I therefore declare (as first revisor) that *Neopimpla abbottii* Ashmead is a senior synonym of *Caenopimpla crassa* Morley, and that its type locality is Zululand in South Africa (the same type locality as *crassa*). This species belongs actually in *Astomaspis* Foerster, 1868. *Astomaspis abbottii* is a new combination and *Neopimpla* is a new synonym of *Astomaspis*.—HENRY TOWNES, *American Entomological Institute, 5950 Warren Road, Ann Arbor, Michigan 48105.*

DELPHINIA PICTA (FABRICIUS) IN CENTRAL AMERICA

(DIPTERA: OTITIDAE)

The distribution of *Delphinia picta* (Fabricius) is cited in the Catalog of the Diptera of North America North of Mexico (Stone, A., et al., eds., 1965, U. S. Dept. Agr., Agr. Res. Serv., Agr. Handbook no. 276) on page 644, as "Minn. to Maine, s. to Kans. and Fla." and, until the specimens noted below were seen, I considered this a concise statement of the total known distribution of the species.

A female specimen, differing in no wise from North American specimens, was taken at Tonacatepeque, El Salvador, 20 June 1958, by O. L. Cartwright. A series of 6 ♀ and 2 ♂ specimens was taken at an unknown date at Santa Engracia, Tamaulipas, Mexico, by C. C. Plummer. The latter locality is about 30 km north of Ciudad Victoria, but appears on few maps.

A figure of the very characteristic wing of this fly is given by Curran (1934, The Families and Genera of North American Diptera, p. 272, fig. 3). Its biology has been treated by Allen and Foote (1967, Ann. Ent. Soc. Amer. 60:826–836); the larvae appear to be saprophagous.—GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture, c/o U. S. National Museum, Washington, D. C. 20560.*

A NEW CECIDOGENOUS SPECIES OF THE GENUS POLYMORPHOMYIA SNOW

(DIPTERA: TEPHRITIDAE)

CHESLAVO A. KORYTKOWSKI, *Universidad Nacional Pedro Ruiz Gallo, Lambayeque, Perú*

ABSTRACT—*Polymorphomyia* **footei**, n. sp., is described from Lambayeque, Perú, forming leaf galls in *Tessaria integrifolia* R. and P. (Compositae). A key to the species of *Polymorphomyia* sensu stricto is included.

The larva of the new species here described live in leaves of *Tessaria integrifolia* R. and P. (Compositae) as gall-makers. Aczél (1953) treated *Polymorphomyia* as a subgenus of *Pseudeutreta* Hendel, but Foote (1967) considered it a distinct genus. The four species now known may be distinguished as in the following key. Only *P. tridentata* has been previously recorded from Perú.

KEY TO THE SPECIES OF Polymorphomyia SNOW

1 (2) Falciform hyaline band at wing tip antemarginal; 2nd posterior cell with hyaline basal incision extending into basal corner of cell .... **P. basilica** Snow

2 (1) Falciform hyaline band at wing tip marginal; 2nd posterior cell with or without hyaline basal incision.

3 (4) 2nd posterior cell without hyaline incision; 3rd posterior cell with 2 hyaline incisions .... **P. tridentata** (Hendel)

4 (3) 2nd posterior cell with basal hyaline incision; 3rd posterior cell with 1 or 2 hyaline incisions.

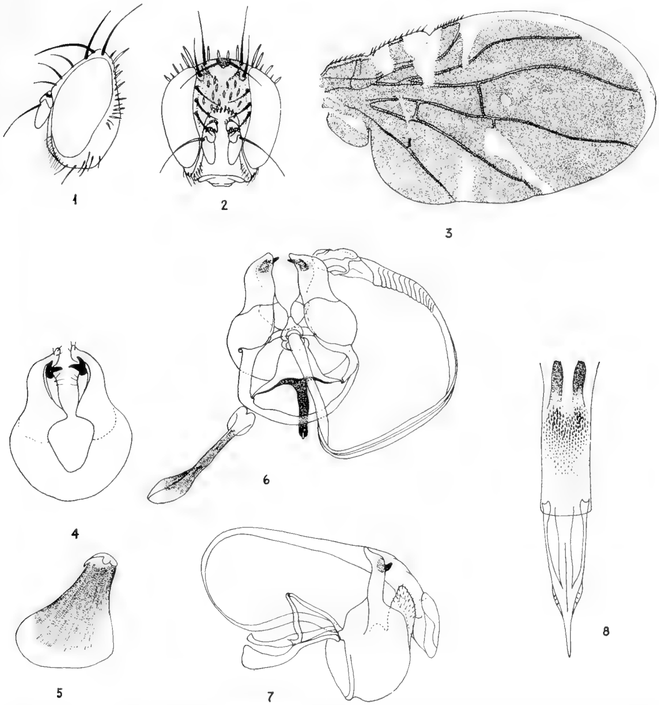
5 (6) Falciform hyaline band fusing with postpterostigmal hyaline triangle; 2nd posterior cell with basal hyaline incision crossing *tp* into discal cell; 3rd posterior cell with 1 hyaline incision .... **P. footei**, n. sp.

6 (5) Falciform hyaline band disjunct from postpterostigmal hyaline triangle; hyaline incision of 2nd posterior cell not crossing *tp*; 3rd posterior cell with 2 hyaline incisions .... **P. pilosula** (Wulp)

Polymorphomyia footei Korytkowski, n. sp.

(Figs. 1–8)

Female. *Head* as in figs. 1 and 2, width 1.74 mm; width of vertex across median ocellus 0.72 mm, slightly wider at level of lunule. Eye somewhat inclined, height 1.44 mm. Length of 3rd antennal segment 0.45 mm. Frons brownish yellow, including vertex, strongly pollinose, with scattered inflated white setae. Frontal triangle behind level of anterior *ors* elevated like a blister, at summit of which is the opaque, pollinose black ocellar triangle. *Ori* 3, long, brownish; *ors* 1, posterior *ors* lacking; *oc* long, slender, brownish; *vti* long, slender; *vte* and *poc* inflated, white; *occ* inflated, white, interspersed with smaller, brownish setae. Face and lunule yellowish, strongly pollinose; facial ridge with numerous brownish setae, decreasing in length upward; facial orbits narrow, silvery pollinose. Genae $1/10$ eye-height. Occiput pollinose, dark brown. Antenna yellowish white, 1st segment fringed with squamous whitish setae,



FIGS. 1–8. *Polymorphomyia footei*, n. sp.: 1, profile of head, ♀; 2, same, anterior view; 3, wing, ♀; 4, hypandrium (♂) with claspers; 5, ejaculatory apodeme; 6, ♂ postabdomen, anterior view; 7, same, lateral view; 8, ovipositor (♀).

2nd with scattered small brownish setae dorsally, 3rd long-ovate, light orange-yellow; arista black, yellowish basally, with scattered inconspicuous minute hairs.

Thorax: Mesoscutum 1.17 mm long, black, pollinose, with scattered small white inflated setae. Scutellum brownish black, lightly pollinose, shining. Pleura brownish black, lightly pollinose; mesopleuron with white inflated hairs. Chaetotaxy typical of the genus, but scutellum with only 1 pair of bristles (apical pair lacking); posterior *ntpl* white, inflated; 3 *mspl*, only uppermost always present, others usually lacking.

Wing (fig. 3) brownish black, with marginal incisions, apical band, small round spot near base of 1st posterior cell, and narrow oblique bar through 2nd basal cell hyaline; apical band confluent with postpterostigmal triangle hyaline incision; marginal incision near lower corner of 2nd posterior cell extending to near anterior end of *tp* and distinctly invading discal cell; 3rd posterior cell with 1 narrow erect marginal incision extending to 5th vein. Venation as shown in figure, *ta* and *tp* close together, *tp* sinuous, strongly oblique; 1st vein (R_1) with numerous strong setae to apex; R_{2+3} bare; R_{4+5} with scattered setae as far as level of end of R_{2+3} above and slightly more in neighborhood of hyaline round spot on lower surface; slight groove in 1st posterior cell forked near wing margin; squames blackish, with margin black. Halter yellow.

Legs with all femora brownish black, yellowish at tip; front and middle tibiae yellowish, hind tibia brown with yellow tip (in 1 paratype all tibiae brownish).

Abdomen blackish brown, with brownish yellow pollen, except on 6th tergum, covered with scattered white, inflated hairs; ovipositor sheath brownish black, length 1.12 mm, spiracles 0.66 mm from base; ovipositor (fig. 8) yellowish, length 1.12 mm, tip 0.78 long, marginal serrations visible only at 100× magnification; rasper decreasing toward sides and apex of membranous portion.

Male. Identical except for postabdomen (figs. 4–7).

TYPES. Holotype, ♀, reared from galls in leaves of *Tessaria integrifolia*, Lambayeque, Perú, September 10, 1968, V. H. Córdova leg. (no. 1626-68, in Museum of the National University Pedro Ruiz Gallo (= UNPRG); allotype, ♂, collected on stem of *Tessaria integrifolia*, Mocupe, Lambayeque, Perú, August 4, 1968, Jorge Su Wing leg. (no. 1000-68, UNPRG); paratypes: 1 ♂, Monsefú, Lambayeque, Perú (no. 2457-68, UNPRG); 1 ♂, Chiclayo, Lambayeque, Perú (no. 996-68, UNPRG); 1 ♂, Ucupe, Lambayeque, Perú (no. 2456-68, UNPRG); 3 ♀, Lambayeque, Lamb., Perú (nos. 2455-68, 2458-68, 999-68, UNPRG).

Remarks. This species is the only one that has an incision in the 2nd posterior cell invading the discal cell. In Aczél's key (1953) and in the above key it will run out with *P. pilosula* (Wulp) (1899), which moreover has 2 pairs of *sc*. *P. tridentata* (Hendel) (1914), the only other Peruvian species, has the posterior *ntpl* inflated, but lacks a hyaline incision in the 2nd posterior cell, R_{4+5} is bare, and the 3rd posterior cell has 2 hyaline incisions. *P. basilica* Snow (1894), the type of the genus, has the falciform apical hyaline band narrowly separated from the wing margin.

I am naming this species in honor of Dr. Richard H. Foote, of the U.S. Department of Agriculture, who has done much to elucidate the taxonomy of the Tephritidae.

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A NEW SPECIES OF RHINACLOA FROM PALO VERDE AND OCOTILLO IN THE WESTERN U. S.

(HEMIPTERA: MIRIDAE)

A new species of *Rhinacloa* is being described to provide a name for use in the work of T. F. Halstead in Phoenix, Arizona. Mr. Halstead first noticed this species damaging palo verde, *Cercidium microphylum* (Torrey) Rose and Johnston, in Encanto Park and adjacent properties on May 28, 1970. Recently, May 20, 1971, he has collected a long series from the same area on both palo verde and ocotillo, *Fouquieria splendens* Engelmann. George Buxton in Sacramento, California, reports (in litt.) that he has taken this species twice in California: Indio, Riverside Co., May 18, 1961 and Ocotillo, Imperial Co., February 1, 1965.

Rhinacloa callicrates, n. sp.

♂. Length 2.6 mm., width 1.1 mm. *Head*: width 32 units (in all measurements, 39 units = 1 mm), vertex width at base subequal to width between eyes across frons 13: 13. *Rostrum*: very short, scarcely attaining posterior margins of anterior coxae, yellow, apex brownish black. *Antennae*: segment II cylindrical, proportion of segments I–IV, 6: 24: 12: 8, uniformly pale, brownish yellow, clothed with fine yellowish pubescence intermixed with conspicuous black setae. *Pronotum*: proportion of length to width at base 19: 39. *Color*: head and body pale brownish yellow; hemelytra straw yellow, mostly translucent, embolium and cuneus opaque; membrane uniformly pale fuscous, veins yellowish. Legs pale yellow, hind femora with scattered black spots on ventral surface; tibiae with black spots at bases of spines, tips of tarsi black. *Vestiture*: dorsum clothed with silvery scalelike pubescence intermixed with conspicuous black simple pubescence; tibiae with black spines; femora with a few black spines near apices.

♀. Length 2.7 mm., width 1.2 mm. *Head*: width 32 units, vertex width at base subequal to width between eyes across frons 15: 15; eyes smaller than in the male. *Antennae*: segment II clavate, proportion of segments I–IV, 7: 21: 12: 9. *Pronotum*: proportion of length to width at base 18: 40.

Holotype, ♂ (USNM type no. 71718), and allotype, ♀, Phoenix, Arizona, May 20, 1971, T. F. Halstead. Paratypes 61 ♂, 52 ♀, same data as above. Material collected from palo verde, *Cercidium microphylum* and ocotillo, *Fouquieria splendens*. Eight paratypes in T. F. Halstead collection, remaining material in USNM.

Rhinacloa callicrates can be separated readily from the other three North American species by its uniformly pale upper surface with the contrasting black pubescence and the very short rostrum, which scarcely reaches the posterior margins of the anterior coxae.—JON L. HERRING, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture, c/o U. S. National Museum, Washington, D. C. 20560.*

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(New taxa indicated in **boldface** type)

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THE

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OF WASHINGTON

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Smithsonian Institution
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PROCEEDINGS OF THE

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Vol. 74 MARCH 1972 No. 1

ODONATA COLLECTED IN WYOMING, SOUTH DAKOTA, AND NEBRASKA[1]

GEORGE H. BICK, *Saint Mary's College, Notre Dame, Indiana 46556*

and

LOTHAR E. HORNUFF, *Central State University, Edmond, Oklahoma 73034*

ABSTRACT—Twenty taxa of Odonata are reported for the first time for Wyoming, nine for South Dakota, and two for Nebraska. Habitat data emphasizing altitude, hot springs, and bogs are given for 57 species collected in Wyoming. Twelve species were collected above 8,000 ft., 17 at hot spring areas, and 10 were closely associated with bogs.

On a trip west in July 1969, we collected specimens of adult Odonata on nine days in Nebraska, South Dakota, and extreme eastern Wyoming. These collections, and the well known scarcity of information (Kormondy, 1960) for the western states, prompted more diligent efforts in 1971 in Wyoming.

During July 1971, almost daily collecting of adults in the Teton area, but also at widely separated Wyoming localities, resulted in a total of 98 collections. Subsequent to Williamson's (1900) *Notes on Wyoming Dragonflies*, no paper has focused on the State. Because of the scarcity of information for Wyoming and for the west in general, we present a list of all species which we collected in Wyoming along with brief habitat notes. However, we consider that our records added to those in the literature are too limited seasonally and geographically to yield a comprehensive State list or to permit analysis of distribution within the State.

Twenty new state records resulted for Wyoming, nine for South Dakota, and two for Nebraska. New state records for Wyoming are indicated by an asterisk (*). For South Dakota and Nebraska only new state records are included. These are based on consideration of Needham and Westfall (1955), Kormondy (1957, 1960), Montgomery (1967), Pruess (1967), Westfall (1970).

County names are capitalized. A few specimens of the more abundant species were discarded; most are in the collections of the authors

[1] Immediate publication secured by full payment of page charges—Editor.

execept those donated to the E. B. Williamson Collection, University of Michigan (U.M.), or to the Florida State Collection of Arthropods, University of Florida (U.F.).

This work was supported by grants from the New York Zoological Society. We thank Dr. L. Floyd Clarke, Director, Jackson Hole Biological Research Station, for extending to us all facilities of the Station, and the personnel of the Grand Teton National Park for allowing us to collect in this magnificent setting.

Wyoming

* *Ophiogomphus severus montanus* (Selys). 1 coll., TETON, Moran, 27.3 mi. N.W., VII-25-71, 3♂, 3♀, at a hot springs area. The locations of our collections substantiate Walker's (1958) statement that in Canada *montanus* occurs only in the Cordilleras, *severus* in the plains.

Ophiogomphus severus severus Hagen. 2 colls., 2♂, SHERIDAN. At very sluggish and moderately swift streams. Our very pale specimens agree substantially with Walker's (1958) description except that thoracic stripe 3 is evident.

* *Anax junius* (Drury). 1 sight record, NATRONA, Casper, 7.3 mi. E., VI-27-71, 5 pairs ovipositing at a well vegetated pond.

* *Aeshna californica* Calvert. 1 coll., NATRONA, Casper, 7.3 mi. E., VI-27-71, 1♀. An eastern range extension based on published records, but Westfall (1971) states that specimens from South Dakota are in the Cornell University Collection.

Aeshna eremita Scudder. 3 colls., 4♂, 2♀, FREMONT, TETON. Only at bog ponds, 6,900–9,000 ft.

Aeshna interrupta interna Walker. 1 coll., 1♂, TETON, at a large, heavily vegetated bog pond with *A. eremita* and *A. juncea* at 8,100 ft.

Aeshna juncea (L.). 2 colls., 2♂, TETON. At bog ponds, 8,100 and 8,300 ft.

Aeshna palmata Hagen. 8 colls., 12♂, 2♀, CARBON, SHERIDAN, TETON. This, the most widespread and frequent *Aeshna* in our collections, occurred at diverse habitats below 6,900 ft.

* *Somatochlora hudsonica* (Selys). 4 colls., all TETON, Moran: 7.9 mi. S., VII-7-71, 1♂; 22.3 mi. E., VII-19-71, 3♂; 12.6 mi. E., VII-24-71, 1♂; 27.3 mi. N.W., VII-25-71, 2♂. Although widespread in Canada, this species has hitherto been recorded only from Colorado in the U.S. It occurred from 6,600 to 8,500 ft. at bog ponds (3) and along a creek fed by hot springs.

Somatochlora minor Calvert. 3 colls., 10♂, 1♀, TETON. Twice along a moderately flowing creek in a boggy area, once at a hot springs area.

Somatochlora semicircularis (Selys). 13 colls., 4 pairs, 16♂, 8♀, TETON. At nearly every bog pond in the Teton area, three collections at 8,300–9,000 ft., the rest at lower elevations.

Cordulia shurtleffi Scudder. 6 colls., 1 pair, 12♂, TETON. All from boggy areas.

* *Libellula forensis* Hagen. 4 colls., CONVERSE, Douglas 27 mi. N., VI-28-71, 1♂; NATRONA, Casper, 7.3 mi. E., VI-27-71, 1♂; TETON, Moran, 27.3 mi. N.W., VII-14-71, 1♀, VII-25-71, 1♀. These records show that the species crosses the State. In grass-sage areas it occurred at a large, heavily vegetated, clear pond and along a sluggish, well vegetated creek; in forested mountain areas it was taken along a creek fed by hot springs.

* *Libellula pulchella* Drury. 1 coll., NATRONA, Casper, 7.3 mi. E., VI-27-71, 1 ♀, with *L. forensis* at a well vegetated pond.

Libellula quadrimaculata L. 12 colls., 17 ♂, 2 sight, FREMONT, NATRONA, TETON. Frequent and abundant, most often at bog ponds but also at a diversity of other habitats, none above 6,900 ft.

Libellula saturata Uhler. 3 colls., 2 pairs, 9 ♂, 1 sight, TETON. Kennedy (1917) and Gloyd (1958, as *Belonia saturata*) record this species from hot spring areas, and all of our collections were from such habitats. However, the association with hot water is not obligatory; we have collected *saturata* at cold water habitats in Arizona and Oklahoma.

* *Plathemis lydia* (Drury). 3 colls., SHERIDAN, Sheridan, 16.4 mi. S.E., VII-31-71, 1 ♂; TETON, Moran, 27.3 mi. N.W., VII-14-71, 4 ♂, 1 ♀, VII-25-71, 3 ♂, 1 ♀. At both a hot springs area in the forested Tetons and a well vegetated pond in a grass-sage area of the east. *P. subornata* was not present in any of our collections.

Leucorrhinia borealis Hagen. 7 colls., 4 normal pairs, 1 tandem pair of 2 ♂'s, 15 ♂, 2 ♀, FREMONT, TETON. All collections of *borealis, hudsonica, proxima* were at boggy areas, whereas *intacta* was at a large heavily vegetated pond. The first three species were collected above 6,700 ft., the last only at 4,900 ft.

Leucorrhinia hudsonica (Selys). 7 colls., 3 pairs, 2 ♂-♂-♀ triplets, 16 ♂, 5 ♀, FREMONT, TETON.

* *Leucorrhinia intacta* (Hagen). 1 coll., NATRONA, Casper, 7.3 mi. E., VI-27-71, 1 pair, 4 ♂.

Leucorrhinia proxima Calvert. 6 coll., 1 pair, 18 ♂, TETON.

Sympetrum costiferum (Hagen). 1 coll., 1 ♂, SHERIDAN.

Sympetrum danae (Sulzer). 4 colls., 2 pairs, 12 ♂, 5 ♀, SUBLETTE, TETON. From bog ponds (2), a large heavily vegetated pond, and a rushing stream. There was a mass emergence on VII-17 in Teton Co.

Sympetrum internum Montgomery. 8 colls., 19 ♂, 5 ♀, CARBON, FREMONT, SUBLETTE, TETON. At a diversity of lentic habitats but once along a rushing stream. A mass emergence occurred on VII-22 in Sublette Co.

Sympetrum obtrusum (Hagen). 2 colls., 8 ♂, 1 ♀, SHERIDAN. From contrasting habitats in the grass-sage area: with *pallipes* at a heavily vegetated clear pond, with *costiferum* at a moderately flowing stream without vegetation.

Sympetrum occidentale fasciatum Walker. 1 coll., 2 ♂, WESTON, at a large, clear, heavily vegetated pond in the high plains.

Sympetrum pallipes (Hagen). 4 colls., 3 ♂, 5 ♀, SHERIDAN, SUBLETTE, WESTON. At clear ponds with abundant vegetation and at a large lake. The tibiae of three females from Sublette Co. were dark, as Kormondy (1960) previously noted for specimens from Wyoming and Idaho.

Tarnetrum corruptum (Hagen). 4 colls., 1 pair, 3 ♂, 2 ♀, CONVERSE, NATRONA, TETON.

Erythemis collocata (Hagen). 2 colls., 7 ♂, 5 ♀, TETON. Abundant at a hot springs area along a small, rocky, moderately flowing creek where females oviposited at one of the many adjacent boggy depressions. The L/W ratio of abdominal segment IV in both sexes is as Gloyd (1958) figures for *collocata*, but our non-pruinose females have much more abdominal dark coloring than she figures for *collocata*.

* *Calopteryx aequabilis* (Say). 1 coll., TETON, Moran, 27.3 mi. N.W., VII-25-71, 1 ♂, 1 ♀, at a creek in a hot springs area.

* *Hetaerina americana* (Fabricius). 1 coll., CROOK, Devil's Tower National Monument, VII-15-69, 2 ♂, along the swiftly flowing Belle Fourche River.

Lestes congener Hagen. 1 coll., 2 ♂, SHERIDAN, at a clear, heavily vegetated pond.

Lestes disjunctus disjunctus Selys. 10 colls., 3 pairs, 25 ♂, 1 ♀, CROOK, SUBLETTE, TETON. This species and *dryas* were most frequent at bog ponds, but both also occurred at a diversity of other habitats.

Lestes dryas Kirby. 14 colls., 5 pairs, 42 ♂, 8 ♀, FREMONT, NATRONA, SUBLETTE, TETON. There was a mass emergence on VII-10 at a bog pond in the Tetons.

* *Lestes forcipatus* Rambur. 1 coll., SHERIDAN, Sheridan, 14 mi. S.E., VII-31-71, 1 ♂, at a well vegetated pond. This site is near the westernmost limits of the species.

Lestes unguiculatus Hagen. 4 colls., 3 pairs, 6 ♂, CROOK, SHERIDAN, WESTON. At well vegetated ponds.

* *Argia alberta* Kennedy. 2 colls., TETON, Moran, 27.3 mi. N.W., VII-14-71, 1 ♂; VII-25-71, 1 pair, 4 ♂. At a hot springs area.

Argia emma Kennedy. 4 colls., 1 pair, 9 ♂, 3 ♀ (1 ♂, 1 ♀ U.M.), CONVERSE, CROOK, FREMONT, SHERIDAN. Along moderately to swiftly flowing streams.

* *Argia fumipennis violacea* (Hagen). 1 coll., CROOK, Devil's Tower National Monument, VII-15-69, 2 pairs, 2 ♂ (2 ♂ U.M.), along the swiftly flowing Belle Fourche River.

Argia vivida Hagen. 4 colls., 6 pairs, 14 ♂, 1 ♀, TETON. At creeks fed by hot springs.

Amphiagrion sp. 22 colls., 13 pairs, 28 ♂, 8 ♀ (4 pairs, 8 ♂, 3 ♀ to U.M.), CARBON, CONVERSE, CROOK, FREMONT, NATRONA, SHERIDAN, SUBLETTE, TETON. From diverse habitats: bogs, well vegetated ponds, sluggish streams, hot springs. Our specimens are obviously distinct from Pennsylvania ones of *saucium* (Burmeister) and from California specimens of *abbreviatum* (Selys) in our collection. Since odonatists have recognized that representatives of *Amphiagrion* from central U.S. probably constitute an undescribed taxon, we are not assigning a specific name to our material.

* *Nehalennia irene* (Hagen). 1 coll., WESTON, Newcastle, 10 mi. S., VII-16-69, 1 ♂, 1 ♀ (both U.F.), at a well vegetated pond.

Coenagrion resolutum (Hagen). 17 colls., 5 pairs, 60 ♂, 1 ♀, FREMONT, SUBLETTE, TETON. Abundant at nearly every bog pond in the Tetons and frequent above 8,000 ft.

Enallagma anna Williamson. 11 colls., 19 pairs, 60 ♂, CROOK, FREMONT, NATRONA, SHERIDAN, SUBLETTE, SWEETWATER, TETON. Nearly always (10) associated with streams, one of which was fed by hot springs.

* *Enallagma antennatum* (Say). 1 coll., CROOK, Devil's Tower National Monument, VII-15-69, 1pair, 7 ♂ (4 U.F.), 1 ♀, abundant and pairing along the swiftly flowing Belle Fourche River. This is a westward extension of an eastern species previously reported west to North Dakota and Oklahoma.

Enallagma boreale Selys. 23 colls., 13 pairs, 50 ♂, CONVERSE, FREMONT, NATRONA, SUBLETTE, TETON, WESTON. Primarily at bog ponds, but also at a great diversity of static water from 4,300 to 9,000 ft., and the most frequent species above 8,000 ft. *E. boreale* was second only to *cyathigerum* in frequency and abundance. Walker (1953) seldom found the two together, but *cyathigerum* was with *boreale* in 14 of our 23 collections.

* *Enallagma carunculatum* Morse. 2 colls., NATRONA, Casper, 7.3 mi. E., VI-27-71, 1♂; SHERIDAN, 18.9 mi. S.E., VII-31-71, 1♂. In grass-sage areas at ponds with abundant vegetation.

Enallagma civile (Hagen). 3 colls., 4♂, CONVERSE, FREMONT. At turbid ponds with little or no submerged vegetation.

Enallagma clausum Morse. 2 colls., 1 pair, 4♂, FREMONT, SHERIDAN. At a large, sparsely vegetated, wind-swept lake and a small, algae-covered pond.

Enallagma cyathigerum (Charpentier). 45 colls., 43 pairs, 159♂, CARBON, CONVERSE, CROOK, FREMONT, NATRONA, SHERIDAN, SUBLETTE, TETON, WESTON. This species, the most frequent and abundant in our records, occurred at all habitats except swiftly flowing streams. In the Teton area it was at nearly every site except those above 8,100 ft.

Enallagma ebrium (Hagen). 3 colls., 3♂, SHERIDAN, WESTON. Only at heavily vegetated ponds.

* *Enallagma hageni* (Walsh). 2 colls., CROOK, Devil's Tower National Monument, 4 mi. S., VII-15-69, 3♂ (U.F.); NATRONA, Waltman, VI-29-71, 1 pair. At heavily vegetated ponds.

Enallagma praevarum (Hagen). 3 colls., 10♂, CONVERSE, CROOK, SHERIDAN. At well vegetated habitats: a swiftly flowing stream, a sluggish stream, and a pond.

* *Ischnura cervula* Selys. 8 colls., CARBON, Saratoga, 10.6 mi. S.E., VII-31-71, 5♂; CONVERSE, Douglas, 27 mi. N., VI-28-71, 1♂, 1♀; NATRONA, Casper, 12 mi. W., VI-25-71, 2♂; Casper, 7.3 mi. E., VI-27-71, 1♂, 3♀; Waltman, VI-29-71, 1♂, 1♀; SHERIDAN, Sheridan, 16.4 mi. S.E., VII-31-71, 2♂; TETON, Kelly, 1.5 mi. N.E., VII-12-71, 1 pair, 3♂, 2♀; Moran, 27.3 mi. N.W., VII-14-71, 1♂. These records are among the easternmost for the species which we collected across the State. It was the only *Ischnura* in the Teton area. There it occurred at hot spring areas, elsewhere at well vegetated ponds and sluggish streams.

* *Ischnura damula* Calvert. 4 colls., CONVERSE, Douglas, VI-28-71, 23 mi. N., 1♂, 27 mi. N., 4♂, 1♀; NATRONA, Casper, 7.3 mi. E., VI-27-71, 1♂; WESTON, Newcastle, 10 mi. S., VII-16-69, 3♂ (U.F.), 5♀. At large, well vegetated ponds and sluggish streams.

Ischnura perparva Selys. 8 colls., 30♂, 4♀, CONVERSE, FREMONT, NATRONA, SHERIDAN. At sluggish to moderately flowing streams (5), and at ponds (3).

* *Ischnura verticalis* (Say). 6 colls., CARBON, Saratoga, 10.6 mi. S.E., VII-31-71, 1♂; CONVERSE, Douglas, 27 mi. N., VI-28-71, 1♂; CROOK, Devil's Tower National Monument, 4 mi. S., VII-15-69, 2♂ (U.F.); NATRONA, Casper, 7.3 mi. E., VI-27-71, 7♂; SHERIDAN, Sheridan, 16.4 mi. S.E., VII-31-71, 3♂; WESTON, Newcastle, 10 mi. S., VII-16-69, 4♂, 2♀. At well vegetated ponds and a sluggish stream. These records are among the westernmost for the species.

Distribution.—The 20 new State records for Wyoming may be grouped into two categories: 1. The collection fills a gap in the distribution of *A. junius*, *S. hudsonica*, *L. forensis*, *L. pulchella*, *P. lydia*, *L. intacta*, *C. aequabilis*, *H. americanan*, *A. alberta*, *A. f. violacea*, *N. irene*, *E. caruncnlatum*, *E. hageni*, *I. damula*. 2. The collection is near the limits or extends the range of *O. s. montanus*, *A. californica*, *I. cervula*, eastward, and *L. forcipatus*, *E. anetnnatum*, *I. verticalis*, westward.

Elevation.—Ten sites at 8,100–9, 600 ft. were sampled: bog ponds (8), bog lake (1), bog creek (1). Odonata were not seen at the three locations above 9,100 ft. Species present and the number of collections of each were: *A. eremita* (2), *A. i. interna* (1), *A. juncea* (2), *S. hudsonica* (2), *S. semicircularis* (3), *L. borealis* (2), *L. hudsonica* (1), *L. proxima* (1), *L. d. disjunctus* (1), *C. resolutum* (4), *E. boreale* (5), *E. cyathigerum* (1). *A. juncea* alone was restricted to these higher elevations, but this species is reported (Walker, 1958) from lower elevations in other parts of the world.

Our Wyoming data, plus information from Bethel (1915), Calvert (1923), and Hess (1940) for Colorado, Ahrens (1938) for California, and Musser (1962) for Utah provide records of 18 taxa of Anisoptera above 8,000 ft. Most of these were also reported by the same authors at lower elevations, and none occurred above 8,000 ft. in all states. We conclude that none of the above, reported at such high elevations, can be considered obligate high altitude species, and that the differences in lists from the four states must be due to a multiplicity of factors rather than to altitude *per se*.

As far as we can determine, our Wyoming records of *L. d. disjunctus*, *C. resolutum*, *E. boreale*, and *E. cyathigerum* are the only ones of Zygoptera above 8,000 ft. from the western states.

Habitat.—The array of species collected at hot spring areas, bogs, and lotic water was of particular interest.

In the Tetons, four sites fed by warm to hot water springs were sampled: two non-rocky creeks, one pond, and a large thermal area consisting of a rocky creek, boggy areas, and a small pond. Nymphs were not collected, but adults of many species were associated with these areas. The species and the number of collections of each were: *O. s. montanus* (1), *S. minor* (1), *S. hudsonica* (1), *L. forensis* (2), *L. quadrimaculata* (2), *L. saturata* (4), *P. lydia* (2), *L. hudsonica* (2), *E. collocata* (2), *C. aequabilis* (1), *L. dryas* (1), *A. alberta* (2), *A. vivida* (4), *Amphiagrion* sp. (4), *E. anna* (3), *E. cyathigerum* (1), *I. cervula* (1). Of these, *montanus*, *saturata*, *alberta*, *vivida*, and *collocata* were collected only at hot spring areas. However, we have found the first four at habitats other than hot springs in other parts of the U.S., and Gloyd (1958) collected *collocata* in Texas at both hot and cold springs. In our experience, the often recorded association of *vivida* with spring fed water holds whether such water is hot or cold. Of the species listed above from hot spring areas in Wyoming, the following are reported by others from such habitats: *forensis*, *lydia*, *cyathigerum*

(Kennedy, 1917), *cervula, vivida* (Walker, 1953), *collocata* (Gloyd, 1958), *saturata* (Kennedy, 1917; Gloyd, 1958).

The greatest diversity of species was associated with ponds or small streams bordered by wet areas with dark soil containing abundant organic matter. We combined all such collections under the term bogs without considering pH, plant composition, or quaking substrate. These areas, common in the Tetons, yielded 21 species. However, most of these were also recorded from other habitats. We calculated the degree of species-habitat association for species represented in five or more collections. Among these 18 species, the majority of collections of 10 were from bogs. These and the per cent occurrence at bogs were: *L. borealis* (100), *L. proxima* (100), *C. shurtleffi* (100), *C. resolutum* (94), *S. semicircularis* (93), *L. hudsonica* (71), *L. quadrimaculata* (64), *E. boreale* (63), *L. d. disjunctus* (60), *L. dryas* (57).

In contrast with the diversity of species at bogs and thermal areas, very few were associated with lotic water. Odonata were absent along the cold rushing melt waters of streams such as Wind River, Pilgrim, Pacific, Lava, and Cascade Creeks but were present along the much more moderately flowing streams, where only *A. emma* and *E. anna* were characteristic.

South Dakota

The following are new State records:

Gomphus (*Gomphus*) *graslinellus* Walsh. 2 colls., CUSTER, Custer State Park, VII-12-69, 4♂, VII-13-69, 2 pairs.

Aeshna interrupta interna Walker. 2 colls., CUSTER, Custer State Park, VII-12-69, 1♀, VII-13-69, 1♀.

Somatochlora minor Calvert. 1 coll., CUSTER, Custer State Park, VII-13-69, 1♂. Although there are no published South Dakota records, Westfall (1971) states that he has specimens from the State.

Sympetrum costiferum (Hagen). 1 coll., YANKTON, Yankton, 5 mi. W., VII-9-69, 2♀.

Argia alberta Kennedy. 1 coll., YANKTON, Yankton, 5 mi. W., VII-9-69, 2♂, 1♀ (1♂ U.M.).

Argia emma Kennedy. 2 colls., CUSTER, Custer State Park, VII-12-69, 1♂, VII-13-69, 1♀.

Argia plana Calvert. 1 coll., YANKTON, Yankton, 5 mi. W., VII-9-69, 3♂, 1♀ (1♂ U.M.).

Enallagma carunculatum Morse. 1 coll., YANKTON, Yankton, 5 mi. W., VII-9-69, 1♂ (U.F.).

Enallagma ebrium (Hagen). 1 coll., CUSTER, Custer State Park, VII-13-69, 1♂ (U.F.).

These nine new South Dakota records may be grouped into two categories: 1. The collection fills a gap in the distribution of *G. graslinellus, S. minor, S. costiferum, E. carunculatum, E. ebrium*. 2.

The collection is near the limits or extends the range of *A. i. interna*, *A. alberta*, *A. emma*, eastward, of *A. plana* northward.

Nebraska

The following are new State records:

Sympetrum ambiguum (Rambur). 1 coll., BLAINE, Brewster, 5 mi. E., VII-18-69, 1♂.

Coenagrion resolutum (Hagen). 1 coll., CHERRY, Valentine, 15 mi. E., VI-24-71, 1♂.

The Nebraska collection of *C. resolutum* fills a gap in its distribution, and the collection of *S. ambiguum* is near the western limits of its range.

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A NEW SPECIES OF NEOBORELLA FROM DWARF MISTLETOE IN COLORADO

(HEMIPTERA: MIRIDAE)

JON L. HERRING, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—A new species of Miridae, *Neoborella* **xanthenes** from dwarf mistletoe in Colorado is described.

The following species of *Neoborella* is being described to provide a name for Robert E. Stevens' work on dwarf mistletoe, *Arceuthobium americanum* Nuttall. The new species of *Neoborella* and also the type species, *tumida* Knight, appear to be important associates of dwarf mistletoes.

Neoborella xanthenes, n. sp.

♂. Length 3.6 mm, width 1.5 mm. *Head*: width 33 units[2], vertex 11; eyes large, subequal to width of vertex, extending below insertion of antennae; frons obliquely, transversely striate, rather distinctly alutaceous, entire frons and vertex concolorous brownish yellow, clothed with very short pale pubescence; basal carina prominent. *Rostrum*: reaching to middle of hind coxae, straw yellow, reddish brown at apex. *Antennae*: proportion of segments I-IV, 14:41:16:9, segment II subclavate, at apex nearly equal to thickness of segment I, III and IV much more slender; I and II straw yellow, III and IV fuscous; clothed with fine yellow pubescence. *Pronotum*: length 25, width at base 47: disk closely, deeply and evenly punctate, punctures extending between and before calli, lateral margins rounded and ecarinate, calli narrow, convex, smooth; collar distinct, slender, in contact with eyes, not raised to level of base of vertex; entire pronotum straw yellow, clothed with very short pale pubescence. *Scutellum*: very strongly convex, punctate as the pronotal disk but sparser; mesoscutum broadly exposed, somewhat darker in color than scutellum and its pubescence longer and more prominent. *Sternum*: straw yellow with some fuscous markings on pleura, osteolar peritreme very pale, almost white. *Hemelytra*: embolar margins rather strongly arcuate; distinctly punctate, as deeply and evenly as the pronotum, surface subopaque, clothed with very short, pale pubescence; cuneus strongly deflexed; completely straw yellow with a pair of very faint fuscous markings medially at the level of the cuneal fracture. Membrane uniformly pale fuscous, veins straw yellow. *Legs*: pale straw yellow; tibiae pubescent, spines evident. *Venter*: straw yellow with some pale fuscous markings along sides of abdomen, yellowish pubescence increasing in length posteriorly; form of genital claspers very similar to that of *tumida*.

♀. Length 4 mm, width 1.8 mm, more robust than the male but very similar in color and practically without fuscous markings. *Head*: width 32, vertex 12. *Antennae*: proportion of segments I-IV, 10:30:14:18.

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[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.
[2] In all of the following measurements, 39 units = 1 mm.

Holotype, ♂ (USNM type no. 71613), Redfeather Lakes, Colorado, September 7, 1970, R. Stevens. Allotype, ♀, same locality and collector, August 31, 1970. Paratypes, same locality and collector, August 31, 1970, 1♀, September 3, 1970, 3♀, September 7, 1970, 14♀, September 15, 1970, 2♂, 2♀. All of the above were taken from dwarf mistletoe, *Arceuthobium americanum.* Material deposited in the USNM.

N. xanthenes can be separated from *tumida*, the only other species, by color alone. It is almost completely straw yellow rather than extensively marked with fuscous. It differs also in the much more densely and deeply punctured hemelytra, with their much shorter and inconspicuous pubescence, and the different proportion of the antennal segments, segment II is approximately 3 times the length of I, whereas in *tumida* it is 5 times.

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A CATALOG OF THE J. H. LOVELL TYPES OF APOIDEA WITH LECTOTYPE DESIGNATIONS[1]

(Hymenoptera)

Charles V. Covell, Jr., *Department of Biology, University of Louisville, Louisville, Kentucky 40208*

When I became curator of the insect collection at the University of Louisville in 1964, about half of the John H. Lovell collection of bees had been incorporated into the institutional collection, donated by Dr. Harvey B. Lovell (son of J. H. Lovell). The remainder of the collection, including many specimens collected by Harvey Lovell, was donated to the University by Eleanor Lovell Irwin and John H. Lovell II upon the death of their father Harvey in November, 1969. Part of this material was still at the old Lovell home in Waldeboro, Maine. With the help of a travel grant from Dr. John A. Dillon, Jr., Dean of the Graduate School, I visited Waldeboro in August, 1970, and brought to Louisville the final portion, consisting of 40 Schmitt boxes containing about 8,000 specimens.

Because of the presence of the J. H. Lovell collection and the contri-

[1] University of Louisville contribution in Biology No. 139 (New Series).

butions to the studies of pollination by Dr. Harvey B. Lovell, the University of Louisville insect collection has been named the Lovell Insect Museum. This is even more appropriate since the Lovell bee collection forms the most important single segment of the collection, now numbering close to 100,000 specimens. The Lovell material comprises about 16,000 specimens, some of them representing insects of orders other than Hymenoptera taken on flowers by J. H. or H. B. Lovell.

The Lovell Types

Between 1905 and 1911 John H. Lovell published 34 names in the Apoidea, 15 of them with T. D. A. Cockerell as junior author. All were species names except two, which were proposed as varietal names. Lovell spent most of his creative years at Waldeboro, Maine, which is the type locality for all but 10 of the taxa he described. Pellett (1939) gives a résumé of his life.

Lovell did not designate types in his descriptions and often did not indicate the number of specimens on which a given name was based. In most cases, however, he did label specimens as "type male" or "type female," and a few apparent paratypes as "cotype." In some cases more than one specimen of a sex was labeled "type." Collection data usually accompany the specimens, but dates are missing on some. There are individual collection numbers on almost all specimens which I am considering types; however, the journal which explains these numbers has not yet been located among the Lovell papers.

Fourteen names were based on single specimens and a lectotype for *Melissodes illata* was designated by LaBerge (1956a). T. B. Mitchell borrowed most of the types from the University of Louisville for study in preparing his *Bees of the Eastern United States* (1960, 1962). He affixed lectotype labels to many specimens, but did not designate these lectotypes in his publications. In 1970 he returned the specimens, and suggested that I make the lectotype designations where needed. In most cases my designations follow his selections, which seem to conform in the most part to the intentions of Lovell as indicated by type labels on specimens.

The primary types for all Lovell names were in the Lovell collection, with the following exceptions: *Prosopis binghami* (holotype in the British Museum), *Sphecodes banksii* (3 of 4 syntypes in the Museum of Comparative Zoology, Harvard University), and *Halictus oblongus* (no specimens found conforming to collection data in original description). For the sake of accessibility and safety of these specimens, I have, with the unanimous consent of my department faculty, deposited them along with the paralectotypes and other specimens listed below, in the U.S. National Museum in Washington, D.C. The total number is 156 specimens.

In addition to the Lovell types, I have turned over to the USNM paratypes of names proposed by other authors who had given the specimens to Lovell. These specimens are:

Andrena alleghanyensis Viereck, 1 paratype female
Andrena braccata Viereck, 1 paratype female
Andrena bradleyi Viereck, 1 paratype male
Andrena rehni Viereck, 1 paratype female
Colletes mesocopus Swenk, 1 paratype female
Halictus pruinosiformis Crawford, 1 paratype female
Halictus robertsoni Crawford, 1 paratype female
Halictus vierecki Crawford, 1 paratype female
Nomada gibbosa Viereck, 2 paratypes female
Proteraner leptanthi Cockerell, 2 cotypes male
Trachandrena daeckei Viereck, 2 paratypes female

Also included in this lot are 7 specimens labeled as types of 3 names in *Andrena* which seem to be manuscript names of Viereck. Since I can find no evidence that these names were published, I shall not list them.

Present status of the Lovell names may be found in Muesebeck *et al.* (1951) and its supplements. Arrangement below is in alphabetical order by genus and trivial names.

List of Specimens

1. *Halictus craterus* Lovell, 1908, pp. 35–36. Thirty specimens, all from Waldeboro, Maine, seem to comprise the type series (no number of specimens was indicated in the original description). I designate as lectotype the female with the following labels: "224;" "Waldeboro, Maine;" "*Iris versicolor*, June 24-July 5;" "*Halictus craterus* n. sp. type female;" and "holotype female" (red label apparently affixed recently). I have labeled as paralectotypes 5 females and 24 males representing the following collection dates and flower sources: 1 female, *Salix bebbiana*, May 13, 1904; 2 females, *Eupatorium perfoliatum*, Aug. 24, 1904; 2 females, *Leontodon autumnalis*, Sept. 6, 1905; 10 males, *Carduus arvensis*, Aug. 7, 1904; 10 males (including one labeled "*Halictus craterus* n. sp. type male" by Lovell), *Aralia hispida*, July 30, 1904; and 4 males, *Leontodon autumnalis*, Sept. 6, 1905. USNM Type No. 71566.

2. *Halictus divergens* Lovell, 1905b, p. 299. Holotype by monotypy labeled "1894;" "Waldeboro, Maine;" "Cultivated blackberry, June 24;" "*Halictus divergens* female type;" and "holotype" in red. Abdomen missing. USNM Type No. 71567.

3. *Halictus hortensis* Lovell, 1905a, p. 39. Fourteen specimens seem acceptable as a type series. One male, labeled as "type male" must be excluded, as no male was mentioned in the description. Likewise, a female collected in 1905 and labeled "cotype female" cannot have been used in formulating the description, which appeared in the Feb., 1905, *Can. Ent.* I designate as lectotype female the specimen labeled "1776;" "Waldeboro, Maine;" "Cultivated blackberry, June 19;" "*Halictus hortensis* female type;" and "*Halictus hortensis* Lov. lectotype by Mitch." All 13 females which I have labeled as paralectotypes were collected at Waldeboro on flowers listed in Lovell's original description. Dates of capture on these flowers

are as follows: 4 specimens on rhubarb, 3 labeled "June," 1 labeled "June 12;" 3 on cultivated blackberry, 2 taken June 19, 1 taken June 25; 4 on Japan plum, 1 taken May 26, the others May 29; and 2 on garden red rose (one headless), taken July 9. USNM Type No. 71568.

Although years are not designated on any labels with the above-mentioned specimens, I am convinced that all were taken during 1904 or earlier because of the collection numbers they bear. Although I have not found the notebook which explains these numbers, the numbers with the specimens I consider to comprise the type series are in a range of 076 to 1937. Many other bees in the Lovell Collection have years indicated, and some in the 1000 to 2000 range of code numbers were also labeled "1904."

4. *Halictus pilosus* Smith var. *leucocomus* Lovell, 1908, pp. 37–38. Four specimens, all females from Waldeboro, Maine, seem to comprise at least part of Lovell's type series. I designate as lectotype female the specimen bearing the following labels: "3379;" "Waldeboro, Me., J. H. Lovell;" "Plum, May 28, 1905;" "*Halictus leucocomus*;" and "*Halictus pilosus* var. *leucocomus* Lov. lectotype by Mitch." Collection data on the specimens I have labeled as paralectotypes are as follows: 1 on plum, May 28, 1905; 1 on *Crataegus coccinea*, June 14, 1905; and 1 on *Solidago*, Sept. 6, 1905. Another female taken July 6, 1905, at Waldeboro on *Rosa humulis*, although not a paralectotype, is included in this series. USNM Type No. 71569.

5. *Halictus nubilus* Lovell, 1905a, p. 40. Three females in the Lovell Collection seem qualified as syntypes. A specimen labeled "type male," although included with this series, must be disqualified since only the female was described. I designate as lectotype the female bearing the following labels: "2220;" "Waldeboro, Me., J. H. Lovell;" "*Solidago*, Aug. 21;" and "*Halictus nubilus* female cotype." I have labeled as paralectotype the other two females. One bears a "type female" label, but is not designated as lectotype because the abdomen is missing. This specimen was taken at Waldeboro on *Solidago* on Aug. 19, and is numbered "2140." The other bears Waldeboro and *Solidago* labels, "Aug. 25," and "2214." I have been unable to locate any syntypes taken on *Iris versicolor*, which Lovell referred to in his description as the second flower source of specimens. USNM Type No. 71570.

6. *Halictus oblongus* Lovell, 1905a, p. 40. Lovell states "Both male and female specimens were taken on *Eupatorium perfoliatum*, August twenty-fourth." I have found no specimens in the Lovell Collection with these label data, nor any labeled as types of this species. There is, however, one male taken on *Solidago* Aug. 21 at Waldeboro with a label "*Halictus oblongus* des. as male of *versans* type." Lovell (1908, p. 38), in discussing *versans*, mentions that "The male described with this species belongs to *H. oblongus*." In the description of *H. versans* (Lovell, 1905a, p. 39) is the statement "Two males taken on *Solidago* are referred to this species." The above specimen is one of the two, and is intended to represent *oblongus* instead of *versans*. I cannot, however, consider this male a type of *oblongus*, since it is not mentioned in the original description.

7. *Halictus arcuatus* Robertson var. *parisus* Lovell, 1908, p. 36. Acceptable as syntypes are 3 females and 5 males from Waldeboro with label data corresponding to the statement in the original description "The female was taken almost exclusively on *Rhus typhina*, July 10; and the male on *Eupatorium perfoliatum*, Aug. 25." I designate as lectotype the female with the following labels: "3698;"

"Waldeboro, Me., J. H. Lovell;" "*Rhus typhina*, July 10, 1905;" "*Halictus arcuatus* Robt. var. *parisus*, n. var. female;" and "*Halictus arcuatus* var. *parisus* Lov. lectotype." The others have been labeled as paralectotypes. All the paralectotype females I have labeled were taken on *Rhus typhina*, July 10, 1905, although Lovell's statement quoted above indicates at least one other source and/or date. USNM Type No. 71571.

8. *Halictus planatus* Lovell, 1905b, p. 300. Three females from Waldeboro seem qualified as syntypes; but a specimen labeled "type male" must be excluded since only the female was described. I designate as lectotype the female labeled as follows: "2541;" "Waldeboro, Me., J. H. Lovell;" "*Aralia trifolia*, May 21, 1904;" "*Halictus planatus* female type;" and "*Halictus planatus* Lov. lectotype by Mitch." The two females I have labeled as paralectotypes were taken on *Salix bebbiana*, May 13, 1904, and on *Aralia trifolia*, May 23, 1904. The former specimen is labeled "*Halictus planatus* female type," and is slightly out of agreement in collection data with that reported in the original description ("Collected on willows, May 6–12 . . ."). USNM Type No. 71572.

9. *Halictus versans* Lovell, 1905a, p. 39. I designate as lectotype the female bearing the following labels: "1339;" "Waldeboro, Me., J. H. Lovell;" "*Epilobium angustifolium*, July 23;" "*Halictus versans* female;" and "*Halictus versans* Lov. lectotype by Mitchell." A second female seems to be Lovell's intended type, as it bears the label "*Halictus versans* female type," as well as data labels in conformity with those in the description. To avoid confusion, I am abiding by Mitchell's choice, and labeling this a paralectotype. Two other females, taken on the same flower species on the same date, have also been labeled paralectotypes (one is headless). No females from other flowers have been labeled as paralectotypes. Lovell (1908, p. 38) mentions *E. angustifolium* alone as the source of females, although he originally stated that the "female is described from specimens taken on *Epilobium angustifolium*; it has also been found on *Solidago* and other flowers." Because of the confusion regarding males of this species (see discussion of *H. oblongus*, above) I have not labeled any males as paralectotypes. There is, however, a male mentioned in Lovell (1908, p. 39), which accompanies the type series. USNM Type No. 71573.

10. *Halictus viridatus* Lovell, 1905b, p. 300. The type series seems to consist of 10 females and 2 males from Waldeboro, Maine. I designate as lectotype the female with the following pin data: "1707;" "Waldeboro, Maine;" "Rhubarb, June 12;" "*Halictus viridatus* female type;" and "*Halictus viridatus* Lov. lectotype by Mitch." Of the remaining females, 5 were collected in June on rhubarb (one on June 12), and the other 4 on cultivated blackberry (3 on June 19, one on June 25). One of the rhubarb specimens bears Lovell's type label in wording identical to that of the lectotype. Of the two males, only one gives flower *Solidago* and date Aug. 20; the other is labeled Aug. 11. Both bear Lovell's labels, "*Halictus viridatus* male type;" and the Aug. 11 specimen has a lectoallotype label affixed by Mitchell. USNM Type No. 71574.

11. *Megachile albula* Lovell and Cockerell, 1907a, pp. 18–19. I have found only one of the two males cited on p. 19 of the original description, and designate it as lectotype male. The pin data are: "1241;" "Waldeboro, Me., J. H. Lovell;" "*Epilobium angustifolium*, July 30;" "*Megachile albula* male Lov. and Ckll. Type;" "*Megachile albula* Lov. and Ckll. Holotype;" and "*Megachile* (*Delomegachile*) *gemula* Cress. det. Mitch." USNM Type No. 71575.

12. *Megachile decipiens* Lovell and Cockerell, 1907a, pp. 19–20. Both males cited in the description are at hand. I designate as lectotype male the specimen labeled; "3705;" "Waldeboro, Me., J. H. Lovell;" "*Rhus typhina*, July 10, 1905;" "*Megachile infragilis* male;" "Type *Megachile decipiens* male Lov. and Ckll.;" "*Megachile decipiens* Lov. and Ckll. lectotype by Mitch.;" and "*Megachile* (*Megachile*) *inermis* Prov. det. Mitch." The paralectotype male is also from Waldeboro, and bears Lovell's type label; it was collected July 30 on *Epilobium angustifolium*. USNM Type No. 71576.

13. *Melissodes apicata* Lovell and Cockerell, 1906, p. 111. Holotype female by monotypy bears the following labels: "2901;" "Waldeboro, Me., J. H. Lovell;" "*Pontederia cordata*, July 21, 1904;" "Type;" and "*Melissodes apicata* Lov. and Ckll., female holotype." Mentioned by LaBerge, 1956b, p. 555. USNM Type No. 71577.

14. *Melissodes illata* Lovell and Cockerell, 1906, pp. 110–111. The type series of six specimens includes a male and a female designated by LaBerge (1961, p. 567) as lectotype male and lectoallotype female. I have found 3 females and another male which also seem to be in the series used by Lovell, and have labeled them paralectotypes. All 6 specimens were collected at Waldeboro. The lectotype female is labeled "3831;" "Waldeboro, Me., J. H. Lovell;" "*Solidago*, Aug. 13, 1905;" "Type;" "*Melissodes illata* n. sp.;" "Lectotype male *Melissodes illata* Lovell and Cockerell det. W. E. LaBerge." The females were all taken on *Solidago*; the lectoallotype is dated Aug. 26, the others Aug. 7, 8, and 13, 1905. The paralectotype male was taken on *Inula helenium* Aug. 3, 1905. I have not found any males taken on *Epilobium angustifolium* as mentioned on p. 111 of the original description. USNM Type No. 71578.

15. *Nomada florilega* Lovell and Cockerell, 1905, p. 41. Of two female syntypes I designate as lectotype the specimen bearing the following labels: "2638;" "Waldeboro, Me., J. H. Lovell;" "*Aralia hispida*, July 30, 1904;" "*Nomada florilegus* [sic] Lov. and Ckll. female type;" and "*Nomada florilega* Lov. and Ckll. Lectotype by Mitch." The paralectotype female, also from Waldeboro, is dated "July, 1904," and bears Lovell's type label. USNM Type No. 71579.

16. *Nomada* (*Xanthidium*) *subrutilia* Lovell and Cockerell, 1905, p. 40. Holotype by monotypy is a male from Waldeboro, Maine, collected on *Viola rotundifolia* on May 4, 1886. USNM Type No. 71580.

17. *Osmia inspergens* Lovell and Cockerell, 1907a, p. 17. Holotype by monotypy is a female from Waldeboro, Maine, collected "July?" on *Vaccinium macrocarpon*. The specimen bears the number "393" in Lovell's collecting series. USNM Type No. 71581.

18. *Osmia melanotricha* Lovell and Cockerell, 1907a, p. 16. The original description indicates 7 females in the type series, six taken on *Rubus strigosus* June 16–18, and one on *Epilobium angustifolium*, July 16, 1905. The series at hand consists of 4 females, of which I designate as lectotype the specimen bearing the following labels: "3501;" "Waldeboro, Me., J. H. Lovell;" "*Osmia melanotricha* L and C Type;" and "*Osmia melanotricha* Lov. and Ckll. Holotype" put on by Mitchell. The three paralectotypes are also from Waldeboro. Two were collected on *Rubus strigosus*, one June 16, 1905; the other June 18, 1905. The third is the single specimen taken on *E. angustifolium* on July 16, 1905. The paper refers to a specimen from Boulder Co., Colo., which probably remained with Cockerell. USNM Type No. 71582.

19. *Prosopis binghami* Lovell, 1910, pp. 180–181. The holotype by monotypy was originally the male of *P. affinis* Smith, described from "U.S. America." Lovell decided it was not conspecific with the type female, and named this new species. The specimen, probably collected in East Florida, is apparently still in the British Museum (Natural History.)

20. *Prosopis melitina* Lovell, 1911, p. 214. Holotype female by monotypy was collected by S. A. Shaw at Hampton, New Hampshire, July 4, 1907. USNM Type No. 71583.

21. *Prosopis minyra* Lovell, 1909, pp. 413–414. Holotype male by monotypy was collected by Nathan Banks at Church Bridge, Va., June 9. USNM Type No. 71584.

22. *Prosopis telepora* Lovell, 1911, pp. 213–214. The series of one female and two males from Southern Pines, North Carolina, is intact. I designate as lectotype male the specimen labeled as follows: "Southern Pines, N. C., iv. 9, A. H. Manee, 10 [no doubt meaning "1910"];" "Thorn;" "*Prosopis teleporus* male Type;" and "*Prosopis teleporus* Lov. Lectotype by Mitch." The paralectotypes bear the dates given in the original description. USNM Type No. 71585.

23. *Sphecodes banksii* Lovell, 1909, p. 416. All four syntypic females from Sea Cliff, Long Island, N.Y. have been located. Three, including one labeled "type" and the others "cotype," are in the Museum of Comparative Zoology at Harvard University; the fourth is now with the other Lovell types in the USNM. I designate as lectotype the female in the MCZ labeled "type," and have sent to Dr. Howard E. Evans a lectotype label for this specimen. The three paralectotypes are so labeled. The USNM paralectotype is USNM Type No. 71586.

24. *Sphecodes distolus* Lovell, 1909, pp. 416–417. Holotype female by monotypy was collected at Great Falls, Virginia, July 17, by Nathan Banks. USNM Type No. 71587.

25. *Sphecodes galerus* Lovell and Cockerell, 1907b, pp. 106–107. Holotype female by monotypy was collected at Hampton, New Hampshire, Sept. 9, 1905, by S. A. Shaw. USNM Type No. 71588.

26. *Sphecodes heterus* Lovell, 1911, pp. 212–213. The holotype female by monotypy was collected by S. A. Shaw at Hampton, New Hampshire. The pin data reads "ix. 6. 1908," but the date given in the description is Sept. 9, 1909. The specimen has a penned label "213" and another in red ink, probably written by Lovell, reading "*Sphecodes heterus* female type." USNM Type No. 71589.

27. *Sphecodes lautus* Lovell and Cockerell, 1907b, p. 102. The holotype female by monotypy bears the following labels: "3927;" "Waldeboro, Me., J. H. Lovell;" "*Spiraea salicifolia*, Aug. 4, 1905;" "*Sphecodes lautus* n. sp. Type female;" and a red holotype label affixed by Harvey B. Lovell. USNM Type No. 71590.

28. *Sphecodes levis* Lovell and Cockerell, 1907b, pp. 105–106. One female and one male were designated in the original description, and are at hand. I designate as lectotype the female, which bears the following labels: "014;" "Waldeboro, Maine;" "*Cornus canadensis*, June 11–July 1;" "*Sphecodes levis* female n. sp. Type;" and a red holotype label affixed by H. B. Lovell. The paralectotype male, also from Waldeboro, was collected on *Solidago bicolor*, and is numbered "979." USNM Type No. 71591.

29. *Sphecodes nephelotus* Lovell and Cockerell, 1907b, p. 106. The description was based on 14 males, of which all but three were found in the Lovell Collection. I designate as lectotype the male bearing the following labels: "2810;" "Waldeboro,

Me., J. H. Lovell;" "*Solidago juncea*, Aug. 7, 1904;" "*Sphecodes nephelotus* n. sp. Type male;" and a red holotype label in H. B. Lovell's hand. The paralectotypes, all from Waldeboro, include 2 males taken on *C. arvensis*, Aug. 6, 1905; 3 on *S. juncea*, Aug. 7, 1904 (2) and Aug. 3, 1905 (1); and 5 on *Solidago* (1 without abdomen), Aug. 17. USNM Type No. 71592.

30. *Sphecodes obscurans* Lovell and Cockerell, 1907b, p. 103. Holotype female by monotypy was collected on *Aralia hispida* at Waldeboro, Maine, by J. H. Lovell. It bears labels "505" "*Sphecodes obscurans* n. sp. Type female," and a red holotype label affixed by H. B. Lovell. USNM Type No. 71593.

31. *Sphecodes paraplesius* Lovell, 1911, p. 213. Holotype female by monotypy is labeled: "Kingston, R. I., 19 June 10;" and "*Sphecodes paraplesius* female Type." The description states that the specimen was "received from Professor John Barlow." The date given is "June 10," but the label seems to me to indicate June 19, 1910. There is also a red holotype label. USNM Type No. 71594.

32. *Sphecodes persimilis* Lovell and Cockerell, 1907b, p. 103. Two syntypic females are indicated in the original description, but I have found only one. I designate this specimen as lectotype. It is labeled: "948;" "Waldeboro, Maine;" "Umbellifer, July 14;" and "*Sphecodes persimilis* n. sp. Type female." It also bears a holotype label. The other specimen was also collected on "Umbelliferous flowers" at Waldeboro on July 19. USNM Type No. 71595.

33. *Sphecodes prosphorus* Lovell and Cockerell, 1907b, pp. 104–105. Two females and two males from Waldeboro were found in the Lovell Collection with data indicating them as syntypes. I designate as lectotype the female labeled as follows: "3438;" "Waldeboro, Me., J. H. Lovell;" "*Crataegus coccinea*, June 14, 1905;" and "*Sphecodes prosphorus* n. sp. Type female." Of the paralectotypes, the female also bears a holotype label affixed apparently by H. B. Lovell, and was collected on the same host and date as the lectotype. The paralectotypes male were taken on *Aralia hispida*, July 30, 1904, and on *Solidago*, Aug. 17, 1905. Also included in the series is a third male taken at Waldeboro Aug. 9 on *Solidago* ("2087") which is apparently not conspecific with the others. USNM Type No. 71596.

34. *Sphecodes shawi* Lovell, 1911, p. 212. The holotype female by monotypy was taken June 8, 1909, at Hampton, New Hampshire, by S. A. Shaw. USNM Type No. 71597.

Acknowledgments

I wish to thank the following for their assistance in this study: Dr. John A. Dillon, Jr., Dean of the Graduate School, University of Louisville; Dr. Howard E. Evans, Museum of Comparative Zoology, Harvard University; Dr. Karl V. Krombein, U.S. National Museum of Natural History; Mr. John H. Lovell II, Freeport, Bahama Islands; and Dr. Theodore B. Mitchell, North Carolina State University. I am particularly grateful to Dr. Paul D. Hurd, Jr., U.S. National Museum of Natural History, for his copious help and for reviewing the manuscript.

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A NEW NEOTROPICAL SCHENDYLURUS, WITH KEY TO ITS SOUTH AMERICA CONGENERS

(CHILOPODA: GEOPHILOMORPHA: SCHENDYLIDAE)

R. E. CRABILL, JR., *Department of Entomology, Smithsonian Institution, Washington, D.C. 20560*[1]

ABSTRACT—*Schendylurus* **olivaceus**, n. sp. is described from Brazil and a key to the South American species of *Schendylurus* is given.

So far as is known, *Schendylurus* inhabits only two areas of the globe, roughly speaking, the facing coasts of South America and Africa. It seems reasonable to suppose that this distribution, especially with par-

[1] This study was undertaken with the aid of a grant from the National Science Foundation. I am also indebted to my friend, Dr. Herbert Levi, Museum of Comparative Zoology, Harvard, for the generous hospitality and unstinting aid that facilitated this and many other studies.

allels in other schendylid genera, is not happenstance, for surely it suggests that historically there have been faunal exchanges between the two continents. Whether one or the other was donor or recipient or both donor and recipient I am not confidently prepared to say. And yet in light of this and other evidence it is tempting to imagine a movement from east to west on innumerable rafts carried by the South Equatorial Current.

The new species, *olivaceus*, is plainly most like the Suranamian *gracilis* Attems, from which it differs most notably as follows. In *gracilis*: (1) First sternite with porefield. (2) Tarsungular basal tooth present. (3) Undivided porefields present through sternite 37, that is, well toward the posterior end of the body. In *olivaceus*: (1) First sternite without a porefield. (2) Tarsungular basal tooth absent. (3) undivided porefields present only through sternite 15, that is, only on anterior portion of the body.

Schendylurus olivaceus, n. sp.

Holotype: male. Brazil: Rio de Janeiro, Serra dos Orgãos, 1900–2100 m. April 19–20, 1965. H. W. Levi, leg.; in log. Deposited in the Museum of Comparative Zoology, Harvard University.

GENERAL. Length, 35 mm. Leg pairs, 49. Body of uniform width over anterior ⅔, posterior ⅓ gradually attenuate. Color: head and legs bright yellowish-orange; dorsum pale olivaceous, with subsurface deep purplish band; pleuron flecked with purplish splotches.

ANTENNAE. Length to head length, 3.5:1. Filiform, each article except the first much longer than wide. Setae distally gradually decreasing in length and increasing in number. Articles 5, 9, and 13 each with a tiny distoventral group of abnormally short, modified setae, all robust, some with one point, some trifid; 14th article ectally and mesally with a subterminal group of clavate setae. CEPHALIC PLATE. Greatest length to greatest width, 10:9. Shape: anteriorly notably wider than posteriorly, 9:6; anteriorly rostrate, sides slightly excurved, rear straight. Prebasal plate totally exposed. Dorsally slightly domed. Cephalic suture absent. Anterior half totally coarsely areolate; posterolaterally weakly areolate. CLYPEUS. Uniformly fulvous except for an anterocentral, minutely areolate colorless area invested with two conspicuously long seate. Plagulae absent. Clypeolabral suture absent. Paraclypeal sutures: complete; meeting lateral ends of fulturae; sinuously curved. Buccae each with an anteromesal plagula. Fulturae: long, transverse, not oblique; anterior margin of cross-members coarsely areolate. Setae: sparse, the majority lateral, only about 12 anterocentral; posteriorly none except the 2 prelabral. LABRUM. Laterally and posterolaterally smooth, not areolate. Unipartite; the very shallow medial embayment with 17 blunt, shortly robust dark teeth, with 2–3 teeth laterad thereof. MANDIBLE. Shaft proximally strongly curved; condyle prominent; corpus divided; dentate lamella with 13 dark teeth in three blocks, viz. 7, 3, 3. FIRST MAXILLAE. Coxosternum: anteroposteriorly deep; lappets scabrous, well-developed, robust. Telopodite: biarticulate; demarcated clearly from coxosternum; lappets very robust, reaching ½ the telopodite length.

SECOND MAXILLAE. Isthmus anteroposteriorly deep, areolate, neither hyaline nor suturate. Postmaxillary sclerites large, discrete from both isthmus and posterolateral extensions. Telopodite: articles length, longest to shortest, 1, 3, 2; article 1 basal condyles both present, equal; terminal claw very long, to length of article 3, 9:14, on edge with a row of hyaline filaments, distally notably curved.

FORCIPULAR SEGMENT. Flexed prehensors: long, slightly exceeding anterior head margin; all articles unarmed. Tarsungula: presentation dorsomesal; ventral edge finely serrulate; poison calyx long, of linear type, not subspherical. Prosternum: Pleurograms and anterior denticles absent; pleuroprosternum sutures strongly oblique, complete.

TERGITES. Setae: on anterior body shorter and less numerous than on posterior body. Bisulcate. Distinctly pale olive-green; their translucent surface revealing underlying deeply pigmented diamond-shaped alary bodies (nephrocytes?) which collectively are manifest as a long, geminate band. PLEURITES. Flecked with subsurface purplish splotches. Spiracles subcircular. LEGS. Relatively long, especially tarsi. Moderately shortly hirsute but without notably long setae. Pretarsal parungues: anterior parungues double, posteriors single and slightly longer than the anteriors. STERNITES. All longer than wide, this lengthening an increasing tendency cephalocaudally. Sulci and *carpophagus*-structures absent. Coarsely areolate except for smooth area surrounding each porefield. Ventral porefields: present on 2nd through ultimate sternite minus 2; on 2 through 15 undivided, transversely elliptical, on 16 through ultimate minus 2 centrally divided, each subcircular, becoming very small on rear body.

ULTIMATE PEDAL SEGMENT. Pretergite laterally separate from its pleurites. Tergite wider than long. Presternite medially undivided. Sternite: wider than long; laterally slightly convergent. Coxopleura: little inflated, short; dorsally nonporous; each ventrally with two large homogeneous gland cavities which exit beneath sternite margin. Telopodite: longer than penult; the two tarsalia notably narrower than foregoing articles; distotarsus slightly longer than proximotarsus; pretarsus a setose turbercle.

POSTPEDAL SEGMENTS. Male gonopods rather flat, biarticulate. Anal pores absent.

Schendylurus: Key to South American Species

The underlying key, except for the second couplet, has been modified from Attems (*Tierreich*, Lief. 52, pp. 73–74, 1929, and Sonderab. Ann. Naturh. Mus. Wien, Bd. 55, pp. 86–87, 1947). Because of the poverty of useful information in their original descriptions two species have not been included in this key: *colombianus* Chamberlin (Occas. Papers Mus. Zool. Michigan, 97, p. 20, 1921) and *iguapensis* Verhoeff (Zool. Jahrb., Bd. 71, p. 379, 1938). Although their placement in the latter part of the key is uncertain, there is no question in my mind that they are distinct from the new species proposed here.

1a. Ultimate pretarsus present as a setose tubercle 2
1b. Ultimate pretarsus wholly absent 3
2a. First sternite with a porefield. Tarsungula with a small basal tooth; ventral edge not serrulate. Single porefields present through sternite 37 .... **gracilis** Attems

2b. First sternite without a porefield. Tarsungula basally without a tooth; ventral edge smooth. Single porefields present only through sternite 15 .... **olivaceus**, n. sp.
3a. Porefields present only on anterior body .... **luederwaldi** Broelemann and Ribaut
3b. Porefields present on anterior and posterior body 4
4a. First sternite with porefield 5
4b. First sternite without porefield 7
5a. All porefields undivided .... **labbanus** Chamberlin
5b. Porefields of posterior body divided 6
6a. Leg pairs, 47. Only porefields 19–22 divided .... **tropicus** Broelemann and Ribaut
6b. Leg pairs, 69. Most porefields divided .... **demelloi** Verhoeff
7a. Certain porefields divided 8
7b. All porefields undivided 9
8a. Leg pairs, 65. Labrum with about 30 teeth. Clypeus with about 40 irregularly distributed setae .... **gounelli** (Broelemann)
8b. Leg pairs, 51. Labrum with about 12 teeth. Clypeus with about 25 seriate setae .... **verhoeffi** Broelemann and Ribaut
9a. Leg pairs, 47. Sternites without *carpophagus*-structures. Penult without porefield .... **lesnei** Broelemann and Ribaut
9b. Some sternites with *carpophagus*-structures. Penult with porefield 10
10a. Antennae 3 times longer than head. Ultimate tarsus 2 times longer and thinner than tarsus 1. Prehensors not reaching head margin. Leg pairs, 37 .... **perditus** Chamberlin
10b. Antennae 2× longer than head. Ultimate tarsus 2 equal to tarsus 1. Prehensors reaching head margin. Leg pairs, 47 .... **bakeri** Chamberlin

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A NEW GILPINIA FROM CHINA

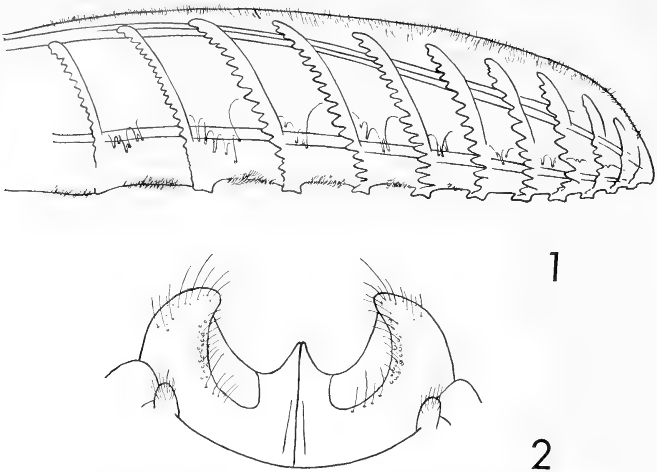
(Hymenoptera: Diprionidae)

David R. Smith, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—*Gilpinia* **disa**, n. sp., from Yunnan Province, China, is described.

While identifying some Asian Diprionidae, I discovered an undescribed species of *Gilpinia* Benson in the U.S. National Museum collection. The species of this family are all potential forest pests, and I believe it worthwhile to describe this new species at this time.

[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.



Figs. 1–2. *Gilpinia disa*, n. sp.: 1, lancet; 2, sheath, dorsal view.

The tips of the antennae, front legs, and all tarsi are missing in both specimens. However, the specimens are not damaged enough to obscure the generic and specific characters required for identification of the Diprionidae.

Gilpinia disa, n. sp.

Female.—Length, 6.7 mm. Black, with midtibia, hindtibia except extreme apex, and each tarsus whitish; maxillary and labial palpi, first and second antennal segments, and posterior two-thirds of tegula brownish. Wings lightly, uniformly infuscated.

Antenna with more than 15 segments (apex broken); ramus of each segment beyond third nearly twice as long as its segment. Head shining, moderately punctate, punctures distinct and usually separated; malar space longer than length of first two antennal segments. Thorax shining; mesopleuron and mesosternum moderately punctate, punctures distinct and separated; punctures of mesonotum small except for mesoscutellum which has large coarse punctures. Cenchri broad, distance between cenchri shorter than breadth of one. Hindtibial spurs simple, inner spur half length of hindbasitarsus. Anal cell of forewing with crossvein; anal cell of hindwing long and broad, its petiole subequal to width of cell at its widest point. Abdomen shining, with well-spaced punctures, fewer punctures on tergites 2 to 6. Sheath with scopa; lateral halves of scopa long, laterally expanded (fig. 2); cerci short, less than one-third length of sheath. Lancet as in fig. 1, with 10 annuli; annuli parallel; ventral margin of lancet straight.

Male.—Unknown.

Holotype.—Female, U. S. N. M. type no. 71215, labeled "8th Malaria Survey APO 627, XII-27-44, S. Billings 2541." According to notes on file in the Systematic Entomology Laboratory, U.S. Department of Agriculture, APO 627 refers to specimens collected from September 1943 to December 1945 from Kunming, China (Yunnan Province).

Paratype.—One female, same data as for holotype. In the U.S. National Museum.

Host.—Unknown.

Discussion.—All characters agree with those of the genus *Gilpinia* as defined by Benson (1939) except for the shorter petiole of the anal cell of the hindwing. The almost entirely black coloration, the expanded scopa of the sheath, the simple hindtibial spurs, and the lancet should distinguish this species from all other described species of *Gilpinia*. This species is unlike any of those treated by Takeuchi (1940) in his study of the Diprionidae of the Japanese Empire or by Gussakovskii (1947) in his revision of the Palaearctic Diprionidae. Only two other species of Diprionidae have been recorded from China, *Nesodiprion biremis* (Konow) and *Gilpinia marshalli* (Forsius). Forsius (1931) described *marshalli* from Foochow, China. *Gilpinia coreana* (Tahagi), described from North Korea, may also occur in China.

The name proposed for this species is an arbitrary combination of letters and should be treated as a noun.

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LECTOTYPE DESIGNATIONS FOR SOME BRUCHIDAE DESCRIBED BY ERICHSON FROM SOUTH AMERICA (COLEOPTERA)

JOHN M. KINGSOLVER, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—Lectotype designations are given for 5 of the 7 species of South American Bruchidae described by W. F. Erichson (Coleoptera).

Erichson described seven species of Bruchidae from South America in 3 papers (1834, 1847, 1848). One of these species, *Bruchus spinipes* Erichson, 1834, was treated by Decelle (1966), who placed it in the genus *Pseudopachymerina*. Both Pic (1913) and Decelle (1966) erroneously listed the date of publication of this species as 1833.

Type series of the other six species were kindly loaned to me by Dr. F. Hieke of the Zoological Museum, Humboldt University, Berlin. Lectotypes are herein designated where necessary, and label data and sex of specimens are given. The species are also placed in their proper genera where this is possible. All specimens are deposited in the Zoological Museum, Humboldt University.

Bruchus jaspideus Erichson, 1847, p. 125

Lectotype, ♂, present designation, bearing following labels "jaspideus Er. Peru v. Tschudi, Humboldt Museum No. 53708." Paralectotype ♂; label data "Peru v. Tschudi 53708."

This species is a junior synonym of *Pseudopachymerina spinipes* (Er.). Its correct combination is *Pseudopachymerina jaspideus* (Er.), **new combination, new synonymy**.

Spermophagus lupinus Erichson, 1848, p. 567

Unique type, ♀, bearing following labels "lupinus- Er., Brit. Guyan, Schombg., Humboldt Museum type No. 53421."

The correct combination for this species is *Amblycerus lupinus* (Er.), first used by Blackwelder (1946).

Bruchus ramicornis Erichson, 1848, p. 567

Lectotype, ♀, present designation, bearing following labels "Brit. Guiani, Schomb, Humboldt Museum No. 53630," and "ramicornis Er." Paralectotype, ♂; label data "Brit Guyana Schomburgh 53630."

The correct combination for this species is *Megacerus ramicornis* (Er.) first used by Blackwelder (1946).

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[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

Bruchus tabidus Erichson, 1847, p. 124

Lectotype, ♀, present designation, bearing following labels "tabidus Er. Peru v. Tschudi, Humboldt Museum No. 53698." Five paralectotypes, 2♂, 3♀, each with the label "Peru v. Tschudi 53968."

Blackwelder (1946) placed this species in *Acanthoscelides*, a broad, composite genus presently under study, and I prefer to leave it under that combination pending completion of the revisionary studies.

Bruchus testudinarius Erichson, 1847, p. 124

Lectotype, ♀, present designation, bearing following labels "testudinarius Er. Peru v. Tsch., Humboldt Museum No. 53513." Paralectotype ♀, label data "v. Tschudi 53135."

Blackwelder (1946) placed this species in *Acanthoscelides*, but the correct combination is *Stator testudinarius* (Er.), **new combination**.

Bruchus eulophus Erichson, 1847, p. 124

Lectotype, ♂, present designation, bearing following labels "eulophus Er. Peru v. Tschudi, Humboldt Museum No. 53632." Six paralectotypes, 2♂, 4♀, all with identical labels "Peru v. Tschudi 53632."

Blackwelder (1946) placed this species in *Acanthoscelides*, but the correct combination is *Megacerus eulophus* (Er.), **new combination**.

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APHIDS IN A YELLOW WATER-PAN IN HADDONFIELD, NEW JERSEY

MORTIMER D. LEONARD, *Collaborator, Entomology Research Division, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—During a 10-year period 125 species of winged aphids have been collected from a yellow water-pan in Haddonfield, New Jersey. Of these, 28 species have not otherwise been found in New Jersey. The 125 pan aphids constitute 53% of the 237 species known to occur in the State.

Haddonfield, New Jersey is situated just across the river from Philadelphia. It is a very old, established community with many tree-lined streets with lawns and gardens of ornamental shrubs and flowers. The surrounding area has woods, ponds, streams and fields and many kinds of plants grow wild.

For many years my wife and I have visited her sister's home in Haddonfield and during the growing season I have always collected aphids in the vicinity. I finally conceived the notion of placing a yellow water-pan out in the yard of this home to see if it would attract flying aphids in that particular situation. The cover of an ash can about 22 in. in diameter was painted on the concave surface a rich yellow and raised a couple of feet above the ground. The pan was first used about 1960 and aphids have been identified from it through 1969 and some in 1970.

During this past decade the pan was in operation during my periodic visits two or three times a year from spring to fall for a week or ten days to a couple of weeks at a time. However in 1963 it was in almost continuous operation from July to the end of November. A fairly accurate record shows that over 4,000 winged aphids were collected from the pan during the decade it was in operation.

To date, about 237 species of aphids have been recorded as occurring in New Jersey. Of these about 125 species have also been found in the pan—53% of the total. Of these, 28 species have never been collected on plants in New Jersey.

Names or initials in parentheses following collections refer to the determinor. Otherwise, all determinations were made by Dr. F. W. Quednau, Research Laboratory, Candian Forest Service, Quebec Canada to whom I am most grateful.

ANT is Dr. A. N. Tissot, University of Florida.

JOP is Prof. J. O. Pepper, State College, Penna.

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[1] Mail address: 2480 16th Street, N.W., Washington, D.C. 20009.

Rolston is Dr. L H. Rolston, Louisiana State University.

Testerman is Gladys Testerman, late of Haddonfield, N.J.

The figures which follow each collection date indicate the number of specimens.

List Of Aphids[2]

Acyrthosiphon pisum (Harris). 14-24.VII.65—2 (Rolston); 12-23.X.69—3 (Rolston).

* *Amphorophora agathonica* Hottes. 16-23.V.70—1.

Anoecia corni (Fabricius). 16-30.IX.63—9; 1-31.X.63—6; 1-5.XI.65—2 (all MDL).

Anoecia querci (Fitch). 16-30.IX.63—4; 16-31.X.63—11; 12-23.X.69—2.

* *Aphis armoraciae* Cowen. 22-30.VII.63—3; 14-24.VI.69—1. Rocky Mountain Region and N.Y.

Aphis cephalanthi Thomas. 22-30.VII.63—13; 14-24.VI.69—16.

Aphis coreopsidis (Thomas) 14-24.VI.69—12; 12-23.X.69—1; 16-23.V.70—7.

Aphis craccivora Koch. 23-31.VII.63—3; 16-31.X.63—2; 14-24.VI.69—1.

Aphis fabae Scopoli. 16-30.IX.63—16; 16-31.X.63—64; 11-19.XI.66—1; 14-24.VI.69—6; 12-23.X.69—16; 16-23.V.70—34.

* *Aphis farinosa* Gmelin. 14-24.VI.69—1. Pa on *Salix* & NY.

Aphis gossypii Glover. 16-30.IX.63—9; 16-31.X.63—10; 11-19.IX.66—10; 14-24.VI.69—9; 12-23.X.69—13.

Aphis helianthi Monell. 14-24.VI.69—4.

Aphis incognita Hottes & Frison—see *Ceodaphis*.

* *Aphis maculatae* Oestlund. 16-31.X.63—1. Also in Pa. D.C. NY.

Aphis nasturtii Kaltenbach. 14-24.VI.69—1.

Aphis nerii Boisduval. 23-31.VII.63—1; 12-23.X.69—8. 2nd NJ.

Aphis oenotherae Oestlund. 16-30.IX.63—1.

Aphis pomi DeGeer. V.61—3. (MDL).; 23-31.VII.63—1; 14-24.VI.69—1.

Aphis rubifolii (Thomas). 13-31.VII.63—1; 16-31.X.63—1; 14-24.VI.69—3; 12-23.X.69—1.

Aphis rumicis Linnaeus. 23-30.VI.63—5; 14-24.VI.69—1.

Aphis sambucifoliae Fitch. IX.61—1 (MDL); 16-30.IX.63—3; 16-31.X.63—7.

Aphis spiraecola Patch. 23-30.VII.63—75; 16-31.X.63—9; 14-24.VI.69—118; 12-23.X.69—11; 16-25.V.70—24.

Aphis viburniphila Patch. 23-30.VI.63—1; 16-23.V.70—1.

Brachycaudus cardui (Linnaeus). 12-23.X.69—1.

Brachycaudus helichrysi (Kaltenbach). 16-31.X.63—1.

Brevicoryne brassicae (Linnaeus). 23-31.VI.63—1; 16-31.X.63—80; 16-30.IX.63—26; 11-19.XI.66—1; 22-24.X.68—4; (MDL); 12-23.X.69—1.

Calaphis alni Baker. 18.VI.67—2. (Also Mo Wisc Pa Va N B Canada).

Calaphis betulaecolens (Fitch). 17-18.VI.66 and 19-22.VI.66—16 (MDL & FWQ) (Omitted from "More Records of New Jersey Aphids).

Calaphis betulella Walsh. IX.61—3; VIII.63—3; 9-15.V.65—6; 16.VI.67—2; 13-22.VI.67—2; 15.VI.66—3; 17-18.VI.66—6; 19-22.VI.66—3; 14-24.VI.69—9; 16-23.V.70—1. (All MDL).

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[2] Species preceded by an asterisk (*) have not been found on plants previously in New Jersey.

Calaphis (*Calipterinella*) *callipterus* (Hartig). 14-24.VI.69—25. (Also Hyattsville, Md. Nov 1965 on white birch).

Calaphis castaneae (Fitch). 12-28.X.69—2.

Calaphis leonardi Quednau. (A birch aphid). 16.VI.67—2; 12-23.X.69—4; 16-23.V.70—17. Also in NY (Stat. Id.) Mass. N B and Que.

* *Capitophorus carduinus* (Walker). Recorded from California, Wash & Mo. 16-31.X.63—1; 14-24.VI.69—1; 12-23.X.69—1.

Capitophorus elaeagni (del Guercio) 15-25.V.61—3 and IX.61—1 (Testerman coll); 16-31.X.63—169 incl. 53 males; 16-30.XI.63—63; 1-15.XI.65—3; 16.VII.65—2; 16.VI.66—1—all MDL det.

Capitophorus hippophoes (Walker). 18.IX–early XII.60 very many incl. males (Testerman coll) probably a mixture of this species and *elaeagni*; 16-30.XI.63—3; daily collecting throughout Oct and Nov 1963 totalled over 100 males; 16.VI.66—2; 11-19.XI.66—11; 14-24.VII.69—5; 12-23.X.69—34 may be a mixture of *elaeagni* and *hippophoes* (all above MDL det).

* *Capitophorus xanthii* (Oestlund) Throughout Rocky Mt. Region & Wash. 16-20.IX.63—5; 14-24.VI.67—3.

* *Cavariella hendersoni* Knowlton & Smith. 16-23.V.70—1. Also Pa and NY.

* *Cedoaphis incognita* Hottes & Frison 12-23.X.69—4. Also in Colo Utah Nev. Wash on *Symphoricarpos*.

* *Chaitophorus salicicola* Essig. 16-31.X.69—3. Only Calif.

* *Chaitophorus stevensis* Sanborn. 16-23.V.70—1. Conn NY Pa etc.

* *Chaitophorus versicolor* (Koch). 16-31.X.63—1. Also Calif & N B.

Chaitophorus viminalis Monell. 13-22.VI.63—1.

Colopha ulmicola (Fitch). IX.61—2 (Testerman Coll—JOP det); 16-30.IX.63—2; 16-31.X.63—2.

Coloradoa artemisiae (del Guercio) ? same as *C. rufomaculata* Wms. 16-31.X.63—1.

Dactynotus ambrosiae (Thomas). 16-18.VI.66—1 (MDL); 14-24.65—1. (Rolston); late IV. and IX.61—1 each (Testerman coll—JOP det).

Dactynotus chrysanthemi (Oestlund) IX.61—1 (Testerman coll—JOP det).

Dactynotus nigrotuberculatus Olive. 17-18.VI.66—several.

Dactynotus tissoti Boudreaux. 13-22.X.67—2.

Drepanaphis acerifolii (Thomas). 16-31.X.63—(MDL); 14-24.VI.69—1; 12-23.X.69—2 males and 16-23.V.70—2 (Dillery).

Drepanaphis carolinensis Smith. 16-30.IX.63—4 (CFS); 14-24.VI.69—1 vivip. and 12-23.X.69—29 males, 5 vivips. (Dillery); 16-23.V.70—8 (Dillery).

Drepanaphis keshenae Granovsky 12-23.X.69—1; 16-25.V.70—1. Only one previous record for New Jersey.

* *Drepanaphis nigricans* Smith. 12-23.X.69—1. N B S Car & West to Mich & Tenn.

Drepanaphis parva Smith. X.63—2; 14-24.VI.69—1 (Dillery).

Drepanaphis simpsoni Smith. X.63—2; (C F Smith). 12-23.X.69—1 male 1 vivip (Dillery). Second record for New Jersey.

* *Dysaphis crataegi* (Kaltenbach). 16-30.IX.61—11; 16-31.X.63—57; 16-30.XI.63—2; 11-19.XI.66—12; 12-23.X.69—43. Not identified in the U S A until rather recently but it appears to be widely distributed.

Dysaphis tulipae (Boisduval). 16-30.IX.63—1; 12-23.X.69—3.

Eriosoma rileyi (Thomas). 15-23.V.70—3. Second rec for N J.

Eucallipterus tilae (Linnaeus). 19-22.VI.66—1; 13-26.IX.62—1; 16-30.XI.63—1; VII.63—1; XI.63—1 (all MDL det).

Euceraphis lineata Baker. 12-23.X.69—1. Second rec for N J.

Euceraphis mucida (Fitch). 22-24.X.68—1 sexupara, 2 males; 16-22.V.70—1. Third rec for N J.

Euceraphis punctipennis (Zetterstedt). 14-24.VI.69—3.

Eulachnus rileyi (Williams). X.63—17. (ANT).

Hormaphis hamamelidis (Fitch). 14-24.VI.69—3.

Hyadaphis foeniculi (Passerini). 16-31.X.63—3; X.61—1 (Testerman coll—MDL det); 14-29.VI.69—3.

* *Hyalopterus amygdali* (Blanchard). 23-31.VII.63—1. Cyrus Thomas in Eighth Rept. State Ent. Ill. 1879 p. 102 lists this species as *Aphis amygdali* Blanchard but states "I know nothing personally in reference to this species."

Hyalopterus pruni (Geoffroy). 23-31.VII.63—1; 16-31.X.63—6; 11-19.XI.66—1; 14-24.VI.69—1; 12-23.X.69—3.

Hyperomyzus lactucae (Linnaeus).—see *Nasonovia lactucae* (L.).

* *Hyperomyzus pallidus* Hille Ris Lambers. 12-23.X.69—1.

Hysteroneura setariae (Thomas). 16-31.X.63—63; 16-30.XI.63—1; 11-19.XI.66—3; 12-22.X.69—250.

* *Izyphya flabella* Sanborn. 16.VI.66—1 (MDL).

Liosomaphis berberidis (Kaltenbach). 16-31.X.63—2.

Lippaphis erisymi (Kaltenbach). 14-24.VI.69—4; 12-23.X.69—2.

Macrosiphum avenae (Fabricius). Late IV and V.59—on yellow cloth (Testerman coll—MDL det); 12-23.X.69—1.

Macrosiphum euphorbiae (Thomas). 13-29.IX.62—2 (MDL); VII.63—1; IX.63—6 (MDL); X. 65—many (MDL); 15-16.VI.66—6 (MDL); 13-22.VI.67—4 (MDL); 12-23.X.69—1 (MDL); 16-25.V.70—1.

Macrosiphum liriodendri (Monell). 19-24.VI.69—1.

* *Macrosiphum pallidum* (Oestlund). 12-23.X.69—4 (Rolston).

Macrosiphum rosae (Linnaeus). IX.63—several (MDL); 8-12.VI.67—2 (MDL); 12-23.X.69—1 (MDL).

Melanocallis caryaefoliae (Davis). 16.VI.67—1 or 2.

Monellia costalis (Fitch). XI.63—3 (MDL).

* *Monellia* n. sp. Quednau in MS. 16-23.V.70—1.

* *Monellia microsetosa* Richards. 16-23.V.70—1.

Myzocallis alnifoliae (Fitch).—see *Pterocallis.*

Myzocallis bella Walsh. VIII.63—3 (ANT).

Myzocallis coryli Goetze. 14-24.VI.69—1. Second rec for N J.

Myzocallis discolor Monell. 19-22.VI.66 and 7-12.VI.67—2 (MDL); 14-24.VI.69—5 (MDL).

Myzocallis exultans Boudreaux & Tissot. 16-31.X.63—1; 8-10.VI.66—34; 14-24.VI.69—50; 16-23.V.70—11 (ANT/FWQ).

Myzocallis frisoni Boudreaux & Tissot. VIII.63—4; IX.63—4; VIII-IX.65 (all ANT det).

* *Myzocallis kahawaluokalani* Kirkaldy. 14-24.VI.69—4 (MDL). First record of the occurrence of the crepemyrtle aphid in N J and also its most northern occurrence in the U S A.

Myzocallis longiunguis Boudreaux & Tissot. 14-24.VI.69—1. Two earlier records for New Jersey.

Myzocallis melanocera Boudreaux & Tissot. 14-24.VI.69—1; VIII.63—2 (ANT); 16-23.V.70—2 (ANT). Third rec for N J.

Myzocallis multisetis Boudreaux & Tissot. 29.V.59—1 on yellow cloth, ?month 1963—2 and 16-23.V.70—13 all ANT.

Myzocallis punctata (Monell). 16-30.IX.63—1; 16.VI.66—1; 17-18.VI.66—1; 19-22.VI.66—3; 14-24.VI.69—15; 16-23.V.70—9 (all MDL).

* *Myzocallis tuberculata* Richards. 14-24.VI.69—1. Also NY & Ont.

Myzus cerasi (Fitch). 16-31.X.63—2.

Myzus lythri (Schrank). 16-30.IX.63—2; 16-31.X.63—13; 16-30.XI.63—4; 12-23.X.69—20. Two previous recs in NJ.

Myzus persicae (Sulzer). 13-26.IX.62—1; 16-31.X.63—4; 16-30.XI.63—1; 16-30.IX.63—4; 11-19.XI.66—3; 13-22.VI.67—1; 12.VIII.67—3; 12-23.X.69—9; 14-24.VI.69—14; (All MDL).

Nasonovia ribisnigri (Mosley). 16-31.X.63—1; 3 previous recs NJ.

Nasonovia (Hyperomyzus) lactucae (Linnaeus). 12-23.X.69—1.

Nearctaphis bakeri (Cowen) see—*Roepkea bakeri* (Cowen).

Neoceruraphis viburnicola (Gillette). 19-24.V.68 a number of spring migrants; 12-23.X.69—1.

Ovatus crataegarius (Walker). 14-24.VI.69—1.

Pemphigus populitransversus Riley. 1959—1 (Testerman coll—JOP det).

Periphyllus californiensis (Shinji). Late IV.59—12 on yellow cloth (Testerman coll—JOB det); 9-15.V.65—540 (JOP); most of the aphids taken were during the first 4 days, the total number in the pan during the week 1336 of which this species constituted about 40% (JOP); 16-30.X.63—1; 11-19.XI.66—4; 16-23.V.70—2. Also in Calif Wash Pa.

Periphyllus negundinis (Thomas). 16-30.IX.63—1.

Phorodon humuli (Schrank). 10-30.IX.63—1.

Phyllaphis fagi (Linnaeus). 16-31.X.63—1; 11-19.XI.66—7; 13-22.VI.69—3 (MDL & FWQ).

Pleotrichophorus glandulosus (Kaltenbach). 16-25.V.70—2.

* *Pleotrichophorus wasatchii* Knowlton. 14-24.VI.69—19. Elsewhere recorded only from Colo Utah NY and Pa.

* *Prociphilus alnifolii fitchii* Baker & Davidson. 12-23.X.69—1. Previously named *P. corrugatans* (Sirrine).

Prociphilus americanus Walker. 11-19.XI.66—2. Second NJ rec. Det as *venafuscus* Patch. Also in Colo Calif NY and Quebec.

Prociphilus fraxinifolii (Riley). 14-24.VI.69—3. Second NJ rec.

Pterocallis alnifoliae (Fitch). Formerly in *Myzocallis*. 14-24.VI.69—1. Second NJ rec.

* *Pterocallis rhombifoliae* (Granovsky). 12-23.X.69—1. Formerly in *Myzocallis*. An *Alnus* aphid. Also in Calif and Wisc.

Pterocomma smithiae (Monell). 12-23.X.69—1.

* *Rhopalomyzus physocarpi* (Pepper). 12-23.X.63—5. Also in Pa. Second rec in NJ.

* *Rhopalomyzus poae* (Gillette). 16-31.X.63—2; 16-30.XII.—3; 14-24.VI.69—1. Also occurs in Colo.

* *Rhopalosiphum enigmae* Hottes & Frison. Sept 1961—1 (Testerman coll—JOP det with query).

Rhopalosiphum fitchii (Sanderson). 23-31.VII.63—5; 16-31.X.63—6; 16-30.XII. 63—15; 11-19.XI.66—4; 12-23.X.69—3.

Rhopalosiphum maidis (Fitch). IX.69—5 (Testerman coll—JOB det); 23-31.VII. 63—1; 16-31.X.63—6; 16-30.XI.63—15; 11-19.XI.66—4; 12-23.X.69—3.

* *Rhopalosiphum padi* (Linnaeus). 16-31.X.63—1; 14-24.VI.69—4; 12-28.X.69—74.

Roepkea (Nearctaphis) bakeri (Cowen). 16-31.X.63—2; 16-29.IX.63—2.

Schizaphis graminum (Rondani). 16-31.X.63—1; 16-30.XI.63—1. Very rare in NJ.

* *Sipha (Rungsia) kurdjumovi* (Mordvilko). 16-30.XI.63—1. The only other record for N. Am. known to me is that in Quednau's Aphids of Quebec, Canada (Can. Ent. 98(4):416, 1966) in which he lists it as occurring on *Agropyron repens.*

Sitomyzus rhois (Monell). Det as *Glabromyzus rhois.* IX.61—1 (Testerman coll); 16-30.IX.63—1; 16-31.X.63—2; 2-23.X.69—2.

* *Takecallis arundinariae* (Essig). 12-23.X.69—1. Known only from bamboo in California but has also been collected in 1969 on Staten Island, NY.

* *Thecabius populiconduplifolius* Cowen. 16-31.X.63—1; 16-30.IX.63—1. Known only from *Populus* spp. and *Ranunculus* in Colo Pa and NY.

Therioaphis trifolii (Monell). 12-23.X.69—1.

Tinocallis ulmifolii (Monell). 14-24.VI.69—9; 12-23.X.69—1.

A NEW GENUS, STENASPILATODES

(Lepidoptera: Geometridae: Ennominae)

John G. Franclemont, *Department of Entomology, Cornell University, Ithaca, New York 14850*

and

Robert W. Poole, *Illinois Natural History Survey, Urbana, Illinois 61801*

ABSTRACT—A new genus, **Stenaspilatodes**, is proposed for *Caberodes antidiscaria* Walker, a species now included in the genus *Stenaspilates* Packard. The moths of the northern and southern populations and the male genitalia are figured.

A recent revision (Poole ms.) of the genus *Pergama* Herrich-Schäffer (*olim Pero* Herrich-Schäffer) of which *Stenaspilates* Packard is considered a junior synonym makes it necessary to erect a new genus for *Caberodes antidiscaria* Walker. This species has been placed in the genus *Gonodontis* Hübner, the genus *Metarranthis* Warren and was removed from that genus and placed in *Stenaspilates* by Rupert.

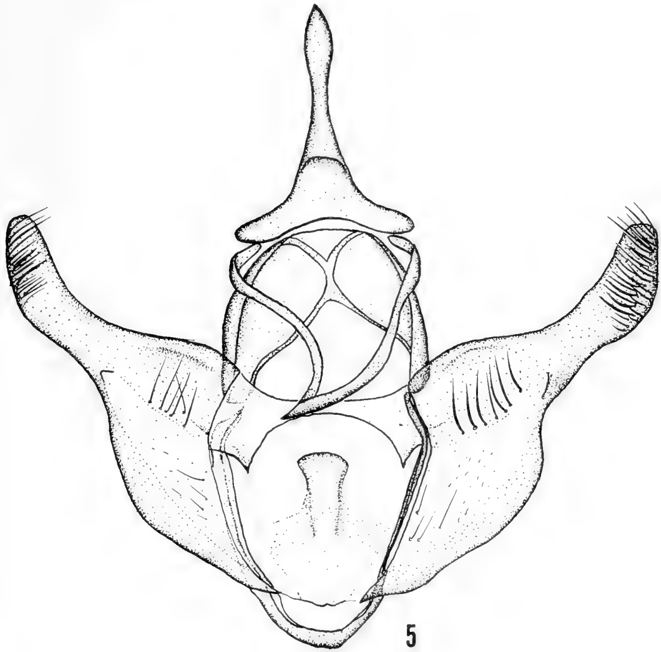
Stenaspilatodes Franclemont and Poole, n. gen.

Type Species: *Caberodes antidiscaria* Walker, 1863. Present designation and monobasic.

Figs. 1–4. *Stenaspilatodes antidiscaria* (Walker): 1, male, Oneco, Manatee Co., Florida, 1 April 1954, J. G. Franclemont (Franclemont Collection); 2, female, Archbold Biological Station, Lake Placid, Highlands Co., Florida, 30 March 1959, J. G. Franclemont (Franclemont Collection); 3, male, Wrangle Brook Road, Lakehurst, New Jersey, 26 June 1954, J. G. Franclemont (Franclemont Collection); 4, female, Wrangle Brook Road, Lakehurst, New Jersey, 4 June 1956, J. G. Franclemont (Franclemont Collection).

The species included in this genus is similar in general appearance to those in the genus *Pergama*, but the genitalia of the male and female are simplified and without the specializations of those of the species placed in that genus. The antennae of the male are pectinate and thus differ from most of the species placed in *Pergama*. The genus is probably most closely related to *Pergama* and possibly represents a reduction derivative from that complex.

Description: Superficially similar to *Pergama*. Antennae of male pectinate, the pectinations unscaled, of female simple; palpi long, ascending and porrect, exceeding the pointed frontal tuft of long hair-like scales by almost half their length; proboscis well developed. Thorax clothed with spatulate and hair-like scales intermixed, with a central, longitudinal scale ridge; foreleg with a prominent, long hair-pencil from base of epiphysis; hind tibia with two pairs of spurs; forewings with apices slightly produced, outer margins rounded; hindwings slightly angulate at veins R and Cu_1; venation as in *Pergama*. Abdomen clothed with appressed scales, with an indication of lateral tufts on the segments in the male; male genitalia with valve narrowed toward apex, without the distinct costal fold characteristic of



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Figs. 5–6. *Stenaspilatodes antidiscaria* (Walker): 5, male genitalia with aedoeagus removed, Lakehurst, New Jersey, 23–31 May, Frdk Lemmer, R. W. Poole genitalia slide 10047 (Cornell University Collection); 6, aedoeagus of male, same data as above.

Pergama, apex of valve spinous, gnathos simple, uncinate, uncus long, juxta simple; female genitalia with ostium not modified, bursa with a single, weak, stellate signum.

Stenaspilatodes antidiscaria (Walker), n. comb.

Caberodes antidiscaria Walker, 1862, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, part 26:1513. Type locality: East

Florida. Presented by E. Doubleday, Esq. Location of Type: British Museum (Natural History)

Caberodes antidiscaria: Packard, 1876, Report of the United States Geological Survey of the Territories, vol. 10, A Monograph of the Geometrid Moths or Phalaenidae, pl. 13, fig. 54. (An illustration of Walker's type.)

Endropia lentaria Hulst, 1886, Ent. Amer. 1:207 Type locality: Florida: Coll. Neumoegen, Coll. Hulst. Location of Type: United States National Museum.

Hulst described this species from four specimens; of these two are in the United States National Museum Collection, and one is in the American Museum of Natural History Collection; we do not know the whereabouts of the fourth specimen. One of the four specimens has customarily been accorded the status of "type" and has so been referred to in print. This specimen is in the United States National Museum from the Neumoegen Collection through the Brooklyn Museum Collection; it is designated the LECTOTYPE, and the data labels are as follows: "Central Florida; Col. B. Neumögen/ Collection Brooklyn Mus/ Endropia lentaria Hulst Type/ Type No. 34288 U.S.N.M./ ♂ genitalia on slide 9 June 1942 HWC 1656."

Caberodes antidiscaria: Hulst, 1887, Ent. Amer. 3:113. (*Endropia lentaria* Hulst synonymized with *Caberodes antidiscaria* Walker.)

Caberodes antidiscaria: Hulst, 1895, Ent. News 6:14. (Synonymy of *lentaria* and *antidiscaria* confirmed.)

Gonodontis antidiscaria (Walker): Hulst, 1896, Trans. Amer. Ent. Soc. 23:374.

Metarranthis antidiscaria (Walker): McDunnough, 1938, Mem. So. California Acad. Sci. 1, Check List of the Lepidoptera of Canada and the United States of America, Part 1, Macrolepidoptera: 169.

Stenaspilates antidiscaria (Walker): Rupert, 1943, J. New York Ent. Soc. 51:134.

Stenaspilates antidiscaria: Forbes, 1948, Cornell Univ. Agr. Exp. Sta. Memoir 274, Lepidoptera of New York and Neighboring States, Part 2: 82.

The soft violaceous brown color, the pectinate antennae of the male and the simple male genitalia will serve to identify this species. The moth ranges from south central Florida north to Lakehurst, New Jersey along the coast. The southern and northern populations are illustrated in figures 1–4. The northern specimens tend to be more sharply marked and more intensely colored.

The early stages and the foodplant of this species are not known.

THE SUBFAMILIES OF FORMICIDAE

George C. Wheeler *and* Jeanette Wheeler, *Desert Research Institute, University of Nevada System, Reno, Nevada 89507*

ABSTRACT—Eleven subfamilies are recognized and characterized. Ten of these are living—Dorylinae, Leptanillinae, Cerapachyinae, Myrmeciinae, Ponerinae, Pseudomyrmecinae, Myrmicinae, Aneuretinae, Dolichoderinae and Formicinae; one is extinct—Sphecomyrminae. An illustrated key is given for the workers of the ten living subfamilies.

Time was when a myrmecologist needed to know only five subfamilies of Formicidae. In 1910 W. M. Wheeler in his "Ants" recognized Ponerinae, Dorylinae, Myrmicinae, Dolichoderinae and Camponotinae. Emery kept this same scheme in the "Genera Insectorum" (1910–1925). It seems that the taxonomists of that day were averse to small taxa. The invertebrate zoologists, for example, were averse to small phyla; they preferred to tack a small group on to a large phylum as an appendix, i.e., with apologies, so to speak. The vertebrate zoologists kept the Agnatha, Chondrichthyes and Osteichthyes together as Class Pisces until fission was long overdue.

A sort of myrmecological independence was declared in 1920 when W. M. Wheeler split off the Cerapachyinae from the Ponerinae and the Pseudomyrminae (later emended to Pseudomyrmecinae) from the Myrmicinae. He also changed the name Camponotinae to Formicinae.

In 1923 W. M. Wheeler first suggested that the Leptanillini be separated from the Dorylinae; by 1932 their separation as Leptanillinae had been effected.

In 1951 Clark separated the tribe Myrmeciini from the Ponerinae to become subfamily Myrmeciinae. At the same time he suggested in a footnote that the Aneuretini in the Dolichoderinae be raised to subfamily rank. It was not, however, until 1956 that Wilson, Eisner, Wheeler and Wheeler made the promotion effective.

Finally, in 1967 Wilson, Carpenter and Brown described the extinct species *Sphecomyrma freyi* and based upon it the extinct subfamily Sphecomyrminae.

That makes 11 subfamilies.

Conspectuses

In 1910 W. M Wheeler had a conspectus of subfamilies and tribes (p. 134–144). In the "Genera Insectorum" Emery gave admirable characterizations of subfamilies, but they were scattered through 15 years and five fascicles. W. M. Wheeler (1922a) likewise gave excellent characterizations of seven subfamilies, but they were scattered through 173 pages of text. Forel (1921:133–140) treated five subfamilies. The latest is that of Bernard (1951), but it can hardly be called a conspectus, because the characterizations are scattered through 47 pages (1040–1087) of text; furthermore he raised the eight subfamilies to family rank.

Keys

In 1910 (p. 557) W. M. Wheeler presented a key to the five subfamilies and in 1922b (631–632) a key to the seven subfamilies. The latest cosmopolitan key is that of Clark (1951:14–16); he recognized 15 subfamilies, 5 of which are not accepted today.

None of the above mentioned is illustrated. In fact we have never seen an illustrated cosmopolitan key to the subfamilies of Formicidae. We present our version below. Few if any keys are perfect and this one is no exception: there are a few genera which will not key out; we have taken care of one such tribe, the Odontomachini, because it includes two large tropicopolitan genera.

Sphecomyrminae

Workers.—Clypeus and frontal carinae simple but ant-like. Eyes large, convex, near the middle of the sides of the head. Ocelli large. Mandibles short, curvilinear, bidentate. Antennal scapes elongate (but shorter than usual in worker ants); funiculi long and filiform, the second segment the longest. Thoracic somites and epinotum separated from each other by 2 complete sutures; mesoscutum separated from mesoscutellum by a sunken area. Metapleural glands well-developed. Pedicel of a single segment, which bears a node. Sting well developed. Claws toothed.

This subfamily was established by Wilson, Carpenter and Brown in 1967 to include 1 extinct species in a new extinct genus, *Sphecomyrma freyi* from the Upper Cretaceous amber of New Jersey.

Dorylinae

Workers.—Clypeus very short and not delimited by sutures. Frontal carinae vertical, close together or even fused, not covering the antennal insertions. Antennae short, of 7–12 segments, inserted near the mouth and quite close to each other. Eyes vestigial or absent. Palps 2- or 3-segmented. Sutures of thorax more or less effaced; metanotum concealed from above. Pedicel of 1 or 2 segments. Sting developed.

Females.—Dichthadiiform. Antennal segments 10–12. Eyes vestigial or absent; no ocelli. Sutures of thorax more or less effaced; metanotum concealed from above; wingless. Pedicel of 1 segment.

Males.—Mandibles developed, usually large. Antennae 13-segmented. Eyes and ocelli well developed. Winged; thoracic segmentation normal. Pedicel of 1 segment. Genitalia completely retractile; subgenital lamina forked. No cerci.

Larvae.—Elongate, slender, subcylindrical (but with a slight progressive attenuation toward the anterior end); nearly straight (but with the anterior third slightly curved ventrally). Hairs short. Mandibles poorly developed and feebly sclerotized.

Pupae.—Worker pupae naked in *Aenictus* and *Neivamyrmex*, enclosed in cocoons in *Labidus* and *Eciton*; sexual pupae in cocoons.

These are the renowned army ants of the tropics (but they also occur in the southern parts of the Holarctic). They comprise about 165 species in 9 genera.

Leptanillinae

Workers.—Minute to small; elongate and slender. Monomorphic. Clypeus forming a narrow straight border along the mouth. Mandibles straight and toothed. Maxillary palps 1- or 2-segmented; labial palps of 1 segment. Eyes absent. Antennae 12-segmented; not inserted close together. Promesonotal suture well marked; other dorsal sutures completely absent. Epinotum unarmed. Claws simple. Pedicel of 2 unequal nodiform segments.

Females.—Small. Eyes vestigial or lacking. Wingless. Pedicel of only 1 segment. Gaster long. Cloaca open.

Males.—Minute to small. Mandibles vestigial and toothless. Maxillary and labial palps prominent, of 1 segment. Eyes rather small, hairy, situated low on the head; ocelli conspicuous, on or near the occiput. Antennae 13-segmented; scape at most as long as the next 2 segments combined; funiculus filiform, the terminal segment the longest. Fore wings with few or no veins; stigma never well defined; hind wings veinless. Pedicel of 1 segment. Genitalia large, nonretractile; subgenital plate bifurcate.

Larvae.—Elongate and very slender; slightly constricted at the metathorax; anterior end curved ventrally; remainder of body straight and clavate. With a complex structure projecting anteroventrally from the venter of the prothorax. Only 1 pair of spiracles, which are on the third abdominal somite; each spiracle opening eccentrically on a naked circular area. Mandibles turned laterally; feebly sclerotized; each with a rather long slender sharp-pointed apical tooth which curves laterally; outer border of each mandible bearing several long slender sharp-pointed teeth.

This is a small (19 species in 4 genera) taxon, which is closely related to the Dorylinae. They are hypogeic, but little else is known about them. They have been taken in the Australian, Oriental and southern Palearctic Faunal Realms. The larvae are markedly different from all other known ant larvae.

Cerapachyinae

Workers.—Intermediate between Dorylinae and Ponerinae. Elongate, slender and subcylindrical. Antennal fossa more or less encricled by a lateral carina of the cheek (rarely obsolete); posterior surface of head usually with a distinct carina running ventrally from each dorsolateral corner. Promesonotal suture distinct; other thoracic sutures obsolete. Pedicel of 1 segment, which is nearly as broad as the thorax; first gastric somite separated by a well marked constriction from the second. Pygidium margined laterally and posteriorly with a row of large or small (but always distinct) spines. Sting developed.

Females.—Winged. Otherwise similar to workers (except dichthadiiform in *Acanthostichus*).

Males.—Mandibles developed. Winged. Genital armature completely retractile; subgenital lamina deeply and broadly furcate. No cerci.

Larvae.—Elongate, slender, subcylindrical and curved ventrally. Head small. Mouth parts large and prominent; bearing few or no spinules. Mandibles rather feebly sclerotized; typically long and slender; base moderately stout; distal ⅔ narrow and thin; tapering to an apex which is slightly curved medially and posteriorly.

This small subfamily (64 species in 10 genera) is intermediate between the Dorylinae and the Ponerinae. It is primarily tropicopolitan but 4 species in 2 genera get up into the southern part of the Holarctic Realm.

Myrmeciinae

Workers.—Head wide and short. Clypeus produced upward between the frontal carinae. Frontal carinae well separated, erect, not covering the antennal insertions. Mandibles very long, linear, narrow and sharp-pointed; masticatory border usually not distinct from basal border; entire masticatory border furnished with numerous unequal teeth. Maxillary palps of 6 segments, labial of 4. Antennae 12-segmented, slender and filiform. Eyes large; below the middle of the sides of the head. Thoracic sutures distinct; metanotum often distinct, its spiracles dorsal. Claws toothed. Epinotum unarmed. Pedicel 2-segmented; petiole nodiform or pedunculate with rounded node; postpetiole cup-shaped or bell-shaped, considerably larger than the petiole but still smaller than the following somite. Sting well developed.

Females.—Similar to workers but usually larger and winged; fore wing with 2 cubital cells and 1 discoidal cell. Mayrian and parapsidal furrows present.

Males.—Mandibles short and triangular; with very few teeth. Antennae 13-segmented; scape short; first funicular segment very short. Thorax, wings, pedicel and gaster as in the females. Pygidium rounded. Genitalia: stipes arched below, with a median dorsal appendage, styliform; volsella and lacinia present. Cerci developed.

Larvae.—Elongate, terete and rather slender; diameter diminishing gradually from the fifth abdominal somite to the anterior end; anterior half strongly curved ventrally. Body hairs simple, short and moderately abundant. Mandibles stout, subtriangular (in anterior view) and heavily sclerotized.

Pupae.—Enclosed in cocoons.

The Myrmeciinae are generally regarded as the most archaic living subfamily. Brown (1954:22–23) divided them into 3 tribes of 1 genus each: Prionomyrmecini, *Prionomyrmex*, 1 species from the Baltic Amber (Oligocene); Nothomyrmeciini, *Nothomyrmecia*, 1 species (2 specimens) from Western Australia, which "appears to satisfy nearly all conditions demanded of an ancestral stock leading to the *Dolichoderinae* and *Formicinae*"; and Myrmeciini, *Myrmecia*, 96 species occurring in Australia and New Caledonia.

The workers range in length from 4 mm to 36 mm. The larger species are called bulldog ants because of the "vicious way they attack and the tenacity with which their huge jaws hang on to their victim. All the workers and females are provided with a large sting with which they inflict a severe and painful wound. A burning sensation accompanied by redness and swelling may be felt at the wound some time afterwards and may last several days." (Clark 1951:18.)

Ponerinae

Workers.—Pedicel 1-segmented; first gastric somite demarcated from the second by a constriction (except in Odontomachini). Sting powerful.

Females.—Winged, the fore wing typically with 2 closed cubital cells. Otherwise similar to workers.

Males.—Winged, the fore wing typically with 2 closed cubital cells. Cerci present.

Larvae.—Varied according to genus, but usually primitive. Usually beset with numerous hairs or tubercles. Mandibles usually large, toothed and heavily sclerotized.

Pupae.—Enclosed in tough brown cocoons; callows capable of emerging without aid of workers.

This subfamily is a primitive but heterogeneous group of 530 species in 57 genera. It attains its greatest development in the Southern Hemisphere, but 13 genera range into the Holarctic Realm. The ponerines are eminently entomophagous. Colonies are usually small. Nests are in the soil or old logs, small and inconspicuous. The economic importance of the Ponerinae in the tropics can hardly be overestimated, since an estimated 80% of their food is termites.

Pseudomyrmecinae

Workers.—Monomorphic. Elongate, often very slender. Clypeus with rounded upper margin, which is not prolonged upward between the frontal carinae (except in certain species of *Pseudomyrmex*). Frontal carinae usually subparallel and close together; generally narrow and not expanded laterally, thus leaving the antennal insertions fully exposed. Antennae short, 12-segmented. Ocelli usually developed. Pedicel 2-segmented, usually long. Sting well developed. Proventriculus developed anteriorly as an apple- or quince-shaped ball with 4 distinct sepals, which are bluntly rounded and hairy-tipped; developed posteriorly as a very short tubule projecting as a button into the cavity of the ventriculus.

Females.—Very similar to workers, except winged; wings with a discoidal cell and a closed radial cell; 2 closed cubital cells (except one in *Viticicola*).

Males.—Rather similar to workers, except winged. Antennae 12-segmented. External genitalia well developed, exserted. Cerci present.

Larvae.—Straight, slender, subcylindrical; ends rounded; somites distinct; head applied to the ventral surface near the anterior end. Near the mouth parts a swelling on each ventrolateral surface of each thoracic somite and the first abdominal somite. Trophothylax well developed. Mandibles rather small; apex stout and round-pointed.

Pupae.—Naked.

This is a small subfamily comprising 146 species in 4 genera. It is primarily tropical, but a few species in 2 genera enter the southernmost part of the Holarctic Realm. The Pseudomyrmecinae are almost exclusively arboreal and nest in plant cavities. The trophothylax is unique among ant larvae.

Myrmicinae

Workers.—Monomorphic, dimorphic or polymorphic; dimorphism and polymorphism often very pronounced, the soldier phase with a very large head and strong mandibles. Frontal carinae large, nearly always covering the antennal insertions; nearly always well separated (rarely close together). Antennae of 4-12 segments; several terminal segments often forming a distinct club. Ocelli frequently lacking. Pedicel always 2-segmented. Sting developed in about half the species.

Females.—Winged. Larger than workers.

Males.—Winged. Mandibles usually developed. Antennae nearly always 13-segmented. Genitalia partially retractile (completely so in a few genera of Solenopsidini).

Larvae.—Extremely heterogeneous as to shape, pilosity and mouth parts.

Pupae.—Always naked.

The Myrmicinae are the largest subfamily of Formicidae comprising 2000 species in 155 genera. As might be expected of so large a taxon, they are a cosmopolitan group, which is heterogeneous in both anatomy and habits, ranging from primitive to highly specialized. Among those specialized as to diet are the harvesters and the fungus-growers. The Myrmicinae also include most of the social parasites, which in extreme cases have lost their worker caste.

Aneuretinae

Workers.—Integument comparatively thin and flexible. Clypeus broad, flat and emarginate below. Frontal carinae very short and only slightly elevated. Eyes below the middle of the sides of the head. Ocelli absent. Antennae 12-segmented; funiculus enlarging distally but not forming a distinct club. Thoracic sutures distinct; thorax impressed in front of the epinotum; metanotal spiracles forming a dorsal projection. Epinotum armed with 2 spines. Pedicel of a single segment, which is long, cylindrical and surmounted behind by a subglobular node. Sting developed. Proventriculus generalized, with simple mobile portal. Cloacal aperture slit-like and terminal.

Females.—Similar to workers, but winged and much larger. Fore wings with first radial crossvein lacking; Mf2 and Rs4 completely contracted. Ocelli well developed.

Males.—Similar to females but much smaller. Antennae 13-segmented, filiform.

Larvae.—Contrasted with Dolichoderinae: with a well developed neck, body hairy, mandibles large, heavily sclerotized, subtriangular (in anterior view) and bearing 2 rather large subapical medial teeth, maxillary palps and galeae paxilliform.

Pupae.—Enclosed in cocoons.

Subfamilies can get no smaller: 1 genus with 1 species—*Aneuretus simoni* of Ceylon. This genus was formerly placed apologetically in the Dolichoderinae but in a separate tribe. It is regarded as annectant between the Dolichoderinae and the Ponerinae. "There is evidence to suggest, and apparently none to deny, that the aneuretines represent the direct ancestors of the Dolichoderinae, and perhaps also of the Formicinae. At the same time it appears, on the important basis of external abdominal anatomy, that the aneuretines are more closely related to *Nothomyrmecia*, the living 'archetypal' myrmeciine ant of Australia, than to any other primitive ant group." (Wilson, Eisner, Wheeler & Wheeler 1956:92.)

Dolichoderinae

Workers.—Integument usually relatively thin and flexible. Clypeus produced upward between the frontal carinae. Antennae of 12 segments (except 11 in *Semonius*) Metanotum participating in the thoracic dorsum; its spiracles often forming a dorsal protuberance. Pedicel of 1 segment, which is often surmounted by a scale. Cloacal opening a ventral transverse slit. Sting vestigial. A pair of anal vesicles into which unicellular anal glands empty their secretion; when irritated the worker expels the secretion, which becomes resinous in contact with air and gives off a characteristic aromatic odor.

Females.—Winged but otherwise similar to workers.

Males.—Winged. Antennae always 13-segmented.

Larvae.—Plump, chunky and turgid; straight or slightly curved; mostly subellipsoidal, with both ends broadly and equally rounded; anterior end formed by the enlarged dorsal portion of the prothorax; head ventral near the anterior end; no neck. Practically hairless; when present, hairs are few, short and usually simple. Mouth parts small; spinules sparse or absent. Mandibles small, feebly sclerotized; basal portion inflated; distal portion slender and acuminate, without teeth on the medial border (rarely a single small tooth). Maxillary palps and galeae represented by clusters of sensilla, never paxilliform.

Pupae.—Always naked.

This is a very homogeneous subfamily comprising 230 species in 19 genera. It is largely tropical, but 6 of the genera occur in the Holarctic Realm. The highly specialized larvae are fed with liquid food regurgitated by the workers.

Formicinae

Workers.—Integument relatively thin and flexible. Antennae of 8–12 segments; funiculus long and filiform, rarely forming a feebly developed club. Pedicel of 1 segment, which is usually surmounted by a scale. Sting vestigial. Poison glands converted into a cushion of convolutions; the poison (mostly formic acid) can be ejected with great force in certain genera (e.g., *Formica*) through a circular opening (the acidopore, which is not the cloacal opening) at the posterior end of the gaster; acidopore typically fringed with a circle of short fine hairs, which keeps the spray of poison directed outward away from the body.

Females.—Similar to workers, but much larger and winged. Wings with venation more or less reduced.

Males.—As large as females or smaller, generally similar; antennae of 10–13 segments; scape long (but exceptionally short in *Polyergus*); funiculus filiform (rarely forming a club).

Larvae.—Heterogeneous but mostly as follows. Thorax and first abdominal somite forming a distinct mobile neck, which is arched ventrally; remainder of body elongate, straight, subellipsoidal and rather slender. Body with a moderate to dense covering of short branched hairs. Mandibles small to moderately large; moderately sclerotized; subtriangular (in anterior view); wedge-shaped; apex forming a short blunt tooth, which is slightly curved medially; medial teeth absent or vestigial.

Pupae.—Usually enclosed in cocoons, but there are exceptions.

This next-to-largest subfamily comprises 43 genera and 1400 species (600 of which are in the genus *Camponotus*). It is a cosmopolitan taxon, which is dominant in temperate regions and common in the tropics.

"The members of this subfamily are morphologically the most highly developed of all ants; this is also true for their ethological peculiarities. Not only are their habits very diverse, but they show the most specialized form of mental and social behavior. The diet is in large part vegetarian and these ants show great predilection for sugary substances, which are sometimes stored in a special, replete form of worker (honey ants: *Melophorus*, *Myrmecocystus*, certain *Plagiolepis*, etc.). The species of *Oecophylla* and certain *Polyrhachis* and *Camponotus* build silk nests in leaves, using their larvae as silk-producing shuttles. Moreover, the nesting habits in this subfamily are very varied. Certain species of *Formica* and *Polyergus* are slave-makers; the species of *Polyergus* are true social parasites of *Formica*, entirely dependent upon their slaves but the worker caste is still present." (W. M. Wheeler 1922a: 211).

Key to the Subfamilies of Formicidae

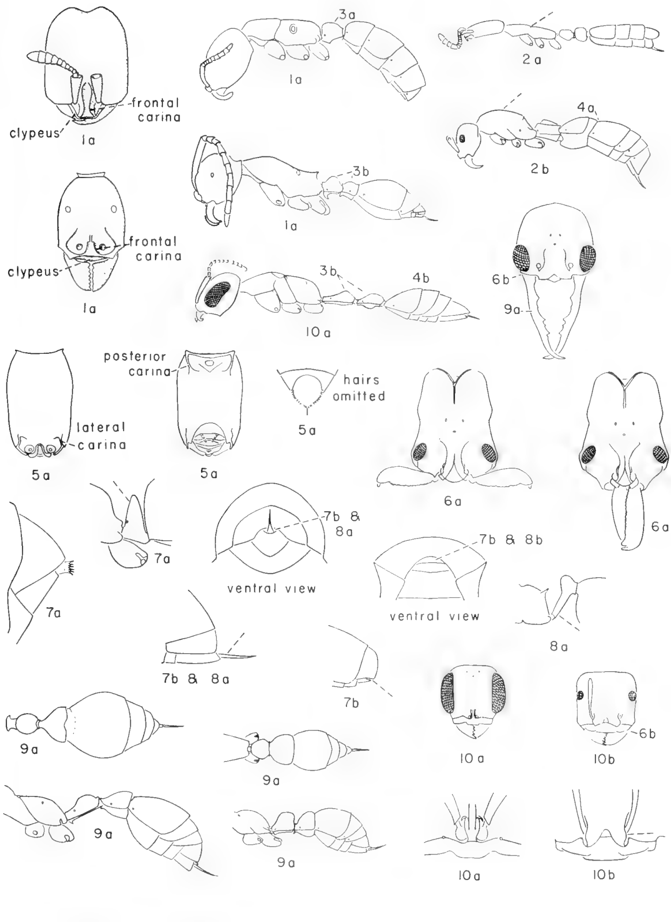
(Based on the workers. Living subfamilies only. The numbers and letters on the figures correspond with half-couplets in the key.)

1a. Eyes absent or vestigial; pedicel usually of two segments in the worker (one in female and male); clypeus short; frontal carinae short and vertical, not covering the antennal insertions; antennae usually short, epinotum usually unarmed 2

1b. Without this combination of characters 3

2a. Promesontal suture distinct; minute to small (2.5 mm long or less); elongate and slender; maxillary palps of one or two segments, labial palps one-segmented .... *Leptanillinae*

2b. Promesonatal suture weak or absent; palps of two or three segments .... *Dorylinae*



3a. Pedicel of one segment 4
3b. Pedicel of two segments 9

4a. With a conspicuous constriction between 1st and 2nd gastric segments 5
4b. Without a constriction between 1st and 2nd gastric segments 6

5a. Elongate, slender and subcylindrical; scape usually short and stout; antennal fossa more or less encircled by a lateral carina on the cheek (rarely obsolete); posterior surface of head usually with a distinct carina running ventrally from each dorsolateral corner; dorsal surface of thorax with sutures indistinct or absent; pygidium margined laterally and posteriorly, with a row of large or small (but always distinct) spines .... *Cerapachyinae*

5b. Without this combination of characters .... *Ponerinae*

6a. Mandibles articulated near the middle of the ventral border of the head; when closed, parallel to each other; when fully open, they form together a straight line parallel to the ventral border of the head. Tribe Odontomachini in the .... *Ponerinae*

6b. Mandibles articulated to the ventral corners of the head 7

7a. Opening at posterior end of gaster (acidopore) terminal, circular and usually surrounded by a fringe of hairs; sting vestigial; petiole usually scale-like .... *Formicinae*

7b. Opening at posterior end of gaster (cloacal orifice) slit-like 8

8a. Sting well developed and protrusible; anterior peduncle of petiole long and cylindrical; node subglobular .... *Aneuretinae*

8b. Sting vestigial; petiole not as above .... *Dolichoderinae*

9a. Mandibles very long, linear, narrow and sharp-pointed, the entire medial border furnished with teeth; epinotum unarmed; petiole nodiform or pedunculate with rounded node; postpetiole cup-shaped or bell-shaped, considerably larger than the petiole but still smaller than the following somite; eyes below the middle of the sides of the head .... *Myrmeciinae*

9b. Without this combination of characters 10

10a. Elongate, often very slender; eyes very large and elongate; clypeus with a rounded upper margin, not prolonged upward between the frontal carinae; frontal carinae usually close together, usually narrow and not expanded laterally to cover the antennal insertions; antennae short .... *Pseudomyrmecinae*

10b. Without this combination of characters; frontal carinae usually large, nearly always covering the antennal insertions and nearly always well separated .... *Myrmicinae*

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A NEW SPECIES OF ACAROPSELLA VOLGIN FROM THE NEST OF A TURKEY VULTURE

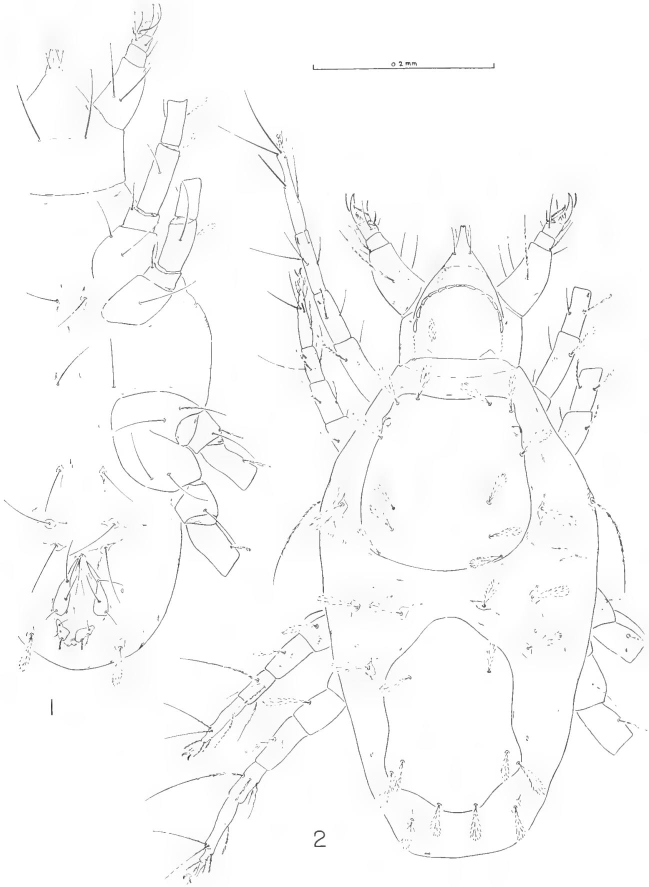
(ACARINA: CHEYLETIDAE)

DOUGLAS W. PRICE, *Department of Entomology and Parasitology, University of California, Berkeley, California 94720*

ABSTRACT—A new species of cheyletid mite from the nest of a turkey vulture in California is described. The species, *Acaropsella* **schmidtmanni**, has features which suggest an affinity to both *Acaropsis* Moquin-Tandon and *Acaropsella* Volgin. These features are discussed, and reasons for assignment to *Acaropsella* are presented.

V. I. Volgin (1969) erected the genus *Acaropsella* to accommodate a group of three species formerly included in the related genera *Acaropsis* Moquin-Tandon and *Neoacaropsis* Volgin. The three genera are similar in having a reduced, inner comb on the palp tarsus. In *Acaropsis* this sensillum is a simple seta, without barbs, whereas in *Neoacaropsis* and *Acaropsella* it bears a few fine barbs or teeth. Further, the dorsal idiosomal setae in *Acaropsis* are acicular to narrow lanceolate, whereas in *Neoacaropsis* and *Acaropsella* they are spatulate in form. The monotypic genus *Neoacaropsis* is set aside on the basis of prominent basal apophyses on the claws of tarsi II to IV. Other lesser differences between these genera are presented in recent reviews by Volgin (1969) and Summers and Price (1970).

The species described has features which suggest a position intermediate between *Acaropsella* and *Acaropsis*. It resembles *Acaropsella* in having a finely-toothed inner comb on the palp tarsi and spatulate dorsal setae on the idiosoma. It resembles *Acaropsis* in having long humeral setae which differ markedly from those on the dorsal idiosoma.



Figs. 1–2. *Acaropsella schmidtmanni*, n. sp.: 1, female, ventral aspect; 2, female, dorsal aspect.

Since the structure of the combs on the palp tarsus and the shape of the dorsal setae have greater significance in cheyletid systematics than the nature of the humeral setae, this species is included in *Acaropsella*. Its assignment to this genus seems preferable at this time to the creation of another monotypic cheyletid genus to accommodate an intermediate form.

Acaropsella schmidtmanni, n. sp.

Female.—Rostrum narrow, pointed; with 1 pair dorsal and 1 pair ventral, adoral setae, subequal in length. Peritremes with about 7 chambers on each side, smoothly arched posteriorly. With 1 pair long, acicular, subcapitular setae. Tegmen and protegmen with faint, longitudinal pattern of bacillus-like striae. Palp tarsus with 2 sickle-like and 1 orthodox comblike sensillae. Inner comb homologue with a few fine barbs on inner face, not comblike in usual sense. Tibial claw with 3 (rarely 4) basal teeth. Tibia with 1 dorsal and 2 ventral acicular setae. Genu with 1 dorsal seta near outer margin. Femur with 1 long (85.6 μ)[1], barbed seta on dorsal surface, 2 acicular ventral setae, and 1 lateral seta near base of genu.

Propodosomal plate with 6 pairs of spatulate setae; the anterior group of 3 are marginals, the posterior group of 3 are medians. Preocular marginal setae 46.0 μ long. Fourth marginals on separate platelets. Eyes present. Humeral setae long (127.7 μ), barbed on basal half, differ significantly from dorsals. With 1 pair of acicular setae on venter between coxae II. Hysterosomal plate somewhat reduced, with only 4 pairs of spatulate setae. First pair of dorsomedians and first 2 pairs of dorsolaterals borne on small platelets. With 2 pairs of spatulate setae posterior to plate; 1 pair set near the plate (apparently the fourth dorsolaterals), and 1 pair located ventrally in para-anal position. With 1 pair acicular setae on venter between anterior margins of coxae III. Three pairs acicular setae on venter in mid-region between coxae IV and genital area. With 3 pairs acicular genital setae, and 3 pairs of anal setae. Anterior pair anal setae smooth, middle pair with a single barb, and hind pair strongly barbed.

Body length to tip of rostrum 697 μ, gnathosoma length 171 μ. Leg measurements I to IV respectively, from coxo-trochanteral joint to claw tips: 365 μ, 263 μ, 279 μ, and 340 μ. All claws are smooth hooklets, without basal apophyses, with rayed empodia.

Tarsus I with long (46.8 μ) solenidion (ωI) in mid-dorsal region, reaches to bases of acicular addorsals (tc). With a minute (4.5 μ) guard seta (g). Two pairs of acicular paraterminals (pt) on tarsal pedicel, and 2 pairs of infraterminals (it). Proximal infraterminal strongly barbed or frayed at tip, distal infraterminal smooth. First ventral (v) and second ventral or azygos seta (a) barbed or frayed at tip. Tibia I with a dorsal solenidion and 5 tactile setae. Genu I with a minute dorsal solenidion and 2 tactile setae. Tarsus II with a solenidion (ωII) in lateral position near bases of addorsals. Tibia II with a small distal solenidion and 4 tactile setae. Tibiae III and IV each with a long barbed seta (133.9 μ on tibia IV) and 3 other, shorter, tactile setae. Setal counts including solenidia on legs I-IV are: tarsi, 10-8-7-7; tibiae, 6-5-4-4; genua, 3-2-2-2; femora, 2-2-2-1; trochanters, 1-1-2-1; and coxae, 2-1-2-2.

Male.—Three heteromorphic males were found. Gnathosoma of heteromorphic males (fig. 8) with an elongated, narrow rostrum; peritremes strongly recurved as an inverted "V," palp femur elongate (236 μ in male, 77 μ in female), with a single basal tooth on palp tibial claw, and a somewhat reduced outer palp comb. Inner palp comb minutely barbed. Idiosomal plates cover entire dorsum, include

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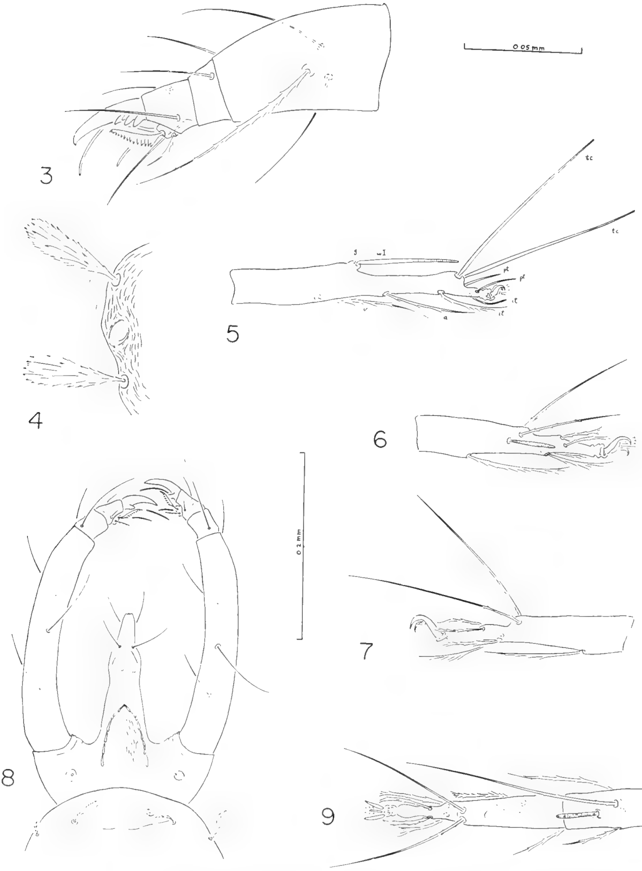
[1] All measurements given are averages of holotype and paratype specimens.



Figs. 3–9. *Acaropsella schmidtmanni*, n. sp.: 3, right palpus of female, dorsal view; 4, marginal propodosomal setae II and III; 5, tarsus I, female; 6, tarsus II, female, inner face; 7, tarsus III, female; 8, gnathosoma, male; 9, tibia and tarsus III of male, dorsal view.

all dorsal setae. Humeral setae on separate platelets, form as in female. Eyes present. Male aedeagus 74 μ long, exits posteriorly. Leg chaetotaxy as in female except for enlarged dorsal solenidion on tibia I, and presence of conspicuous solenidia on tibiae and tarsi III and IV (fig. 9).

Type specimens.—Holotype female, 1 paratype and 1 allotype are deposited in the United States National Museum. Six paratypes and 2 allotypes are deposited in the Department of Entomology and Parasitology, University of California, Berkeley.

Type locality and collection data.—The species was collected from the nest of a turkey vulture (*Cathartes aura septentrionalis* Wied) in the foothills of the Sierra Nevada mountains, California, about 4 miles north of Shingle Springs, El Dorado County. The approximate elevation was 1,300 feet. The nest was located on the ground between large rocks at the summit of a small knoll. It consisted of small broken branches and twigs, and a rich assortment of organic matter, such as feathers, feces, and keratinous skin fragments. The nest was unoccupied at the time of collection, but had been in use earlier in the year.

The species was collected September 16, 1970, by E. T. Schmidtmann of the University of California, Davis, after whom it is named. The collection data was provided by Mr. Schmidtmann.

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TETRAPALPUS TRINIDADENSIS, A NEW GENUS AND SPECIES OF CAVE MOTH FROM TRINIDAD

(LEPIDOPTERA: TINEIDAE)

DONALD R. DAVIS, *Department of Entomology, Smithsonian Institution, Washington, D.C., 20560*

ABSTRACT—**Tetrapalpus**, n. gen., is proposed for **T. trinidadensis**, n. sp., described from Mt. Tamana Caves, Trinidad. The species is a troglophilic moth, the larvae of which feed primarily on the guano of a fruit eating bat, *Phyllostomus hastatus hastatus* (Pallas).

A new genus and species of cave dwelling moth is described herein, in response to a request from Miss Johanna Darlington who first sent the species to me for determination. Miss Darlington collected the moths in the course of her field investigations on the fauna of the Tamana Caves. I am indebted to her for all material used in preparing this paper. A mimeographed, preliminary report on the Tamana Caves

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Figs. 1–2. *Tetrapalpus trinidadensis*, n. sp.; 1, holotype, female, wing expanse 14 mm; 2, larval case, length 9 mm.

was issued by Darlington and Hill in 1966 and most of my comments concerning the type locality of *Tetrapalpus trinidadensis* are based on this reference.

Mt. Tamana, a limestone table mountain, at a maximum elevation of 1,009 feet is the highest peak of the Central Range and is located in Tamana Ward, St. Andrew County, two miles east of Four Roads, Trinidad. The Tamana Caves are known to consist of at least two separate solution caverns situated on the Northwest slope of Mt. Tamana at an elevation of 600 to 700 feet. The specimens described in this paper were collected only in the larger of the two caves; henceforth to be referred to as the "Tamana Main Cave," in accordance with Darlington's and Hill's terminology.

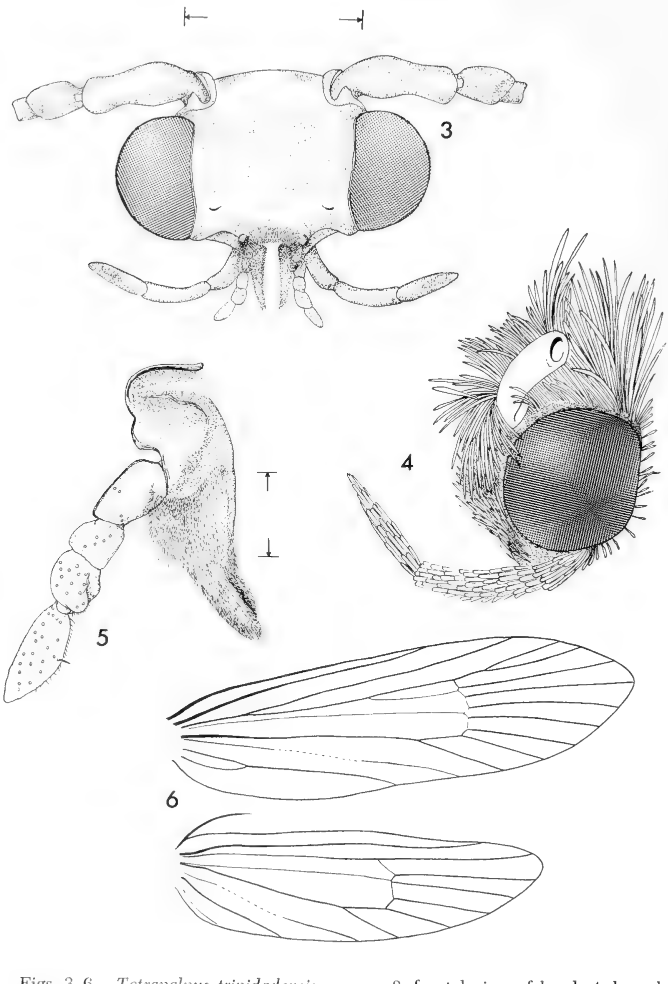
Tamana Main Cave is approximately a quarter mile in length and has a small stream flowing through it. Usually the cave is entered via a rope or ladder through the main chimney which has a vertical drop of about 17 feet. The densest concentrations of the moth were observed approximately 60 feet upstream (toward the main entrance of the cave) from the chimney area, and about 130 feet from the main entrance.

The smaller of the two known Tamana caves, usually referred to simply as the Dry Cave, is located approximately fifty yards further up the mountain side. As its name indicates, there is no water in the cave. To date, no moths have been collected from this cave.

Surprisingly little interest has been shown toward cave dwelling Lepidoptera in sharp contrast to other orders of insects containing cavernicolous forms. The paucity of research in this area probably is due largely to the rather different and perhaps slightly more tedious methods for collecting suitable material, as well as to the pronounced scarcity of lepidopterists with any interests along these lines.

Wolf (1934–1938) lists 31 species of Lepidoptera from caves, but some of these may have only been accidental strays. Few cavernicolous Lepidoptera have been described (Diakonoff, 1951) or reported in recent years. Those that have been mentioned in the literature of late rarely are positively identified, reflecting, again, both the poor condition of the material being sent to specialists for identification as well as the immature state of our knowledge of the fauna.

In an attempt to remedy this situation, I have initiated a world study on cave dwelling Lepidoptera and would like to take this opportunity to request study material from anyone who has collected, or is willing to collect Lepidoptera inside caves. The adults need not have their wings spread, but they should be pinned squarely through the thorax and *not* preserved in alcohol. Intensive collecting in the future is expected to reveal a number of new forms, such as the one described below.



Figs. 3–6. *Tetrapalpus trinidadensis*, n. sp.: 3, frontal view of head; 4, lateral view of head; 5, right maxilla; 6, wing venation. Scale = 0.5 mm (fig. 3), 0.1 mm (fig. 5).

Tetrapalpus, n. gen.

TYPE SPECIES.—*Tetrapalpus trinidadensis*, n. sp.

ADULT.—Small, slender moths; wing expanse approximately 10–15 mm.

Head (figs. 3–5): Vestiture rough. Antennae relatively long, moniliform, smooth scaled, with a single scale row completely encircling each segment; pecten absent; sensory setae rather sparse, scattered, short, length less than one half diameter of flagellum. Ocelli absent. Compound eyes large, nearly spherical, naked. Mandibles present. Maxillary palpi short, less than one half the length of labial palpi, four segmented; basal and terminal segments the longest and approximately equal in length; second and third segments the shortest, each approximately one half the length of terminal segment. Tongue densely pubescent, short, approximately two thirds the length of maxillary palpi. Labial palpi three segmented; all segments of approximately equal lengths, smooth scaled, without conspicuous, erect hairlike setae.

Thorax: Wings (fig. 6) relatively narrow. Forewings 12-veined; 11 arising from basal fifth of discal cell; 9 and 10 variable, usually stalked up to one half their length, but may be narrowly separate or connate or shortly stalked; accessory cell present; base of medius undivided within cell. Hindwing 8-veined, all veins arising separate from cell; base of medius undivided within cell. Legs with tarsal segments relatively long and slender; prothoracic leg with tibia distinctly shorter than first tarsal segment; epiphysis present, one half the length of foretibia.

Male genitalia: Uncus simple, acute. Gnathos mostly divided, two arms connected only by a membranous sheet. Tegumen relatively narrow dorsally, broadened laterally and forming a broad ring ventrally. Saccus well developed, elongate. Aedeagus simple, relatively slender and elongate; cornuti absent.

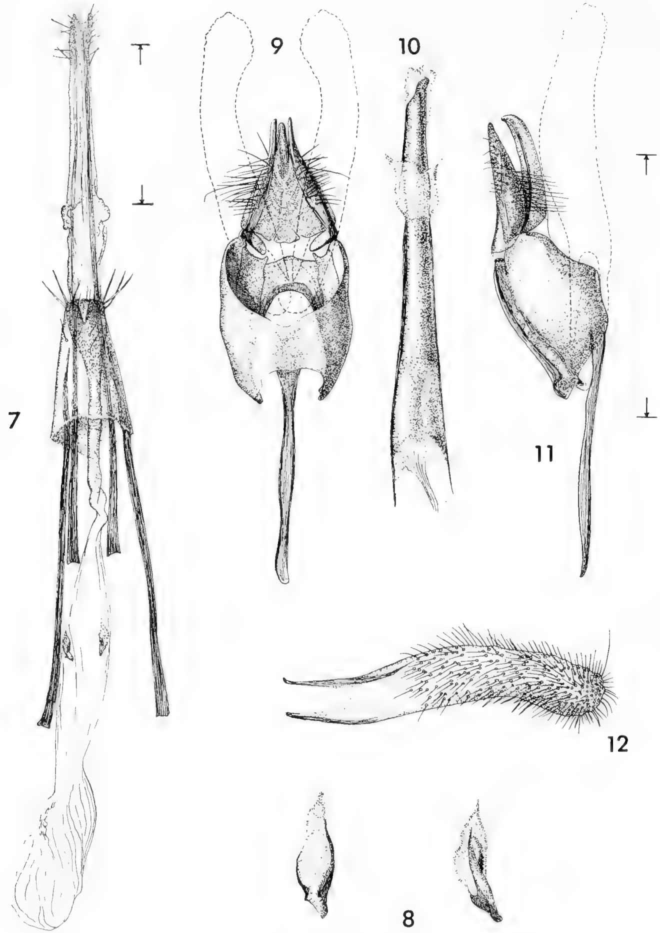
Female genitalia: Ovipositor elongate, telescoping. Anterior and posterior apophysis greatly extended. Ductus bursae slender, relatively short. Corpus bursae completely membranous, elongate, relatively narrow, a pair of signa present.

DISCUSSION.—As far as I have been able to determine, *Tetrapalpus trinidadensis* has no known close relatives. Cave dwelling moths which I have examined to date from other parts of the world appear abundantly distinct and only distantly related. Very few genera of Tineidae normally demonstrate a stalking of veins 9 and 10 in the forewing and those that do may be easily distinguished by other features. For example, *Barymochtha* Meyrick possesses 12 veins in the forewing with 9 and 10 stalked, but in addition to having a much differently shaped wing, *Barymochtha* lacks an accessory cell. *Tetrapalpus* may be further distinguished from such widespread genera as *Tinea*, which presently contains most of the described guanobious species, by the four segmented maxillary palpus—a character which has suggested its generic name.

Tetrapalpus trinidadensis, n. sp.

ADULT (fig. 1).—Entire body unicolorous, brownish. Wing expanse: ♂, 9.5–10.5 mm: ♀, 13–15 mm.

Head (figs. 3–5): Light brown to tan; scales hairlike with acute apices. An-



Figs. 7–12. *Tetrapalpus trinidadensis*, n. sp.: 7, female genitalia; 8, signa; 9, male genitalia, ventral view; 10, aedeagus; 11, male genitalia, lateral view; 12, right valve, lateral view. Scale = 0.5 mm.

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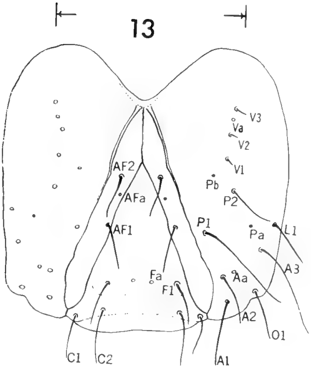

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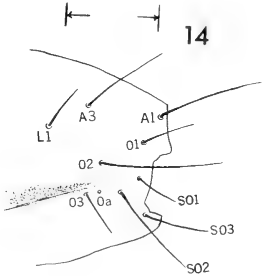

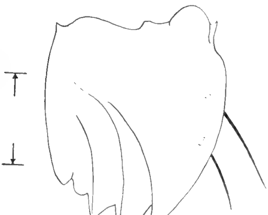

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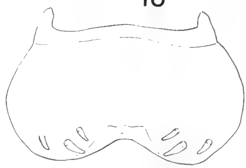

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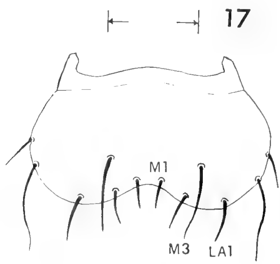

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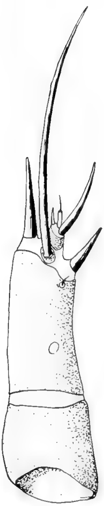


Figs. 13–18. *Tetrapalpus trinidadensis*, n. sp., larval structures: 13, head, dorsal view; 14, ocellar region of right side of head; 15; ventral view of right mandible; 16, ventral view of labrum; 17, dorsal view of labrum; 18, antenna. Scale = 0.5 mm (fig. 13), 0.2 mm (fig. 14), 0.1 mm (figs. 15, 17).

tennae unicolorous, light to medium brown, elongate, slightly exceeding forewing in length. Labial palpi medium brown to pale fuscous.

Thorax: Forewings, legs and dorsum of thorax light brown with slight bronzy iridescence. Venter of thorax lighter in color, pale tan to light gray; tibial fringe of metathoracic legs silvery gray. Hindwings light gray.

Abdomen: Light brown above; paler, more whitish beneath.

Male genitalia (figs. 9–12): Uncus broadly conical. Lateral arms of gnathos partially separate; apices bluntly pointed. Tegumen expanded laterally; anterior margin extended anteriorly, angulate. Vinculum with anterior margin deeply excavated. Saccus rodlike, approximately 2 × length of uncus. Aedeagus broad at anterior end, gradually tapering posteriorally; length almost twice that of saccus.

Female genitalia (figs. 7, 8): Lamella antevaginalis with a deep, broad, V-shaped median cleft. Ductus bursae with a slight collarlike thickening about midway along its length. Corpus bursae greatly lengthened and relatively slender; signa of small size, approximately symmetrical, of an irregular, somewhat elliptical outline.

LARVA (figs. 13–24).—Length of largest larva 10 mm.

Head (figs. 13–18, 22): Dark brown with a short, longitudinal black stripe at level of ocellar setae extending to 02. Ocelli absent. A2 midway between Aa and adfrontal suture. AFa about midway between AF1 and AF2, although usually closer to AF2. Labrum with M3 well separated from external margin; all other setae closely bordering margin.

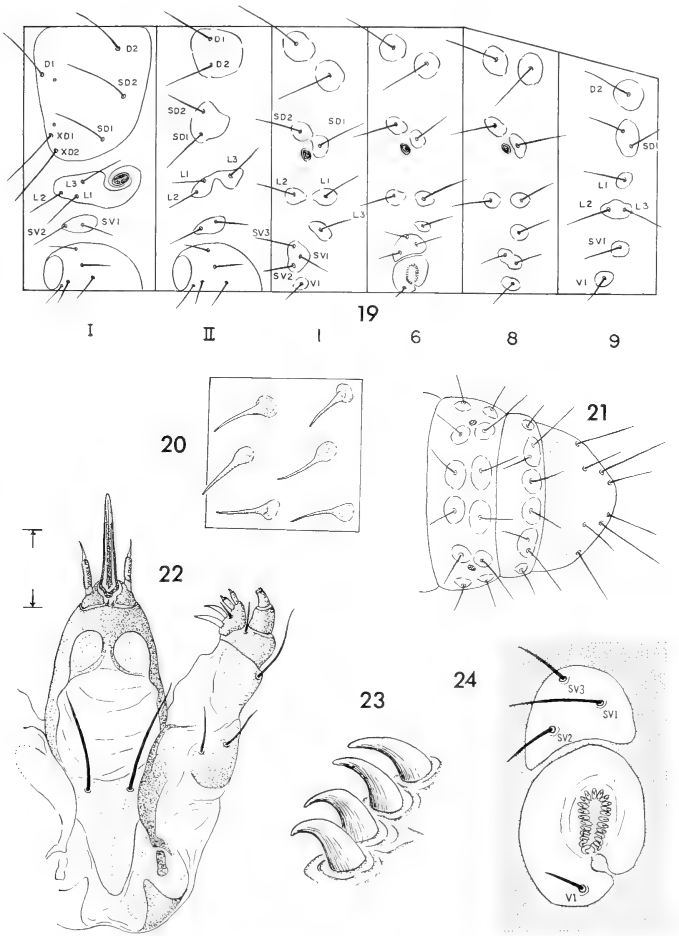
Thorax (fig. 19): Prothorax with tergal, plural and sternal plates dark reddish brown. Sclerites of legs pale brownish. All coxae separated, narrowly so on prothorax and becoming progressively further apart on meso-and metathorax. Integument white or nearly so. Prothorax with L1 below and between L2 and L3. Thoracic pleura with L1, L2 and L3 together on same pinnaculum.

Abdomen (figs. 19–21, 23, 24): Pinnacula only slightly darker than whitish integument; integument densely covered with minute spinules. Setae D1 and D2 of first eight segments borne on separate pinnacula. SD1 and SD2 usually arising from separate pinnacula on segments 1 to 8, although nearly united on first segment. Crochets on segments 3 to 6 uniordinal and arranged in a compact uniserial circle, numbering usually 22–26; crochets on anal prolegs similar except arranged in a much larger circle with a broad posterior interruption and numbering approximately 19–23. SV1, SV2 and SV3 of abdominal prolegs borne on same pinnaculum and separated from plate bearing both VI and crochets. Ninth segment with D1 and SD1 arising from same pinnaculum.

LARVAL CASE (fig. 2).—Relatively broad and distinctly depressed, slightly broader at middle; both ends rounded and open; openings slitlike, extending transversely at either end and inwards toward center about 1 mm on either side; ventral and dorsal margins of openings coincident, not overlapping. Texture of case rough, covered with dark fragments of soil, plants, and guano. Dimensions of largest case: 10 mm long, 3 mm wide, and 1.75 mm thick.

HOLOTYPE.—Mt. Tamana Main Cave, Trinidad, ♀, reared from larva collected by J. Darlington May 28, 1968, USNM 71430; in the U.S. National Museum.

PARATYPES.—Same data as holotype, 11♂, 14♀, 7 larvae, 9 larval cases (USNM).



Figs. 19–24, *Tetrapalpus trinidadensis*, n. sp., larval structures: 19, setae (left side) of prothorax, mesothorax, and abdominal segments 1, 6, 8, and 9; 20, microtrichia of sixth abdominal tergite (approximately 1,400 ×); 21, dorsal view of eighth, ninth and tenth abdominal tergite; 22, ventral view of labium and left maxilla; 23, detail view of crochets; 24, left proleg of seventh abdominal segment.

HOST.—Coprophagous, primarily on guano of fruit eating bat, *Phyllostomus hastatus hastatus* (Pallas).

DISTRIBUTION.—Presently known only from the Mt. Tamana Main Cave of central Trinidad.

DISCUSSION.—The radial system in the forewings of this species is variable, sometimes differing between the right and left pair of wings on the same specimen. An examination of several specimens has shown the most common condition is to have veins 9 and 10 shortly stalked and 7 and 8 distinctly separate.

The larvae are reported by Darlington (in litt.) to normally occur over the surface of moist but well drained bat guano; occasionally they may be observed crawling, dragging their case along, up the walls of the cave, perhaps where they attach for pupation. The adults are usually seen resting on the guano and, when disturbed, seldom fly more than a few inches above the surface.

Although ten species of bats have been reported from Tamana Main Cave, *Tetrapalpus trinidadensis* seems to be largely restricted to the piles of guano deposited by *Phyllostomus hastatus hastatus.* These piles accumulate because *Phyllostomus* bats occur in only certain limited areas of the cave. It also appears that none of the other bats roost in sufficient density to create such piles. Why *T. trinidadensis* should be so restricted is not known at present, but it may be due to several factors. Some of these factors are presumably being studied by Miss Darlington.

Tetrapalpus is apparently a troglophile, although it may be more confined to a cave existence than certain other troglophilic tineids, such as *Amydria arizonella* Dietz. The latter is a widespread species ranging over much of the southern United States. It appears to be the most common moth frequenting caves in this country and is particularly abundant in the Bat Cave at Carlsbad Caverns. However, this species is often encountered over its range far from any cave and probably also lives in the nests of various mammals (i.e., a facultative troglophile). When the Microlepidoptera of Trinidad are better known, *Tetrapalpus* may also be shown to occur in a variety of habitats. However, it is perhaps worthy to note one atypical feature present in *T. trinidadensis*, and not so developed in most Tineidae, which apparently is an adaptation toward cave existence; i.e., the elongate antennae. Species of troglophilic Tineinae collected or examined by the author from other regions, particularly the Indo-Australian area, also possess antennae significantly longer than that of most members of this subfamily. If ever a truly troglobitic or obligate troglophilic moth is discovered, then likely it will be a member of the subfamily Tineinae.

It has been noted (fig. 14) that ocelli are lacking in *Tetrapalpus* larvae, but from a biospeliological standpoint this apparently has little significance as several tineid genera (e.g., *Tineola*) never reported from caves also lack larval ocelli. The larva of *Amydria arizonella* has not been studied, although the larva of a closely related species, *A. effrentella*, is known not to possess ocelli (Johnson and Martin, 1969).

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A NEW SPECIES OF GARGAPHIA LACE BUG FROM BEANS IN COLOMBIA
(Hemiptera: Tingidae)

Richard C. Froeschner, *Department of Entomology, Smithsonian Institution, Washington, D.C. 20560*

ABSTRACT—A population of lace bugs of the genus *Gargaphia* found attacking bean plants in Colombia is described as *G.* **sanchezi**, n. sp. near *G. nigrinervis* Stål. Probable repeated occurrence of this lace bug on beans is attested to by another Colombian series collected on this same host forty years previously.

This plant-feeder whose adults and nymphs attack beans in Colombia is apparently unnamed. The description is based on two Colombian series collected forty years apart on that host.

Gargaphia sanchezi, n. sp.

Diagnosis: *Gargaphia sanchezi* belongs to that group of tropical American species members of the genus, including *G. nigrinervis* Stål to which it is most closely related, recognized by the combination of the broad costal area with four to six cells across its widest part, the obtusely angled paranotum with three to four cells across its widest part, and four to six blackened veins in the otherwise unmarked, hyaline expansions of the elytra. Within this group it is readily recognized by the strongly concave dorsal outline of the median carina which maintains the same height in passing down the posterior slope of the interhumeral convexity onto the posterior pronotal projection.

Characters: Length 4.2–4.5 mm.

Head vertically deflexed, with 5 long, tapering cephalic spines. Antennal segment I elongate, almost as long as width of vertex plus 1 eye, 3 times as long as II; III thinnest, 4 times as long as I plus II and 3 times as long as IV. Labium reaching between middle coxae.

Pronotum with a distinct, somewhat compressed hood rising as high as or slightly higher than median carina, only slightly extended above base of head. Median carina uniseriate, about as high as a femoral diameter, its dorsal outline concave as it passes down posterior interhumeral convexity onto posterior pronotal projection. Lateral carinae uniseriate, about as high as median carina, reaching to calli anteriorly. Paranotum 3 to 4 cells wide across obtuse angulation opposite humeri, thence narrowing anteriorly and posteriorly. Posterior pronotal projection reaching nearly or quite to midlength of discoidal area.

Forewing with discoidal area 5 to 6 cells wide and confined to basal two-fifths. Subcostal area weakly oblique; biseriate in male, triseriate in female. Costal area triseriate in basal third, with 4 to 6 cells across widest part beyond apex of discoidal area; hypocostal lamina uniseriate.

Peritreme elevated, narrowly transversely oval. Sternal laminae present on all 3 sterna, gradually and continuously diverging on pro- and mesosternum, on metasternum broadly cordate with posterior apices widely separated; enclosed sternal groove interrupted by a strongly elevated, angled, transverse lamina at base of metasternum (characteristic of the genus *Gargaphia*). Abdomen convex, impunctate.

Color: Head black, bucculae and subantennal plates whitish; cephalic spines yellow; antenna with segments I, II, and IV (except base) black, III usually yellow, becoming black toward base on some males; labium brown. Thorax black, pronotal disk with a dense pale pile; hood, longitudinal carinae, paranota, and sternal laminae yellowish white; posterior pronotal projection mostly white; legs, except for blackened tarsi, yellow. Forewing with frosty white discoidal and subcostal areas interrupted by a postmedian dark band formed from embrowned veins; costal area and apex of forewing beyond tip of abdomen with cells and most veins clear hyaline, 2–4 cross veins in costal area and 2 veins extending from tip of subcostal area distinctly blackened. Abdomen black in fully matured specimens.

Holotype male: Colombia, Bello, Antioquia, August 17, 1970, Guillermo Sanchez G., from beans (USNM type number 71127). Paratypes: 7 males and 11 females taken with the holotype; Colombia, Medellin, Antioquia, August 21, 1930, C. H. Ballou, on leaves of pole beans, 1 male, 6 females, from C. J. Drake Collection (USNM).

This new species is dedicated to Dr. Guillermo Sanchez G. who collected the fine series of specimens at Bello.

A NEW SUBGENUS AND SPECIES OF MEGANDRENA FROM NEVADA, WITH NOTES ON ITS FORAGING AND MATING BEHAVIOR

(HYMENOPTERA: ANDRENIDAE)

THOMAS J. ZAVORTINK, *Department of Zoology, University of California, Los Angeles, California 90024*

ABSTRACT: A new subgenus, **Erythrandrena**, and new species, **mentzeliae**, of *Megandrena* from southern Nevada are described and illustrated. Characters for separating the subgenera *Erythrandrena* and *Megandrena* and the genera *Megandrena* and *Ancylandrena* are provided. The unusual characteristics of *Megandrena* and the subgenus *Erythrandrena* are discussed and it is suggested that *Megandrena* is as old as the andrenid subfamilies Panurginae and Andreninae. Since *Megandrena mentzeliae* is closely associated with the loasaceous plant *Mentzelia tricuspis*, a brief description of the ecology, floral morphology and floral biology of this plant is given before a more detailed discussion of the behavior of males, foraging females and mating pairs of *Megandrena mentzeliae*. Possible coadaptations of *Megandrena mentzeliae* and *Mentzelia tricuspis* are indicated, the role of *Megandrena mentzeliae* in the pollination of *Mentzelia tricuspis* in southern Nevada is discussed, and the complexity of pollination ecology in *Mentzelia tricuspis* and other plants with similar flowers is mentioned.

Among the bees collected visiting *Mentzelia tricuspis* Gray in the Spring Mountains northwest of Las Vegas, Nevada, in 1968 and 1969 is an undescribed species of *Megandrena*. This species is sufficiently different from *M. enceliae* (Cockerell, 1927) to be placed in a separate subgenus. The present paper provides descriptions of both the species and subgenus and notes on the mating and foraging behavior of the bee and the pollination of *Mentzelia tricuspis*.

The subgeneric description includes characters which have been found to be of value in defining the North American subgenera of *Andrena* (Lanham, 1949; LaBerge, 1964) as well as characters which serve to separate *Erythrandrena* from *Megandrena s. str.* and the genera *Andrena* and *Ancylandrena*.

Erythrandrena, n. subgen.

Diagnosis.—Differs from *Megandrena s. str.* as follows: both sexes with metasoma largely red; female with long flexible curved or wavy bristles on foretarsus; male with head enlarged, face short and broad, and eyes conspicuously divergent below; male genitalia without exposed portion of gonobase.

Description.—Medium-sized species; head and mesosoma largely black with pale pubescence, metasoma largely red with conspicuous white pubescent fasciae; male with cream-colored to yellowish markings on face and mandible.

Female.—Facial quadrangle a little broader than long; eyes slightly divergent below; clypeus slightly protuberant; genal area narrower than eye, without carina; malar space very short; ocelli not enlarged; facial fovea very broad and moderately

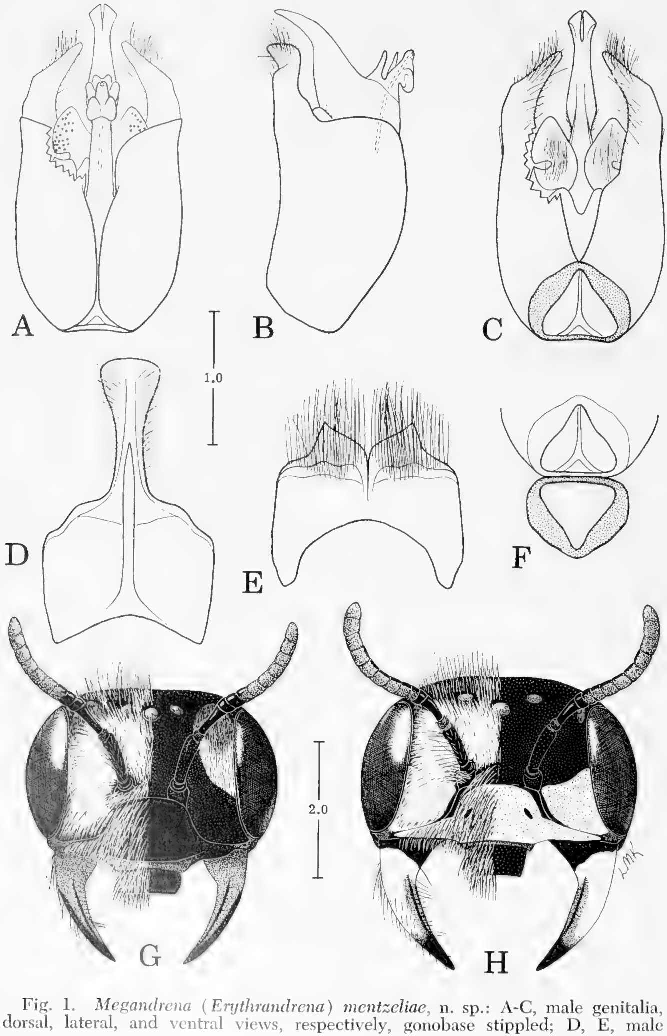

Fig. 1. *Megandrena* (*Erythrandrena*) *mentzeliae*, n. sp.: A-C, male genitalia, dorsal, lateral, and ventral views, respectively, gonobase stippled; D, E, male

impressed above, narrowed and unimpressed below, and moderately long, extending to level of antenna; paramandibular carina without setae; flagellar segment 1 subequal to combined length of following 3 segments, segments 2 to 9 broader than long; anterior mandibular articulation far behind lower anterior margin of eye; mandibles edentate, long, decussate, without basal blister; proboscis without specialized bristles; galea about 0.7 to 0.8 times length of prementum; maxillary palpus extending slightly beyond apex of galea, segment 1 longest, 2 shortest, 3 to 5 subequal in length, each slightly longer than 2, 6 slender, longer than 5; labial palpus shorter than maxillary palpus, subcylindrical, segment 1 longest, 2 and 3 subequal in length and together about equal to length of segment 1, 4 slender, longer than 3; glossa pointed, about 0.4 times length of prementum.

Prothorax with conspicuous humeral angle; basal portion of propodeum gently declivous, in profile nearly touching line tangent to convexities of scutellum and metanotum; propodeal enclosure not bordered by carina; propodeal corbicula very well developed, anterior and dorsal margins with dense vestiture of long, curled, short-plumose hairs, interior with a few long hairs. Tibiae not modified; postvelar portion of malus usually very short; fore tarsus with long slender flexible curved or wavy hairs; hind tarsus shorter than mid tarsus or hind tibia; mid basitarsus not expanded, narrower than hind basitarsus; hind basitarsus short, about 0.5 times length of hind tibia; hind coxa and trochanter with dense floccus of long, curled, short-plumose hairs; scopa of hind tibia and base of hind basitarsus long and dense, hairs of outer surface simple. Fore wing with pterostigma short, about 0.45 to 0.55 as long as distance from its apex to apex of marginal cell, and narrow, about as broad as distance from inner edge of prestigma to costal margin; apex of marginal cell conspicuously, and frequently very abruptly, bent away from wing margin; three submarginal cells, second longer than broad, trapezoidal, third subequal in length to first or slightly shorter; first recurrent vein usually ending near apex of second submarginal cell.

Anterior face of first metasomal tergum shallowly sulcate; pygidial plate with broad rounded median keel; sterna 1 and 2 with scopa of long simple or short-plumose hairs.

Male.—Head enlarged; facial quadrangle much broader than long; eyes conspicuously divergent below; clypeus very slightly protuberant; genal area slightly broader than eye; upper paraocular area relatively flat; antenna scarcely longer than that of female, flagellar segment 1 longer than combined length of segments 2 and 3, segments 2 to 10 slightly broader than long.

Hind tarsus slightly longer than mid tarsus or hind tibia.

Metasomal tergum 7 without well defined pygidial plate, but with long slender flat-topped apical process; sternum 7 without strongly sclerotized median projection. Exposed portion of gonobase absent; gonocoxite without dorsal lobe; volsella moderately long, spiculate; penis valves fused, exceeding apical lobe of gonocoxite; penis emergent dorsally, surrounded by delicate lamellae and membranous lobes.

Etymology.—*Erythrandrena*: erythr-, Greek combining form meaning red, plus *Andrena*, a genus of bees; prefix refers to the red metasoma (feminine).

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sterna VIII and VII, respectively; F, base of male genitalia, gonobase pulled from gonocoxal apodeme; G, H, face of female and male, respectively, right half denuded.

TYPE-SPECIES: *Megandrena* (*Erythrandrena*) *mentzeliae*, n. sp.

Megandrena (Erythrandrena) mentzeliae, n. sp.
(Figs. 1, 2, 3)

Female.—Length, exclusive of antenna, about 10.5 to 13.5 mm. Length of fore wing about 7.3 to 8.3 mm. Width of head about 3.4 to 3.8 mm.

Width of face at level of cylpeal base 1.04 to 1.13 times length from lower edge of median ocellus to apex of clypeus; subantennal area broader than long; facial fovea with hairs of upper portion short, outstanding, brownish-grey when viewed from front but whitish when viewed from above, hairs of lower portion longer, appressed, white; head largely black, reddened ventrally; punctation mostly fine and close; disc of clypeus more coarsely and sparsely punctured, its surface minutely tessellate; small impunctate, smooth or minutely tessellate area present dorsolaterad of lateral ocellus; pubescence dense, white on face and gena, light brownish-grey to brown on vertex; labrum subrectangular, width about 2.2 to 2.5 times median length, base black with crescentic elevated process, apex reddened; mandible ferruginous to black suffused with red except for darker apex and inner edges; scape, pedicel and basal portion of flagellum black, distal portion of flagellum ferruginous; scape with long white pubescence on inner and lower outer surfaces.

Mesosoma black with small lateral areas suffused with red; largely finely and closely punctured; subdorsal posterior median portion of mesoscutum and subdorsal median portion of scutellum nearly impunctate, smooth or shallowly tessellate; metanotum and propodeum roughened; pubescence abundant, long and white on mesepisternum and propodeum, short and light tan to brown on posterior lobe of pronotum, mesoscutum, scutellum and metanotum; tegula black to brown. Legs blackish or brownish basally, becoming lighter distally; tibial spurs usually testaceous yellow; pubescence, including scopal hairs, largely white; apex of fore tibia, distal posterior margin of mid tibia, and basal posterior margin of hind tibia with some brownish hair; wavy bristles of fore tarsus testaceous. Wing veins black and brown; membrane mostly colorless basally, tinged with brown beyond cells, pubescent, especially distally.

Metasoma flattened dorso-ventrally; terga 1 to 4 slightly impressed beneath apical fascia; largely red; terga 1 and 2 with lateral black spot; middorsal portion of tergum 1, lateral portion of tergum 3, and all of terga 4 and 5 frequently suffused with black; terga and sterna finely and closely punctured; terga 1 to 4 with broad white fascia on posterior margin; tergum 1 with additional long, erect white pubescence and terga 2 to 4 with short appressed white pubescence laterally; prepygidial fimbria white, emarginate; pygidial fimbria brown mesally, becoming white laterally; pygidial plate black, suffused with red basally; sterna 2 to 5 with 2 apical rows of long white pubescence broadly interrupted medially.

Male.—Length, exclusive of antenna, about 10.5 to 14.0 mm. Length of fore wing about 7.3 to 8.5 mm. Width of head about 3.6 to 4.3 mm.

Like female except for the following: Width of face 1.31 to 1.46 times length; facial fovea sometimes developed, narrow, short, weakly impressed and sparsely pubescent when present; head black with clypeus and lower paraocular area largely cream-colored to yellowish; disc of clypeus finely and moderately closely punctured; labrum narrower and longer than in female, median width about 1.6 to 1.8 times length, brown, nearly plane; mandible cream-colored to yellowish except for brownish or reddish-black base, apex and inner edges.

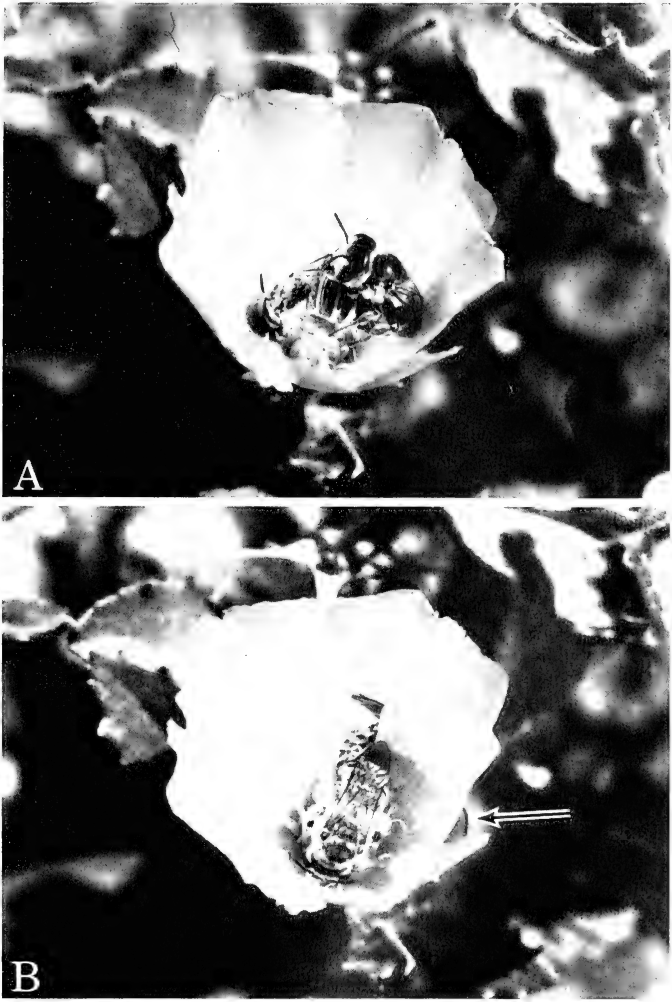

Fig. 2. *Megandrena* (*Erythrandrena*) *mentzeliae*, n. sp. in flower of *Mentzelia tricuspis*: A, first phase of mating, male mounted on foraging female; B, second phase of mating, male partly outside flower, arrow pointing to antenna, female foraging, rotated from position in A.

Pubescence of posterior lobe of pronotum and anterior portion of mesoscutum usually whitish, that of posterior portion of mesoscutum, scutellum and metanotum usually tinged with light brown or grey. Pubescence of tibiae white.

Metasoma not as flattened as that of female; terga 1 to 6 moderately impressed beneath apical fascia; black markings usually restricted to lateral spot on terga 1 and 2 and middorsal blotch on tergum 1; terga 1 to 7 with broad white fascia on posterior margin; sterna 2 to 6 with 2 apical rows of long white pubescence, these sometimes broadly interrupted medially; sternum 7 with long white pubescence concealing a pair of subtriangular apical lamellae; sternum 8 with long, strongly sclerotized, apically expanded median projection.

TYPES: *Holotype* male, *allotype* female, and 254 *paratypes* (205 males, 49 females) from foothills of Spring Mountains, about 13 miles northwest of Las Vegas, Clark County, Nevada (36° 15′ North, 115° 18′ to 115° 21′ West), 3,000 to 3,400 feet, May 3, 1968, and May 10 to June 9, 1969, T. J. Zavortink and/or R. R. Snelling, on *Mentzelia tricuspis*. The holotype, allotype, and 24 paratypes (19 males, 5 females) are at the Los Angeles County Museum of Natural History. Additional paratypes are in the collections of the American Museum of Natural History, the United States National Museum, the University of California at Riverside, the University of Kansas, G. I. Stage, and T. J. Zavortink.

Discussion.—I originally thought this species, first known from two males collected in 1968, belonged to the subfamily Panurginae. But examination of females collected in 1969 indicates it does not, and comparison of males and females with both sexes of *Megandrena enceliae*, which is currently placed in the subfamily Andreninae (Michener, 1944), leaves no doubt that these two species are related. The differences between them are, however, so numerous and significant that *Megandrena mentzeliae* is being placed in the monotypic subgenus *Erythrandrena*. *Erythrandrena* is most conspicuously differentiated from *Megandrena s. str.* by the following features: 1) enlarged head of male, 2) broadened face of male, 3) ventrally divergent eyes of male, 4) relatively flat upper paraocular area of male, 5) conspicuous humeral angle, 6) short postvelar portion of malus, 7) flexible wavy foretarsal bristles of female, 8) strongly bent apex of marginal cell, 9) largely red metasoma, 10) absence of exposed portion of male gonobase, 11) absence of dorsal lobe on male gonocoxite, and 12) moderately long volsella of male genitalia.

The genus *Megandrena*, as interpreted here, includes only the monotypic subgenera *Erythrandrena* and *Megandrena*. It does not include *Ancylandrena*. That small group of four species, one yet undescribed, should be recognized at the generic level. *Megandrena* can be distinguished from *Ancylandrena* by the following morphological characteristics: 1) short antenna of male, 2) posteriorly displaced anterior mandibular articulation, 3) more gently declivous basal portion of propodeum, 4) well developed propodeal corbicula of female, 5) dense

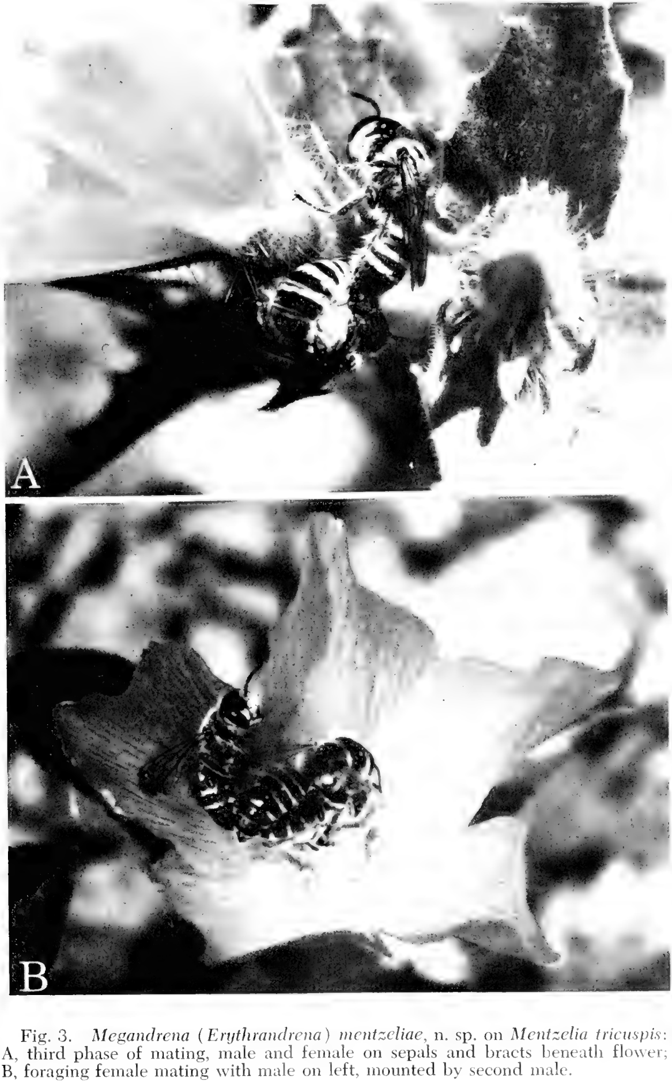

Fig. 3. *Megandrena* (*Erythrandrena*) *mentzeliae*, n. sp. on *Mentzelia tricuspis*: A, third phase of mating, male and female on sepals and bracts beneath flower; B, foraging female mating with male on left, mounted by second male.

floccus of long, curled hairs on hind coxa and trochanter of female, 6) shallowly sulcate first metasomal tergum, 7) absence of well defined pygidial plate in male, 8) absence of strongly sclerotized median process on seventh sternum of male, 9) characteristically shaped male genital capsule, 10) reduced male gonobase, and 11) dorsally emergent penis.

Many of the characteristics of *Megandrena* and of the subgenus *Erythrandrena* in particular are unusual for andrenine bees. Males of *M. mentzeliae* have a relatively flat upper paraocular area in which a small facial fovea is sometimes developed. The fovea is weakly impressed, yet quite distinct, and sparsely pubescent. Males of *M. enceliae* have the broad, shallow, poorly defined depression between the eye and the lateral ocellus which is typical of andrenines. The marginal cell of *M. mentzeliae* is conspicuously bent away from the wing margin, sometimes so sharply that it is obliquely truncate, and noticeably appendiculate. The marginal cell of *M. enceliae* is pointed, but with the apex slightly bent away from the wing margin and minutely appendiculate. Again, the condition in *M. enceliae* is more typical of an andrenine bee. The pollen transporting apparatus of both species of *Megandrena* is unusually extensive. Pollen is carried in a very well developed propodeal corbicula and in scopal hairs on the hind coxa, trochanter, femur, tibia and basitarsus and the metasomal sterna. The species differ in extent of the metasomal scopa: in *M. enceliae* it is found on segments 1 to 4, in *M. mentzeliae* it is restricted to segments 1 and 2. The male genitalia of *Megandrena* are very distinctive. The genital capsule is thick and massive and very frequently protrudes from the genital chamber. The penis projects from the dorsal surface of the aedeagus and is surrounded by lobes and lamellae. The gonobase of the male genitalia is much reduced from the usual condition in *Ancylandrena* and *Andrena*. In *M. enceliae* the exposed portion is present, but very short; the inflected portion is large and coextensive with the large gonocoxal apodeme. In *M. mentzeliae* the exposed portion is absent; the inflected portion is still present, though, as a thin, moderately sclerotic ring adnate to the gonocoxal apodeme. This ring can be pulled free from the gonocoxal apodeme in its entirety (fig. 1F, gonobase stippled). The gonobase of the male genitalia has been reported to be absent in only two other groups of bees, the genus *Apis* (Snodgrass, 1941) and the subfamily Panurginae (Rozen, 1951). The inflected portion of the gonobase may be present in the Panurginae also, as it is possible to pull a thin sclerotic sheet from at least a portion of the gonocoxal apodeme in species of *Hypomacrotera*, *Nomadopsis* and *Perdita*.

The many unusual characteristics of *Megandrena* indicate a long history for the lineage leading to the extant forms. The occurrence of panurgine features in one of the modern species suggests, moreover, that the group is as old as or older than the Panurginae and Andreninae. I believe further speculations about the age and relationships of *Megandrena* and, of course, any change in the rank accorded this group within the Andrenidae should await the discovery and study of the nests and immature stages.

Females of *Megandrena mentzeliae* forage on *Mentzelia tricuspis.* Pollen is combed from the spaces between the stamens by the flexible wavy bristles of the foretarsi as the latter are pulled through the androecium. The shortened postvelar portion of the malus is undoubtedly correlated with this peculiar use of the fore legs.

Megandrena mentzeliae is known at present from only the type locality near Las Vegas, Nevada. Although extensive collections of pollinators of *Mentzelia tricuspis* and the other species of the section BICUSPIDARIA of *Mentzelia* have been made at numerous localities south of the latitude of Las Vegas, *Megandrena mentzeliae* has not been found. Since relatively little collecting has been done at or north of the latitude of Las Vegas, this bee may be found to be widely distributed in the northern portion of the range of BICUSPIDARIA.

Biology.—Megandrena mentzeliae is intimately associated with *Mentzelia tricuspis.* This loasaceous plant is a desert annual that characteristically grows in disturbed sandy or gravelly areas. It is particularly common on the pediment between the Spring Mountains and the Las Vegas Valley about 13 miles northwest of the city of Las Vegas, Nevada. Here it grows sparsely over the surface of the desert, apparently in response to the slight downslope movement of surface material, and more densely in areas of greater substrate movement. These areas include the sides and bottoms of small washes, the tumuli of rodent burrows, the edges of graded roads, and the sides of gravel pits. It is in the last mentioned habitat, gravel pits, that *Mentzelia tricuspis* is most common and forms, in favorable years, large, nearly pure stands on the southfacing slopes. Most of the observations of *Megandrena mentzeliae* were made on plants growing in such situations.

Mentzelia tricuspis has large, solitary, erect, yellowish-white, more or less infundibular flowers with five free, imbricate petals, a single style from an inferior ovary, and very numerous stamens in several series. The style is peculiarly stiff and exserted beyond the stamens. Although three cleft, it appears to be simple because the rigid stigmatic lobes are erect and appressed to each other. Stigmatic hairs are exserted from the distal portion of the grooves between the lobes and from the end of each lobe. The stamens of *M. tricuspis*, as well as those of most of the other species of the section BICUSPIDARIA of *Mentzelia*, are unusual because the basifixed anther is subtended by a pair of lateral lobes from the ampliate filament. These lobes are especially long and conspicuous on the outer stamens, where they subtend a relatively small anther set atop a prolongation of the filament between the lobes. There is a gradual change from this type of stamen to the inner stamens, which have short lateral lobes subtending a large anther nearly sessile in the crotch between the lobes.

Buds of *Mentzelia tricuspis* open throughout the day and the flowers last for two or three days. During late afternoon or early evening the flowers partially close and do not reopen until the following morning. When a flower first opens the filaments of most of the stamens are curved toward the center of the flower and the anthers are held in a compact mass around the style; as the flower ages, successive series of stamens bend toward the petals or straighten and their anthers are moved away from the style. As pollen is released from the anthers it falls into the spaces between the filaments and into the chamber formed around the base of the style by the incurvature of the filaments. This chamber has been called the pollen chamber in another loasaceous plant, *Eucnide urens* Parry, by Thompson and Ernst (1967). As far as is known, the stigma is receptive when the flower first opens.

Males of *Megandrena mentzeliae* spend the night solitarily in the partially closed flowers of *Mentzelia tricuspis*. They resume their activities in the morning at about the same time the flowers are reopening. This time seems to vary from 0715 to 0845 PST, a full 2.5 to 4.0 hours after sunrise. Once active, the males patrol the patches of *Mentzelia* for the rest of the day by flying low and rapidly over the flowers. They have not been observed gathering nectar from the flowers of *Mentzelia* or any other plant and have been seen resting in *Mentzelia* flowers only infrequently. During its patrolling, a male drops from the air into any flower occupied by another moderate-sized bee. If the individual upon which it lands is a female *Megandrena mentzeliae*, mating seems to invariably follow. If the individual is another male *Megandrena* or either sex of the species of *Hesperapis* and *Xeralictus* which regularly visit *Mentzelia tricuspis* at this site, the male *Megandrena* leaves the flower immediately. Indeed, this interaction between sexually incompatible individuals is so rapid that the male *Megandrena* appears to fall into the flower and bounce right out. Males of *Megandrena mentzeliae* start retiring in the late afternoon or early evening, as the flowers of *Mentzelia* begin to close. This time extends from nearly 1600 to 1730 PST.

Females of *Megandrena mentzeliae* start arriving at the patches of *Mentzelia* at about the same time the males become active. Although they continue to forage throughout the day, they seem to be less numerous in the afternoon. They gather pollen from newly opened flowers which, as noted above, have most of the stamens in a compact mass around the style. A female alights in the center of the flower and is supported by the rigid stigma which extends into the cavity formed between the hind legs and the base of the deflexed metasoma. It anchors itself in this position by extending its head far down into the space between the outer stamens and petals and grasping several filaments with its mandibles (fig. 2A, head of female to far left). Then it pulls its fore legs through the mass of stamens rapidly and repeatedly, raking pollen from the spaces between the filaments with the flexible wavy bristles of the fore tarsi. This pollen is continuously transferred to the scopa. After several seconds of raking, the female releases the filaments held by its mandibles, rotates to a new position in the flower (fig. 2B, female rotated from position in 2A), grasps another set of filaments, and repeats the raking. A female may forage in one flower for several minutes and pass through more than a complete rotation during this time. At the completion of foraging, the female abruptly leaves the flower and apparently flies a considerable distance before relanding. Females make no attempt to gather pollen from flowers which do not have a compact mass of stamens. Like the males, they have not been observed gathering nectar.

Megandrena mentzeliae and *Mentzelia tricuspis* seem well adapted to each other. The bee must very effectively outcross the plant. When a female alights on the stigma, the scopa of the hind coxae and trochanters and base of the metasoma is in direct contact with that organ and when it rotates in the flower pollen from the scopa is most certainly forced into the grooves between the appressed lobes of the stigma. Adaptations of the flower for foraging by *Megandrena mentzeliae* could include the rigid style and stigma, which support the bee, the aggregrated anthers on incurved filaments, which concentrate the pollen and allow its collection by centripetal combing, the expanded filaments, which prevent pollen from the outer anthers from falling to the bottom of the flower, and the subtending lobes of the anthers, which protect the latter during raking by the bee.

Mating of *Megandrena mentzeliae* occurs throughout the day on the *Mentzelia* plants. Copulation usually lasts for many minutes and typically consists of three distinct phases. These are a short initial period when both bees are in the flower, a longer interval during which only the female remains in the flower, and a final stage, lasting several minutes, in which both bees rest on the subfloral parts of the plant. The duration of each of these phases is, of course, variable and any may occasionally be so short as to be virtually absent. As indicated earlier males of *Megandrena mentzeliae* drop into flowers occupied by other bees. If the male lands on a female *Megandrena mentzeliae* (fig. 2A), it produces a characteristic, and quite loud, buzzing during the time it takes to connect its genitalia with those of the female. This period of buzzing is normally very brief, lasting but a few seconds. It can, however, be quite long and in one recorded instance lasted more than four minutes. While the male is mounted on her back and buzzing, the female continues to forage. Once its genitalia are firmly attached, the male falls backward (fig. 3B, male to the left) and partially or completely leaves the flower by crawling between two petals (fig. 2B, arrow pointing to male antenna). The female persists in collecting pollen and usually remains in the flower for an additional one to three minutes. The recorded extremes for this period of additional foraging are a few seconds to six minutes. The arc through which the female can rotate while foraging at this time is, of course, much reduced by the more or less stationary position of the male. After completing her foraging the female also crawls from the flower and the mating pair clings to the sepals or bracts of the flower in which they started mating (fig. 3A) or to the buds, bracts or leaves of adjacent stems. The time that the pair remains in copulation outside the flower is usually between six and twelve minutes, but varies from a few seconds to as long as 18 minutes. The male is normally quite passive during this time and does little more than alter his stance in response to movements by the female. The female frequently grooms herself and may palpate the male with her antennae. Almost invariably she ultimately turns and bites and claws at the pygidial area of the male (fig. 3A). This activity increases in frequency as long as mating continues and it is usually during such movements that copulation suddenly ends and both bees fly away.

The only major departure from the mating behavior outlined above occurs in the early morning when the flowers are still partially closed. Bees mating in such flowers often make no attempt to crawl between the petals and the entire period of copulation is spent in the flower. The female does not forage throughout the duration of these matings.

Males of *Megandrena mentzeliae* will mate with freshly killed females placed in *Mentzelia* flowers. Such matings are like normal matings except that the male drags the female from the flower immediately after pairing and may remain in copulation beneath the flower for as long as 40 minutes. These observations suggest that the live female resists being pulled from the flower and plays an active part in terminating the mating. Individual dead females have been mated as many as three times, with as little as one minute elapsing between the end of one mating and the start of the next.

As long as one or both members of the mating pair remain in the flower, the female is subject to disturbance by other males. These frequently land and attempt to copulate (fig. 3B, mating male to the left, non-mating male mounted on female). They usually leave after a few seconds and seldom cause the mating pair to break up. After the mating pair has left the flower, it is only very rarely disturbed by another male. Possibly, then, exodus from the flower evolved as a means of minimizing disturbance by other males.

The nests of *Megandrena mentzeliae* have not been located yet. Small areas on the legs of some males and females and on the pygidial plate of some females are encrusted with fine grained light colored soil, which suggests that nesting occurs in the ground.

The complexity of pollination ecology in *Mentzelia tricuspis* and the other plants with similar flowers is only beginning to be appreciated and can only be alluded to in the present paper. In gross morphology the flowers of the section BICUSPIDARIA are quite unlike those of the other sections of *Mentzelia* and are, in fact, with one exception quite unlike those of any other plant in western North America. The lone exception is another member of the family Loasaceae, *Eucnide urens*. *E. urens* is itself so different from other *Eucnide* that it has been placed in the monotypic section MENTZELIOPSIS. Apparently in response to the vast amount of pollen present in this unique flower type, bees of three different kinds have become oligolectic on these plants. These are the subgenus *Erythrandrena* of the andrenid genus *Megandrena*, the halictid genus *Xeralictus*, and two closely related species of the melittid genus *Hesperapis*. These flowers are, of course, visited regularly by the ubiquitous *Perdita* and occasionally by other bees. There is considerable regional differentiation in the plants, bees, and interaction between the two. In BICUSPIDARIA there is variation, some specific, with much of this currently misinterpreted as being intraspecific, and some regional, in flower size and color, style length, number and compactness of the stamens, and development of the lobes of the filament. In MENTZELIOPSIS there is variation in time of flowering, this possibly correlated with the historical presence or absence of BICUSPIDARIA in the same area. Among the bees there are interspecific differences and at least geographic intraspecific variations in size and color. At the level of interaction between the plants and bees there appear to be temporal, microgeographic, and macrogeographic differences in the number of species and kinds of bees visiting a given species of plant. Most populations of melittophilous BICUSPIDARIA which have been studied are visited by two species of bees which are almost always differentiated by metasomal color of the females. The population of *Mentzelia tricuspis* northwest of Las Vegas is unusual because it is visited by three species of bees, all of which have a largely red metasoma. These bees are *Megandrena* (*Erythrandrena*) *mentzeliae*, an undescribed species of *Xeralictus*, and an undescribed species of *Hesperapis* near *H. laticeps* Crawford, 1917. Early in the season, when only the *Mentzelia* growing on the south-facing slopes of the gravel pits is in bloom, *Xeralictus* is the only bee present. Later in the season, when the *Mentzelia* growing in areas of natural disturbance is also in flower, all three bees are active. If *Xeralictus* is the only *Mentzelia* visiting bee in the area that finds suitable nesting sites in the gravel pits, which are obviously the warmest microhabitat, then its earlier emergence could be due solely to man's disturbance of the environment. This is, of course, sheer speculation since the nesting sites of all three species are unknown. During the height of the flowering season all three bees can be found visiting *Mentzelia* throughout the day. *Megandrena mentzeliae* is, however, more common than the others in the forenoon. It is undoubtedly the most effective and important pollinator because it visits the flowers at an earlier stage in their development than does either the *Hesperapis* or *Xeralictus*. The latter bees visit older flowers in which the mass of stamens has loosened and forage in a totally different manner. They alight in the flower, usually on the stigma, and force their way head first between the stamens and style and enter the pollen chamber. Here they gather pollen on the foreparts of the body, then back from the chamber, frequently aided in this by movements of the metasoma which is hooked over the apex of the stiff stigma, and transfer the pollen to the scopa of the hind legs. When the stamens are tightly appressed to the style, as they are in the fresh flowers visited by *Megandrena mentzeliae*, the *Xeralictus* and *Hesperapis* are not able to force their way into the pollen chamber. They are, in fact, only rarely seen in such flowers. If, as is apparently the case, the stigma of *Mentzelia tricuspis* is receptive when the flower first opens, then pollination has occurred before the flower is visited by *Xeralictus* and *Hesperapis*, and the latter do little more than collect residual pollen.

One can speculate *ad infinitum* about the evolution of BICUSPIDARIA, MENTZELIOPSIS, the bees associated with them, and a pollination system in which some of the same morphological features of the flower are utilized in totally different ways by unlike bees. Some very obvious unanswered and possibly unanswerable questions to be considered are: Does *Megandrena mentzeliae* exploit flowers adapted for pollination by *Xeralictus* and *Hesperapis*? Or, are *Xeralictus* and *Hesperapis* pollen scavengers which have come to be the sole pollinators of BICUSPIDARIA over most of its range? Or, could the flowers possibly have evolved synchronously for pollination by two different, but not incompatible, means? What is the basis for the similarity in the flowers of MENTZELIOPSIS and BICUSPIDARIA? Do these plants compete for pollinators? Could MENTZELIOPSIS have lost pollinators to BICUSPIDARIA? Is there any relationship between speciation in BICUSPIDARIA and the bees? Is there competition for pollen between *Megandrena mentzeliae* and the *Xeralictus* and

Hesperapis or do they tap more or less separate supplies of pollen? Why isn't the *Megandrena*, which forages so successfully near Las Vegas, found throughout a greater part of the range of BICUSPIDARIA?

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I wish to thank P. H. Timberlake of the University of California at Riverside, R. R. Snelling of the Los Angeles County Museum of Natural History, G. I. Stage of the University of Connecticut, and J. G. Rozen of the American Museum of Natural History for their remarks on the position of this species. I am indebted to J. N. Belkin of the University of California at Los Angeles for many courtesies extended to me during this study, H. J. Thompson of the University of California at Los Angeles for botanical counsel, and R. R. Snelling for many favors and for reviewing the manuscript and suggesting certain improvements. The illustrations were prepared by L. Margaret Kowalczyk and the manuscript was typed by Nancy E. Tometich and Claire M. Price.

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THE GENERIC NAMES SALIA AND COLOBOCHYLA OF HÜBNER
(LEPIDOPTERA: NOCTUIDAE)

JOHN G. FRANCLEMONT, *Department of Entomology Cornell University Ithaca, New York 14850*

ABSTRACT—The generic names *Salia* Hübner, [1806] and [1818], and *Colobochyla* Hübner, [1821], are discussed, and their application in the fauna of the Americas is clarified.

In his check list of the North American Lepidoptera McDunnough, 1938, page 129, uses the generic name *Salia* Hübner for a small anomalous noctuid moth described as *Madopa interpuncta* by Grote in 1872. With the promulgation by the International Commission on Zoological

Nomenclature in 1926 of Opinion 97 ruling the Tentamen of Hübner ". . . obviously prepared essentially as a manifold manuscript, or as a proof sheet (cf. Opinion 87), for examination and opinion by a restricted group of experts, *i.e.*, in Lepidoptera, and not for general distribution as a record in Zoology.", this use of the name became invalid because the name was not available from 1806, the date of publication of the Tentamen. It is apparently available from 1818 when Hübner used it for a small noctuid from South America in the subfamily Herminiinae. The valid name for the species called *Salia interpuncta* (Grote) by McDunnough is *Colobochyla interpuncta.*

The following may help to make matters clear:

Colobochyla Hübner

Salia Hübner, [1806], Tentamen. . ., p. [2].
Type: *Pyralis salicalis* Dennis and Schiffermüller, 1775. Monotypy. Unavailable; see Opinion 97.
Colobochyla Hübner, [1825], Verzeichniss bekannter Schmettling (*sic*), p. 344.
Type: *Pyralis salicalis* Dennis and Schiffermüller, 1775. Monotypy.
Madopa Stephens, 1829 [June], Nomenclature of British Insects, p. 45.
Type: *Pyralis salicalis* Dennis and Schiffermüller, 1775. Monotypy.

The North American species *interpuncta* is very closely related to the Eurasian species *salicalis*, and *Colobochyla* has been in use for that species for a number of years, at least since Tams in 1939 demonstrated the correct application of the name. Warren, 1913, page 398, used *Colobochyla* for *salicalis*, but he was not generally followed. Grote, 1873a, page 309, used *Colobochyla* for the species that he had described in *Madopa* the previous year, apparently realizing that *Colobochyla* was an earlier name for the same concept as *Madopa.* Zeller in 1872, page 462, redescribed Grote's *interpuncta* as a new species, *saligna*, and used the emended spelling *Colobochila*, and he pointed out that Walker, 1858, page 18, had misspelled the name as *Calobochyla.* Grote, 1873b, page 170, accepted the emendation proposed by Zeller. When Scudder made the contents of Hübner's Tentamen known, Grote, 1875, page 223, accepted the generic names proposed therein and replaced *Colobochila* (*recte Colobochyla*) with *Salia.* Finally it should be noted that Stephens in 1834, page 18, placed his genus *Madopa* as a synonym of *Colobochyla* Hübner.

Salia Hübner

Salia Hübner, [1818], Sammlung exotischer Schmetterlinge, vol. 1, pl. [208].
Type: *Salia* mirabilis *Mimalis* Hübner, [1818]. Monotypy.
Megatomis Hübner, 1821, Index Exoticorum Lepidopterorum, p. [5]. **New synonymy.**
Type: *Salia* mirabilis *Mimalis* Hübner, [1818]. Monotypy.

Schaus, 1916, page 388, lists *Homogramma* Guenée, 1854, with type *Homogramma mialis* Guenée, 1854, *Ægara* Walker, 1865, with type *Ægara interruptalis* Walker, 1865, and *Batyma* Schaus, 1906, with type *Batyma onesalis* Schaus, 1906, as synonyms of *Megatomis* Hübner. I have not studied any of these species so I cannot confirm the synonymy.

The species of this genus have the males with the palpi elongate and recurved over the head and thorax. They are apparently restricted in their distribution to the American Tropics. Thus, although some confusion will result from this mandatory transfer of the generic name, it is hoped that it will not be great. The name will be applied to a group that occurs outside the range of the species which were formerly referred to *Salia* in the sense of Hübner, 1806.

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THE LAST INSTAR CATERPILLARS OF OXYCILLA TRIPLA GROTE AND COLOBOCHYLA INTERPUNCTA (GROTE)

(Lepidoptera: Noctuidae)

George L. Godfrey, *Illinois Agricultural Experiment Station, University of Illinois and Illinois Natural History Survey, Urbana, Illinois 61801*

ABSTRACT—The last instar caterpillars of two species of the subfamily Rivulinae are described. The larva of *Oxycilla tripla* Grote is decribed for the first time, and *Colobochyla interpuncta* (Grote) is redescribed. These species agree only slightly with the existing definition of the subfamily Rivulinae that is based on larval characters.

Very few caterpillars of the Nearctic species of moths now included in the subfamily Rivulinae have been described. Dethier (1941) described the last instar caterpillar of *Rivula propinqualis* Guenée, and Forbes (1954) gave a superficial account of *Colobochyla* (*olim Salia*) *interpuncta* (Grote). The purpose of this paper is to describe the caterpillar of *Oxycilla tripla* Grote for the first time, to describe in greater detail the caterpillar of *Colobochyla interpuncta* (Grt.), and to compare them with Beck's (1960) definition of the subfamily Rivulinae that he based on larval characters.

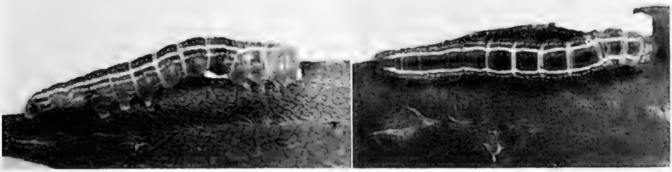
The genus *Oxycilla* Grote was assigned to the subfamily Rivulinae by Richards (1932). Besides *O. tripla* four other species of *Oxycilla* occur in America north of Mexico (McDunnough, 1938). No caterpillars of the genus were known until Dr. J. G. Franclemont and I hand collected many caterpillars of *O. tripla* that were feeding on *Desmodium batocaulon* A. Gray (Leguminosae). They were found near East Turkey Creek at an elevation of 6,400 feet in the Chiricahua Mountains, Cochise County, Arizona on the night of August 13, 1967 and on succeeding nights. Four of the caterpillars were preserved, and the remainder pupated in September of 1967. Thirty-three adults emerged from the pupae during the first part of June 1968 and were identified by Dr. Franclemont.

All original line illustrations were drawn to scale with the aid of an M5 Wild stereomicroscope and a grid system. The scale lines represent 0.5 mm. The terminology and measurements used in this paper are the same as the ones I previously adopted (Godfrey, 1970). I used an Asahi Pentax camera equipped with the Pentax Bellows II and Pentax Slide Copier to take the black and white photographs of *Oxycilla tripla* from Kodachrome Slides taken by Dr. Franclemont.

Oxycilla tripla Grote

(Figs. 1–7, 16–18)

Diagnostic features. The last instar caterpillar lacks a middorsal line, but has conspicuous, white subdorsal lines contrasting with the green ground color (figs.



Figs. 1–2. *Oxycilla tripla* Grote: 1, lateral view; 2, dorsal view.

1, 2). The morphological structures of the mouthparts described below can be used to recognize specimens preserved in alcohol.

General. Head 1.9–2.0 mm wide. Total length 22–23 mm. Abdominal prolegs absent on third abdominal segment, reduced on the fourth, normal on fifth and sixth segments. Crochets uniordinal. Head and body smooth. Dorsal abdominal setae tapering distad, 2.4–3.0 times height of seventh abdominal spiracle; setal insertions flat, inconspicuous.

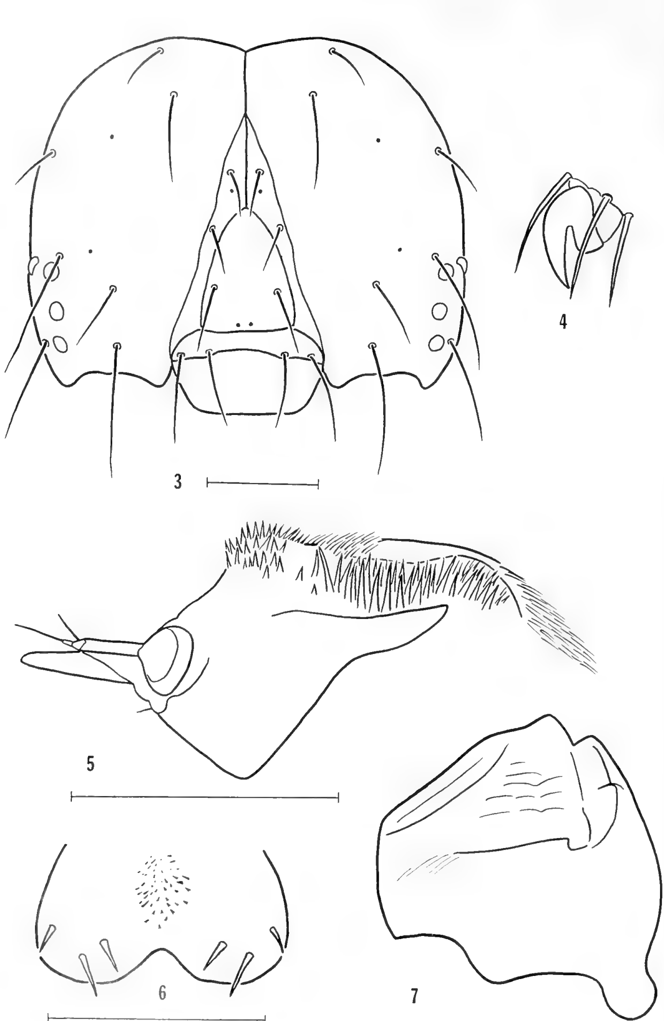
Head. Postgenal sutures straight, parallel to each other (fig. 9); epicranial suture 1.3 times longer than height of frons (fig. 3); distance from seta F-1 to fronto-clypeal suture 0.33 times the distance between F-1's; AFa and AF-2 distinctly posterior of apex of frons; setae A 1–3 forming an obtuse angle; seta L caudad of transverse line formed by AF-2's; seta P-1 caudad of juncture of adfrontal sutures; Oc 1–4 equally spaced, interspaces larger than greatest width of individual ocelli.

Mouthparts. Oral surface of labrum medially covered with short spines (fig. 6). Hypopharyngeal complex (fig. 5): spinneret long, tapering, not surpassing tip of Lp-2; stipular seta shorter than Lps-1 and Lp-1, about 1.5 times longer than Lps-2, shorter than Lp-2; distal region lacking spines above spinneret, with numerous stout spines on pronounced raised area proximad of unspined area; proximo-lateral region with numerous long spines irregularly arranged. Mandible (fig. 7) with a low but elongated inner tooth; outer teeth 1–3 triangular, region of outer teeth 4–6 a low, broad cutting edge.

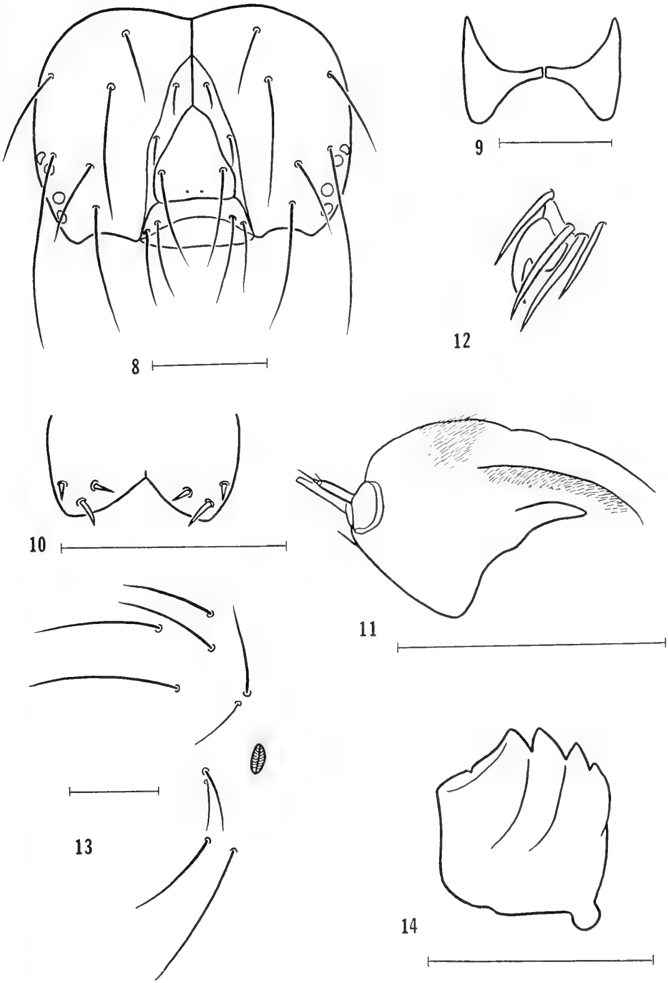
Thorax. Segment T-1 (fig. 17): seta D-2 caudad of line formed by D-1 and XD-2; major axis of spiracle passing caudad of SD 1–2, cephalad of SV 1–2; SD-1 vertically in line with D 1–2. Segments T 2–3: seta L-1 located dorsad and slightly caudad of L-2. Tarsal claws as in fig. 4; tarsal setae simple.

Abdomen. Segment Ab-1: only two subventral setae (SV-1 and -3) present, SV-1 located postero-laterad of line formed by setae V and SV-3 (fig. 16). Segments Ab 2–6: three subventral setae present. Segment Ab-8: only one seta in each subventral group. Segment Ab-9: seta SD-1 as strong as setae D 1-2. Anal and subanal setae no larger than lateral setae on anal proleg (fig. 18).

Coloration. Head translucent, yellowish green without conspicuous markings. Body generally translucent green. Dorsal area marked with two continuous subdorsal lines; middorsal line absent. Subdorsal area with a broken white line on T-2 through Ab-10. Ventral margin of lateral area present on Ab 3–9 as an interrupted white line. Spiracles pale yellowish brown.



Figs. 3–7. *Oxycilla tripla* Grote: 3, head capsule; 4, tarsal claws; 5, hypopharyngeal complex; 6, oral surface of labrum; 7, oral surface of left mandible.



Figs. 8–14. *Colobochyla interpuncta* (Grote): 8, head capsule; 9, postgenae; 10, oral surface of labrum; 11, hypopharyngeal complex; 12, tarsal claw; 13, prothoracic segment; 14, oral surface of left mandible.

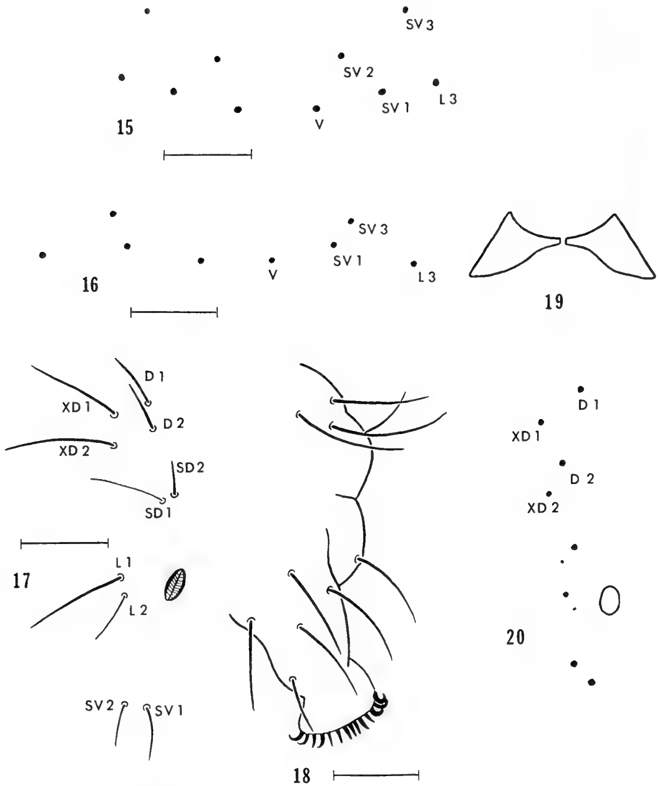


Fig. 15. *Colobochyla interpuncta* (Grote), venter of first abdominal segment. Figs. 16–18. *Oxycilla tripla* Grote: 16, venter of first abdominal segment; 17, prothoracic segment; 18, anal segment and proleg. Figs. 19–20. *Rivula sericealis* (Scopoli) (adapted from Beck, 1960): 19, post-genae; 20, prothoracic segment.

Material examined. Four specimens: East Turkey Creek, 6400 feet, Chiricahua Mountains, Cochise County, Arizona. August 13, 1967. Collected feeding on *Desmodium batocaulon* A. Gray by G. L. Godfrey and J. G. Franclemont.

Comments. Casual field observations showed that all instars ate the leaflets of the host, but only the larger caterpillars fed on the floral parts.

Colobochyla interpuncta (Grote)
(Figs. 8–15)

Diagnostic features. The two distinct internal ridges and the structure of the outer cutting teeth of the mandible (fig. 14) characterize this species. In addition, the hypopharynx (fig. 11) bears very weak spines only on the proximal half of the convex distal region.

General. Head about 1.4 mm wide. Total length about 23 mm. Abdominal prolegs minute on third abdominal segment, slightly reduced on the fourth, normal on fifth and sixth segments. Crochets uniordinal. Head and body smooth. Dorsal abdominal setae tapering distad, 6.7–8.0 times height of seventh abdominal spiracle; dorsal setal insertions flat, inconspicuous.

Head. Postgenal sutures straight, parallel to each other or slightly curved (fig. 9); epicranial suture equal to height of frons (fig. 8); distance from seta F-1 to fronto-clypeal suture 0.47 times distance between F-1's; seta AF-2 definitely posterior of apex of frons; setae A 1–3 forming obtuse angle; seta L nearly in line with or slightly posterior of line formed by AF-2's; seta P-1 anterior of juncture of adfrontal sutures; distance between first and second ocelli (Oc 1–2) equal to width of Oc-2; Oc 2–4 equally spaced with interspaces greater than width of Oc-2.

Mouthparts. Oral surface of labrum unspined (fig. 10). Hypopharyngeal complex (fig. 11): spinneret long and tapering, not surpassing Lp-2; stipular seta shorter than Lps-1, longer than Lp-1 and Lps-2, equal to or slightly longer than Lp-2; distal region with fine spines except above spinneret; proximo-lateral region with fine spines; proximo-medial region bare. Mandible (fig. 14) with only two inner ridges, no inner tooth; outer teeth 1–4 distinctly triangular; outer teeth 5–6 greatly reduced.

Thorax. Segment T-1 (fig. 13): seta D-2 caudad of line formed by D-1 and XD-2; major axis of spiracle passing caudad of SD 1–2 and SV 1–2; SD-1 located slightly posterior of vertical line passing through D-2. Segments T 2–3: seta L-1 located above and slightly caudad of L-2. Tarsal claws as in fig. 12; tarsal setae simple.

Abdomen. Segment Ab-1: three subventral setae (SV 1–3) present; SV-1 located postero-laterad of line formed by seta V and SV-3 (fig. 15). Ab 2–6 with three subventral setae. Ab-8 with only one seta in each subventral group. Seta SD-1 on Ab-9 as strong as setae D 1–2. Anal and subanal setae no larger than lateral setae on anal proleg (fig. 18).

Coloration. Forbes' (1954) description is the following: "Light green with double, fine irregular dorsal line, weaker white subdorsal and pale yellow stigmatal; incisures somewhat constricted, yellow. Head held almost flat."

Material examined. One specimen: Arlington, Virginia. August 1950. Reared on *Salix* sp. from ovum laid by female collected by J. G. Franclemont.

Discussion

The subfamily Rivulinae was proposed on the basis of adult characters by Richards (1932). Later Beck (1960) diagnosed the subfamily using the larval characters of *Rivula sericealis* (Scopoli). Some of the main characters that Beck used are the following:

1. The shape of the postgenae: "*Enden der Postgenae schmal, einander berührend. Nähte gerade, cephal sehr stark konvergierend. . .*" (fig. 19).

2. The spininess of the oral surface of the labrum: "*Labrum cephal median nur gering eingebuchtet, von charakteristischer Form, auf der Innenseite mit auffallender Bestachelung. . .*"

3. The setal pattern on the cervical shield: "SI: I-II 1½-2 II-IX; II *der Linie* IX-X *stark genähert. . .*" (fig. 20: I = D-1, II = D-2, X = XD-1, IX = XD-2).

4. The number of setae on the abdominal prolegs: "S 3–6: *Aussenseite der Abdominal beine mit einer uberzahligen Borste, also* 4 *Borsten. . .*"

5. The number of subventral setae on the eighth abdominal segment: "S 8: VII *aus* 2 *Makroborsten. . .*"

The last instar caterpillar of *Oxycilla tripla* has spines on the oral surface of the labrum, but this is the only apparent similarity between it and *Rivula sericealis.* According to fig. 176 by Beck (1960), the spines on the oral surface of the labrum of the latter species are much more numerous than in *Oxycilla tripla.* There is no agreement between the two species when the other four characters that are listed above are considered: the postgenae of *Oxycilla tripla* have parallel sutures; seta D-2 on the cervical shield of *O. tripla* is inserted posterior of the line formed by D-1 and XD-2 instead of being closely inserted to the line formed by setae XD-1 and XD-2; the subventral setal groups of *O. tripla* contain only three setae on the abdominal prolegs and only one seta on the eighth abdominal segment. *Colobochyla interpuncta* has no spines on the oral surface of the labrum, otherwise it is similar to *Oxycilla tripla* in respect to the other four main characters.

Tympanal characters of the moths of the genus *Rivula* indicate that the genus is more primitive than either *Colobochyla* (*olim Salia*) or *Oxycilla* (Richards, 1932). The fully developed prolegs of *Rivula sericealis* and *R. propinqualis* in contrast to the reduced condition of the anterior prolegs of *Oxycilla tripla* and *Colobochyla interpuncta* tends to substantiate this. The characters of the two species that I have compared with Beck's (1960) definition of the subfamily Rivulinae show that the relationship is perhaps more distant than stated by Richards (1932). In regards to the characters discussed in this paper, excluding the condition of the oral surface of the labrum, *Oxycilla tripla* and *Colobochyla interpuncta* are more similar to the species included in the subfamily Lithacodiinae as restricted by Crumb (1956).

Acknowledgments

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Entomology at Cornell University and supported by USDA AGR RMA Grant No. 12–14–100–8031(33). Additional support came from the Illinois Agricultural Experiment Station, University of Illinois and the Illinois Natural History Survey. I thank Dr. P. A. Hyppio of the Bailey Horotorium, Cornell University for identifying the specimens of *Desmodium batocaulon* A. Gray. Dr. J. G. Franclemont of Cornell University and Drs. Lewis J. Stannard and Robert W. Poole of the Illinois Natural History Survey were very helpful in the preparation of this paper.

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THE FUNCTION OF THE EYE STALKS IN DIOPSIDAE (DIPTERA)

HENRY TOWNES, *American Entomological Institute, 5950 Warren Road, Ann Arbor, Michigan 48105*

ABSTRACT—The hypothesis is presented that the function of the stalked eyes in flies of the family Diopsidae is to aid the flies in mimicry of wasps, the eye stalks being used to simulate the long antennae of the wasps.

Diopsid flies are familiar to entomologists who have worked in the tropics. The family is not a large one, but their strange head shape always draws attention to them. Each side of the head is drawn out laterally as a long stalk, with the compound eye at the end of the stalk. The result is something like the stalked eyes of decapod crustaceans, but more bizarre because the stalks are longer.

Adult diopsids occur where there is shade, damp or wet soil, and lush vegetation. They crawl about on the leaves of broad leaved plants, like Araceae and Zingiberaceae, and because of this they are conspicuous. The family is scarce in temperate areas and common in the tropics. In museum collections the eye stalks immediately attract attention and cause some wonder about their purpose. Eyes situated far to each side would enhance the sense of perspective or depth perception. While it is easy to imagine that diopsids should have unusually good depth perception, it is not obvious why they need it, or why other insects do not have similar developments.

While increased depth perception might well be a function of the eye stalks, and while there might also be other functions, the only use that the author has actually observed is that they help the flies to mimic wasps. Diopsids achieve mimicry of wasps (smaller wasps) by a combination of several factors:

1. They crawl about on broad leaves with the same pace and manner as wasps.
2. They swing the head in a way that gives the eye stalks a motion which, together with their shape, results in a reasonable resemblance to wasp antennae.
3. They sometimes flip their wings like wasps.
4. They have a shiny color that is characteristic of Hymenoptera rather than of Diptera.
5. The combination of wing and body colors of many species tends to give the illusion of a constricted wasp waist.
6. When held in the fingers, diopsids give a high-pitched buzz, like a wasp.
7. There are sharp spines on the scutellum that can give a prick simulating a wasp sting.

While the author can, of course, distinguish a diopsid crawling on a leaf from a small wasp, this frequently requires a second look. A significant part of the resemblance is due to the eye stalks.

Diptera frequently mimic Hymenoptera. The hymenopterous attribute that seems to be most difficult for Diptera to mimic is the relatively long antennae, as antennae are quite short in most Diptera. In the dipterous mimics, waving appropriately colored front legs in the manner of antennae is the usual ruse to simulate hymenopterous antennae. This is a common practice among syrphids, rhagionids, and micropezids. In the diopsids the eye stalks, moved by the proper head jerks, achieve a fair simulation of wasp antennae.

There are a few diopsids, like *Sphyracephala*, with very short eye stalks. Whether the short eye stalks of those particular species are incipient or vestigial developments, and what may be the function of the very short eye stalks, are questions that this article is not intended to answer.

THE CASE OF THE ELUSIVE AUTHOR

CURTIS W. SABROSKY, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—A discussion of the authorship of the species *Arocera elongata* (Hemiptera: Pentatomidae) is given.

Authorship of scientific names of organisms is usually obvious, and the pertinent rules simple. Occasionally, however, strange quirks beget differences of opinion. The case of *Arocera elongata* in the stink bug family Pentatomidae is such a curious nomenclatural and bibliographical problem.

Van Duzee (1937, Pan-Pac. Ent. 13:25–27), under "*Arocera elongata* Uhler, MS," described a striking red and black pentatomid from 4 specimens (1, Venezuela, Calif. Acad. Sci.; 1, Chapada, Brazil, and 2, Bolivia, Carnegie Mus.). Then he added this titillant (for a nomenclaturist): "This is apparently the species figured in the July, 1929 number of the National Geographic Magazine, plate V fig. 1, where it is given the name used above, evidently a MS name never published by Dr. Uhler." Van Duzee then questioned: "Does the publication of this figure in the National Geographic Magazine establish the species, and if so what is the type of the species and who is its author? Uhler cannot be the authority for the name as he neither described nor figured it. Mr. Franklin L. Fisher apparently selected the specimens for illustration in this article and Mr. E. L. Wisherd photographed them. . . . As we cannot give Dr. Uhler as authority for the species should we credit it to Mr. Fisher and Mr. Wisherd, or to Mr. Grosvenor as editor of the National Geographic Magazine, who appropriated the funds for the preparation and illustration of the paper, or should the present brief description be used as authority of the species."

Before 1931, a figure alone was sufficient to make a name nomenclaturally available (International Code of Zoological Nomenclature, Arts. 12 and 16a.vii). Hence the specific name *elongata* dates from 1929, not from Van Duzee, 1937. Uhler is not the author, of course; his was a manuscript name on a collection label. But who is the author? This question "bugged" Van Duzee, and small wonder. The authorship is curiously concealed.

To begin with, "*Arocera elongata* Uhler" is mentioned twice: On p. [33] in the legend for color plate V, and on p. 40 in the text on Pentatomidae, where the figure is listed. No description is given, merely the sex (♀, legend) and the provenance (Brazil, p. 40). On

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[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

p. 90 we are also told that all specimens photographed in color were in the collections of the U.S. National Museum. These pages are in a section entitled "Insect Rivals of the Rainbow," pp. 28–90, but oddly no author is given beneath the section title on p. 28, nor in the table of contents on the front cover of that July issue, nor in the complete table of contents for the whole volume, nor in the volume's Index under that title. The last three places state after the title only that the article contains color photographs by Edwin L. Wisherd and paintings by Hashime Murayama. On p. 90 at the very end of the article is the byline "Franklin L. Fisher," after a general statement on the source of the specimens, the care in relaxing, spreading, and arranging them, and the Society's staff personnel responsible for the color photographs and the paintings.

The Index for the entire volume resolves the confusion. The entry, "Insects: Exploring the Wonders of the Insect World," credits William Joseph Showalter with all 90 pages, even though in the July issue itself only pp. 1–27 are under the "Exploring" title, whereas pp. 28–90 are under the title and running head "Insect Rivals of the Rainbow." Also, both in the above Index entry and on the cover of the July issue, Showalter's article is said to have 59 illustrations, a figure only derivable from the 24 figures on pp. 1–27 plus the 35 figures on pp. 28–90. Furthermore, the Index credits Fisher only with pages 28 *and* 90 of the section on "Insect Rivals of the Rainbow," i.e., with the brief introductory remarks and the concluding general statement noted above.

My conclusion is therefore that the authorship of *Arocera elongata* must be credited to Showalter, the author of the article in which the name was published in connection with a figure.

As a final step, I examined the collection of Pentatomidae in the U.S. National Museum along with Dr. R. C. Froeschner, Curator of Hemiptera, to whom I am indebted for calling my attention to Van Duzee's article. There are 5 specimens of *A. elongata* from Chapada, Brazil, including one with Uhler's handwritten label "*Arocera elongata* Uhler, Brazil." Another, a female with legs and antennae extended in photogenic position, bears a large handlettered label, apparently by H. G. Barber, "This specimen was fig. Nat. Geo. Mag. July 1929 and becomes the type *Arocera elongata* Showalter." It bears the labels "Oct.," "Chapada," and "Type No./52107/U.S.N.M." The Museum's Type Book shows that it was entered there on July 8, 1937, also apparently by H. G. Barber. I agree with Barber's conclusions on authorship and type, but to obviate any possible later argument that all of Uhler's Brazil material under his manuscript name *elongata* constitutes a series of syntypes, I hereby formally designate the above figured specimen as lectotype.

A REVIEW OF THE GENUS DAIDALOTARSONEMUS DELEON (ACARINA: TARSONEMIDAE)

ROBERT L. SMILEY, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Washington, D. C., 20250*

ABSTRACT—Illustrations and a key for all known females of the genus *Daidalotarsonemus* are presented. *Hemitarsonemus deleoni* and *H. leonardi* Smiley are transferred to this genus.

The mites of the genus *Daidalotarsonemus* DeLeon have been recorded from several hosts of agricultural importance, including *Litchi chinensis* Sonn; *Citrus sinensis* (L.), *Hibiscus* sp., *Vaccinium* sp., *Malus* sp. and some epiphytes. Because of their potential economic importance I take the opportunity to illustrate and briefly redescribe all the known females of the genus.

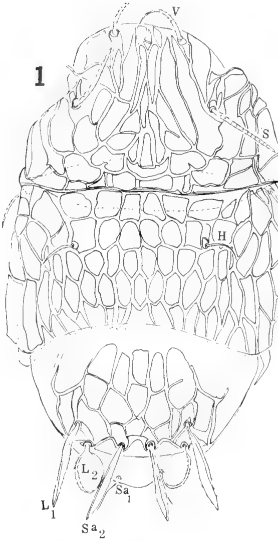
Daidalotarsonemus now includes seven described species. Until recently it was suspected that these mites occurred only in subtropical regions until Suski (1967) described *D. vandevriei* from Poland and Ito (1963) reported *D. tessellatus* from Japan. Smiley (1967) described *Hemitarsonemus deleoni* and *H. leonardi* based on the males. Since that time I have had the opportunity to study a male paratype of *D. vandevriei* Suski and a male of a species of *Daidalotarsonemus* that Attiah illustrated but did not describe. Examination of these males clearly demonstrates that *H. deleoni* and *H. leonardi* are congeneric with *D. vandvriei* and the species illustrated by Attiah. Therefore, I take this opportunity to place *H. deleoni* and *H. leonardi* in *Daidalotarsonemus*. Rather than give a detailed redescription of all known species, I present notes of differences and similarities of each species, except for *D. fossae*. DeLeon (1956) did not illustrate the dorsum for *D. fossae*, and I have taken the opportunity to illustrate and redescribe this species.

The author has had the opportunity to study the types of all known species through the courtesy of Dr. Herbert W. Levi, Museum of Comparative Zoology, Harvard University, Dr. Martin H. Muma, Citrus Experiment Station, Lake Alfred, Florida and Dr. Z. W. Suski, Institute of Pomology, Skierniewice, Poland.

KEY TO KNOWN FEMALES OF **Daidalotarsonemus**

1. Anteromedial dorsal hysterosoma plate patterns not contiguous longitudinally 2
   Anteromedial dorsal hysterosoma plate patterns contiguous longitudinally .... **jamesbakeri** Smiley
2. Sa_2 (sacral) setae short, narrowly lanceolate 3
   Sa_2 setae long, broadly lanceolate 4
3. Second pair of L (lumbal) setae shorter and smaller than Sa_2 setae, or V

1



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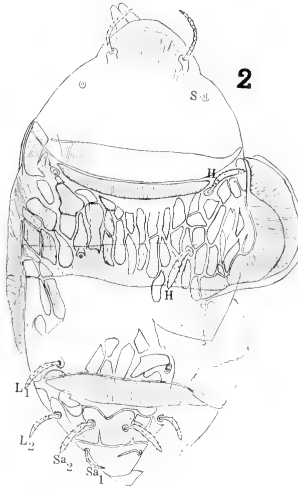

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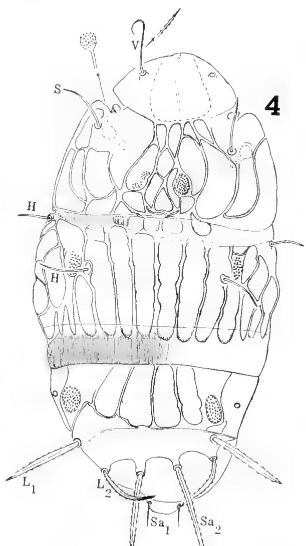

(vertical) setae not as long as distance between their base ..... **fossae** DeLeon
Second pair of L (lumbal) setae subequal to Sa_2 setae of V setae longer than the distance between their base ..... **vandevriei** Suski
4. Both pairs of H (humeral) setae smooth 5
Both pairs of H setae barbulate ..... **tessellatus** DeLeon
5. S (scapular) setae smooth 6
S setae barbulate ..... **venustus** Attiah
6. Anteromedial dorsal hysterosoma with 3 transverse rows of distinct platelets ..... **somalatus** Attiah
Anteromedial dorsal hysterosoma with an irregular row of longitudinal platelets ..... **seitus** Attiah

Daidalotarsonemus tessellatus DeLeon
(Fig. 1)

Daidalotarsonemus tessellatus DeLeon, 1956:163.

The female of this species is very close to *D. venustus* Attiah in dorsal appearance. The humeral setae of this species are barbulate, whereas in *venustus* they are smooth. *D. tessellatus* is larger than the latter. The vertical pair of setae of *tessellatus* is shorter than the distance between their bases and are slender. This species is known from the female holotype, allotype, and two males and five female paratypes collected by D. DeLeon in 1955 from *Litchi chinensis* Sonn., at the U.S. Plant Introduction Garden, South Miami, Florida.

Daidalotarsonemus fossae DeLeon
(Figs. 2–3)

Daidalotarsonemus fossae DeLeon, 1956:165.

This species resembles *D. vandevriei* Suski, but the shape and size of the opisthosomal setae of the female will separate the two species.

Female.—Body oval, broadest in the region of hysterosoma. Dorsum of propodosoma with two pairs of setae; vertical pair barbulate, not as long as distance between their bases; second pair, or scapular setae, broken on holotype. According to DeLeon this pair of setae is smooth; a notch on lateral margin of capitulum; platelets of propodosoma irregular in shape and size. Dorsum of hysterosoma with platelets of irregular shape and size; with two pairs of subequal, short, obovate, barbulate humeral setae; with two pairs of barbulate lumbal setae, anterior pair longer and stronger than posterior pair; a single pair of barbulate sacral setae subequal in length to anterior pair of lumbal setae. Venter of propodosoma and hysterosoma as figured. Apodeme I short, converging with anterior median

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Fig. 1. *Daidalotarsonemus tessellatus* DeLeon, female dorsum. Figs. 2–3. *D. fossae* DeLeon, female: 2, dorsum; 3, venter. Fig. 4. *D. jamesbakeri* Smiley, female dorsum.

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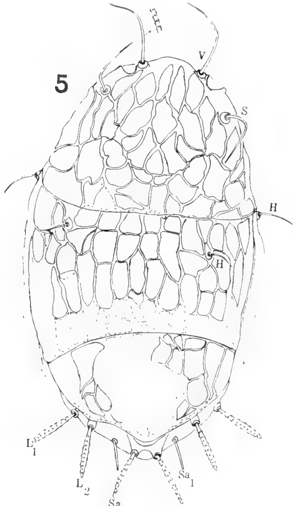
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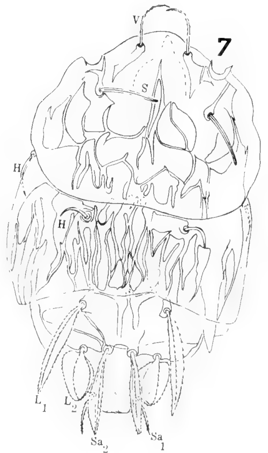
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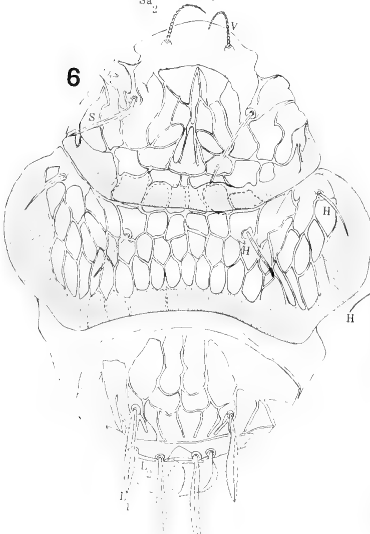
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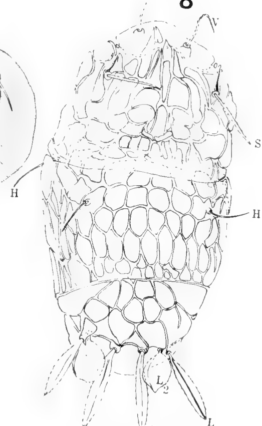
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apodeme; apodemal plate I with simple setae; apodeme II longer and converging with anterior median apodeme; apodemal plate II with a simple seta twice the length of seta on apodemal plate I; anterior median apodeme lightly visible below apodeme II; transverse apodeme with a series of U-shaped bends; posterior median apodeme Y-shaped proximally, not converging with apodemes III and IV; setae in region of apodemes III and IV subequal in length. Genitalia as figured. Legs short, moderately robust; legs III longest. Body 204 μ long, 85 μ wide.

Male.—Not known.

The female holotype and six female paratypes were collected from *Litchi chinensis* Sonn., U.S. Plant Introduction Garden, four miles south of South Miami, Florida, 26 June 1956 by D. DeLeon.

Daidalotarsonemus jamesbakeri Smiley
(Fig. 4)

Daidalotarsonemus jamesbakeri Smiley, 1969:227.

The female of this species differs from others in the genus by possessing contiguous dorsomedian longitudinal plates on the hysterosoma. This species is known from the female holotype and five female paratypes collected 8 March 1967 at Ivanhoe, North Carolina, on blueberry buds. It is also known from one female paratype reared in a laboratory culture at the Department of Entomology, North Carolina State University. All specimens were reared by James R. Baker.

Daidalotarsonemus vandevriei Suski
(Fig. 5)

Daidalotarsonemus vandevriei Suski, 1967:227.

This species is close to *D. fossae* DeLeon but the shape of the humeral setae will separate the two species. The female holotype was found on a twig collected from "closed" apple tree in Dworek, Poland, 11 May 1966 by M. van de Vrie. Suski (1967) gives a detailed account of additional types and host localities.

Daidalotarsonemus somalatus Attiah
(Fig. 6)

Daidalotarsonemus somalatus Attiah, 1970:193.

This species is distinctive from other known species in the genus by the large oval-shaped shield in the caudal region of the hysterosoma. This shield possesses a pair of subequal dorsomedian longitudinal plate-

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Fig. 5. *Daidalotarsonemus vandevriei* Suski, female dorsum. Fig. 6. *D. somalatus* Attiah, female dorsum. Fig. 7. *D. seitus* Attiah, female dorsum. Fig. 8. *D. venustus* Attiah, female dorsum.

lets anteriorly. The species is known only from the holotype female and three female paratypes collected from citrus at Vero Beach, Florida, on 4 October 1959.

Daidalotarsonemus seitus Attiah
(Fig. 7)

Daidalotarsonemus seitus Attiah, 1970:191.

The serrate setae in the caudal region of the hysterosoma will separate this species from all known species in the genus. *D. seitus* is known only from the female holotype and three female paratypes collected from citrus leaves by M. H. Muma, 26 September 1962 at Fort Pierce, Florida.

Daidalotarsonemus venustus Attiah
(Fig. 8)

Daidalotarsonemus venustus Attiah, 1970:191.

This species is close to *tessellatus* in appearance but can be separated by the humeral setae. The setae of this species are smooth, whereas the humeral setae of *tessellatus* are barbulate. This species is known only from the female holotype and two female paratypes collected from citrus by M. H. Muma, 4 February 1959 at Melbourne, Florida.

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HOST PLANTS OF APHIDS COLLECTED AT THE LOS ANGELES STATE AND COUNTY ARBORETUM DURING 1966 AND 1967

(Homoptera: Aphididae)

Mortimer D. Leonard, *Collaborator, Entomology Research Division, Agricultural Research Service, U.S. Department of Agriculture*[1]

and

Harry G. Walker, *Entomologist, and* Leonid Enari, *Plant Taxonomist, Los Angeles State and County Arboretum, 301 North Baldwin Ave., Arcadia, California, 91006*

ABSTRACT—During 1966 and 1967 about 2400 collections of aphids were made from 1332 plants in the Los Angeles State and County Arboretum at Arcadia, California. The plant groupings, which include about 4000 exotic species and varieties besides many native plants, are indicated. 95 aphids have been identified to species, 3 of which are new and 7 others are given only to genus. The aphids are listed alphabetically by genus and species with the day, month and year of each collection plus an indication of the general abundance (abundant, moderate or scarce on at least some part of the plant) or of the abundance of the different stages in the collection.

The Los Angeles State and County Arboretum is about a 126 acre tract of land located on a part of the Lucky Baldwin estate adjacent to the Santa Anita Race Track in Arcadia, Los Angeles County, California. It is estimated that in addition to many native California plants, there are about 4,000 species and varieties of plants growing on these grounds that have been introduced from many floral areas of the world. An effort has been made to group these plantings in several sections such as the Australian, South African, South American, and Mediterranean Plant Sections. Other groupings include Tropical Garden, the Pinetum, Flowering Trees, Avocado, Citrus, Ficus spp., Economic Fruit Trees, Jungle, and Bamboo and Palm Sections.

A preliminary survey of this large number of different species of plants indicated that aphids were one of the most abundant and one of the most injurious groups of insects present. It was further noted that some species of plants were heavily infested, while others were free, or relatively free, of aphid attack. As a result of these observations and the presence of such a wide variety of potential host plants in a relatively small area, it was decided to undertake a project to determine what species of aphids were present and to secure data on their seasonal host range and relative abundance with a view to securing information on what species of plants were free or relatively free from aphid attack.

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[1] Mail address: 2480 16th Street, NW, Washington, D. C. 20009.

In setting up the project, it was agreed that Dr. Leonard would be responsible for the identification of the aphids, that Dr. Enari would be responsible for the identification of the host plants, and that Dr. Walker would be responsible for the survey and collection of aphids.

In addition, among others, the authors are indebted to the following for determination of aphids: Dr. A. N. Tissot, University of Florida, Gainesville (ANT); Dr. Clyde F. Smith, North Carolina State University, Raleigh (CFS); Dr. F. W. Quednau, Research Laboratory, Dept. Forestry, Quebec, Canada (FWQ); Dr. Louise M. Russell, U.S. Department of Agriculture, Washington, D.C. (LMR); and Dr. M. E. MacGillivray, Research Lab., Dept. Agr., Fredericton, N.B., Canada (MacG). To these we give our sincere thanks.

The well known green peach aphid, *Myzus persicae*, was by far the most widespread and often very abundant aphid. This is not so surprising but it is remarkable that this aphid occurred on about 560 or 42% of the 1332 plants on which aphids were found. This is by far the largest list of food plants of *M. persicae* ever compiled. About 293 plant genera in 97 plant families were involved.

Aphis gossypii, the cotton or melon aphid, was the next in abundance occurring on 204 plants and distributed in 84 genera and 35 plant families. Following *A. gossypii* were 3 more polyphagous and widespread aphids. These were *Myzus ornatus*, the ornate aphid, on 110 plants in 85 genera and 37 families, *Macrosiphum euphorbiae*, the potato aphid, on 107 plants in 63 genera and 34 families, and *Acyrthosiphon solani*, the foxglove aphid, on 64 plants in 50 genera and 24 families. In addition the black citrus aphid, *Toxoptera auranti*, was taken on 47 plants in 25 genera and 19 plant families.

Other well-known aphids were *Aphis spiraecola*, the spiraea aphid, but identified from only 40 plants in 10 genera and *Aphis pomi*, the apple aphid, on 30 plants in 6 genera. Other aphids were found on a lesser number of plants.

There were about 300 plants distributed in about 157 genera the aphids from which have only been assigned to the genus *Aphis*. Further study may show that many of these are *A. gossypii* or *A. spiraecola*.

The pine family (Pinaceae) furnished many collections of aphids in a number of plant genera. *Cinara* spp. were often abundant on several genera including *Pinus*. *Widdringtonia* spp. yielded a number of collections of *Masonaphis* spp. and *Callitris* spp. produced collections of these aphids as well as of *Cinara*. In 1967 *Masonaphis* was collected 3 times on the Redwood, *Sequoia sempervirens* (many on one) and 5 times on the Big Tree, *Sequoiadendron gigantea* (many on one). Aphids have been previously almost unknown on these Giants of the Forest.

Eucalyptus is a large genus of about 650 species, subspecies and varieties of plants native to Australia. About 250 of these grow in the Arboretum and although aphids are almost unknown on *Eucalyptus* in Australia they were collected from about 214 or 85% of those growing at the Arboretum. *Aphis gossypii* has been identified from 54, *Myzus persicae* from 37, and *Macrosiphum euphorbiae* and *Aphis spiraecola* each from 11. A number of starvation forms of the apterae of *Macrosiphum californicum* constituted one collection.

It may be of interest to note that aphids have been collected at the Arboretum in every month from March 1966 into October 1971. These collections total a little more than 10,000. If all these specimens could be specifically identified we wonder how many aphids would be recorded as occurring in the Arboretum.

In 1966 and 1967 about 2,400 collections were made from 1,332 plants. In order to insure that aphids were actually breeding on a given host, no collections were made unless wingless forms were present; however, this could not eliminate the possibility of winged forms being accidentally present from a second species of aphid. To date, 95 species of aphids have been identified from these, three of which are new species, and seven others only to the genus.

The aphids so far identified from the 1966 and 1967 collections are presented as follows in alphabetical order according to the genus with an indication of the day, month and year plus an indication of the general abundance (abundant, moderate or scarce on at least some part of the host) or of the abundance of the different stages in the collection (al = alate, ap = apterous and ny = nymphs).

List of Aphids

Acyrthosiphon pelargonii (Kaltenbach), Geranium Aphid

Geranium robertianum Linn.
3.V.67 1 al 2 ap
Pelargonium 'Apple Cider'
17.IV.67 abundant
P. 'Attar of Roses'
12.VII.67 15 ap
P. 'Aztec'
29.XII.67 abundant
P. denticulatum Jacq.
16.VI.67 1 al 30 ap ny
P. graveolens L'Herit
24.III.67 abundant
23.V.67 2 ap 4 ny
12.VII.67 20 ap
P. hortorum L. H. Bailey
6.VI.67 abundant
P. 'Joy Lucille'
12.VII.67 35 ap
P. 'Mood Indigo'
29.XII.67 abundant
P. 'Nutmeg'
15.V.67 1 al 4 ap
P. odoratissimum Ait.
6.VI.67 30 ap ny
P. 'Zulu Warrior'
15.V.67 40 al ap

Acyrthosiphon pisum (Harris), Pea Aphid

Clematis paniculata Thunb.
4.V.67 2 ap 1 pupa
Colutea arborescens Linn.
31.X.67 8 ap ny
C. melanocalyx B. & H.
30.X.67 15 ap ny
C. persica Boiss.
2.VI.67 2 ap
Daubentonia tripetii Poit.
5.VI.67 moderate (F.W.Q.)
Indigofera australis Willd.
30.VII.66 abundant
14.IV.67 scarce
I. gerardiana R. Grah.
5.VI.67 scarce (F.W.Q.)
I. splendens F. & H.
3.XI.67 1 al 50 ap ny
Lathyrus odoratus Linn.
1.V.67 2 al 40 ap ny
31.X.67 1 ap 3 ny
Mundulea suberosa Benth.
5.IV.67 2 ap 4 pupae?
Robinia sp.
4.V.67 abundant
R. hispida Linn.
I.VI.67 8 ny?
Sutherlandia frutescens R.Br.
3.XI.67 1 al 4 ap ny

Acyrthosiphon solani (Kaltenbach)
See *Aulacorthum solani* (Kaltenbach)

Amphorophora sp.

Arbutus unedo Linn.
11.IV.66 (L.M.R.)
Hakea leucoptera R.Br.
20.1.67 1 ap

Amphorophora agathonica Hottes

Rubus palmatus Thunb.
1.IX.66 2 ap (F.W.Q.)

Amphorophora rubitoxica (Knowlton)

Rubus palmatus Thunb.
12 & 14.IV, 1.IX and 21.X.66 1 ap
2 ny (MacG.)

Aphis spp.

Aloe sp.
28.III, 28.X and II.XI.66
13.II and 17.X.67 abundant
A. africana Mill.
16.VI.66
A. brevifolia Mill.
15.VI.66
A. castanea Schonland
16.VI.66
A. falcata Baker
16.VI.66
A. rivae Baker
8.XII.66 ± 40 ap
A. striata Haw.
30.VII several ap and 8.XII.66
13.II and 28.VI.67 15 al ap
Anacampseros telephiastrum DC.
28.III.66 30–40 al very few ny
Bischofia trifoliata Hook.
15.II.67 scarce
Brassaia actinophylla F. Muell.
13.VII.66
Calliandra eriophylla Benth.
12.V.67 3 ap
C. inaequilatera Rusby
5.IV.66 moderate

Calotropis gigantea Ait.
7.IX a few al ap, 23.X
40–50 al and ap and 21.XII.66
12 ap al 15.VIII.67 2 al
10 ap ny
Calycanthus fertilis Walt.
7.VII.66
Carissa macrocarpa A.DC.
30.VI.66
Cassia acutifolia Delile
5.IV.67 2 al 3 ny
C. bicapsularis Linn.
21.II.67 moderate
C. didymobotrya Fresen.
15.II.67 scarce
C. leptophylla Vog.
3.VI.67 moderate
C. splendida Vog.
11.XI.66 many al and ap
30.X.67 1 ap 6 ny
Casuarina sp.
28.I.67 scarce
C. equisetifolia Linn.
25.I.67
Celtis caucasica Willd.
15.VIII.67 1 al 12 ap
C. tournefortii Lam.
8.VII.66
C. willdenowiana R. & S.
16.VIII.67 many ap.
C. yunnanensis C. K. Schneider
14.IV.66
Centaurea argentea Frivald.
25.IV.67 moderate
Cercidiphyllum japonicum S. & Z.
13.V.67 3 ap
Cercis siliquastrum Linn.
5.IV.67 22 al ny
Cestrum sp.
21.II.67 moderate
C. parqui L'Herit.
21.II.67 abundant
Chamaelaucium uncinatum Schau.
20.X.67 ± 50 ap ny
C. uncinatum 'Rubrum'
26.I.67 abundant
Chrysanthemum maximum 'Polaris'
30.XII.67 scarce
Cistus albidus Linn.
18.III.67 scarce
C. ladaniferus Linn.
20.IV.67 10 al 10 ap
C. laurifolius Linn.
21.VI.67 3 ap
C. villosus Linn.
4.II.67 scarce
Citrus limon 'Eureka'
23.II.67 abundant
C. 'Kara'
23.II.67 abundant
C. 'Temple Orange'
1.VI.67 40 ap ny
C. 'Minneola'
7.II.67 moderate
C. 'Shamouti'
23.II.67 abundant
C. sinensis 'Valencia'
19.VII.66 and 16.VI.67 abundant
Clethra arborea Ait.
10.VIII.67 4 ap 10 ny
Coleonema album E. Mey
10.XI.66, 27.I & 17.IV.67 moderate
Colletia cruciata G. & H.
20.VI.67 10 ap
Colutea melanocalyx B. & H.
30.X.67 2 al + 45 ap ny
C. persica Boiss.
2.VI.67 3 ap
Cordia abyssinica R.Br.
27.VI.66
Cornus amomum Mill.
12.IV.66 and 5.IV.67 scarce
C. candidissima Mill.
5.IV.67 moderate
C. chinensis Wagerin
3.V.67 7 ap
C. stolonifera Michx.
14 & 15.III.67 scarce
Coronilla glauca Linn.
9.III.67 moderate
C. montana Scop.
10.III and 23.V.67 abundant
Cotoneaster sp. (Pl#210540)
6.V.67 9 ap.
C. buxifolia Wall
20.IV.67 abundant
3.V and 19.VI.67 scarce

C. buxifolia vellaea Franch.
16.VIII.67 ± 60 ap ny
C. glaucophylla Franch.
12.IV.66 & 31.I.67 scarce
C. harroviana Wils.
23.XI, 7 and 19.XII.66
4.II, 21.VI & 14.VIII.67 abundant
C. microphylla Wall.
11.I.67 abundant
C. microphylla cochleata R. & W.
5.V.67 7 ap
C. nitens R. & W.
5.V.67 2 al 6 ap
C. pannosa Franch.
14.III & 13.VI.67 moderate
C. racemiflora C. Koch
13.IV & 7.XII.66 abundant
C. rhytidophylla R. & W.
13.IV.66
C. serotinus Hutchinson
13.IV.66 & 1. II.67 scarce
C. wardii W. W. Smith
16.VI & 23.X.66 scarce
Cussonia paniculata E. & Z.
10.XI.66, 31.I, 8.VII, & 6.X.67 abundant
C. spicata Thunb.
8.VII & 6.X.67 scarce
Cynodon dactylon Pers.
27.XII.66 abundant
Cyphomandra betacea Senot.
27.VIII.66 & 21.II.67 scarce
Daubentonia sp.
7.I.67 abundant
D. tripetii Poit.
7.I & 21.II.67 moderate
Deutzia hybrida 'Mont Rose'
8.VII.66
Dodonaea boroniaefolia G. Don.
2.IV.67 ± 40 al ap
D. cuneata Rudge
28.I.67 scarce
D. inaequifolia Turcz
17.IV.67 1 al 2 ap
D. truncatiales F. Muell.
31.III.67 ± 30 ap ny
Dombeya sp.
27.VI.67 5 ap 7 ny
D. natalensis Sond.
15.II.67 scarce
Dovyalis caffra H. & S.
15.II.67 scarce
Dyckia rariflora Schult.
25.IV many ap & 20.VI.67 2 al 6 ny
Echeveria crenulata Rose
20 & 31.X.66, and 17.III, 16.VI & 5.X.67 abundant
Ehretia hottentotica Burch.
30.VII.66, 27.I, 17.IV & 25.X.67 moderate
Eremophila maculata F. Muell.
2.IV.67 ± 75 al ap ny
Eriobotrya deflexa koshunensis K. & S.
15.III.67 abundant
E. japonica Lindl.
25.XII.66 and 15.III.67 moderate
Eriocephalus africanus Linn.
22.IV.67 11 ap
Eriogonum arborescens Greene
26.VI.67 20 ap ny
Erlangea rogersii S. Moore
11.IV.66 & 5.IV.67 1 al 13 ap ny
Erythrina coralloides M. & S.
23.III.66 abundant
E. falcata Benth.
18.I.67 moderate
E. lysistemon 'Raja'
19.VI.67 abundant
E. ovalifolia Roxb.
24.II.67 ± 60 ap ny
E. vespertilis Benth.
25.III.67 scarce
Eucalyptus sp.
11.VII.67 5 ap
E. baeuerlenii F. Muell.
7.VII.67 ± 40 ap
E. brachycalyx Blakely
6.VII.66 & 26.I.67 scarce
E. caesia Benth.
30.III & 29.VI.67 abundant
E. cloeziana F. Muell.
30.III.67 3 al 1 ap
E. coccifera Hook.
4.II.67 moderate
E. coccifera Favieri
19.VII.67 scarce

E. cosmophylla F. Muell.
25.I.67 moderate
E. dives Schau.
2.XI.67 7 ap–ny 1 pupa
E. ebbanoensis Maiden
6.VII.67 7 ap
E. ficifolia F. Muell.
17.X.67 5 ny
E. foecunda Schau.
25.I.67 moderate
E. grossa F. Muell.
23.I.67 moderate
E. jugalis Naud.
25.I and 7.VII.67 moderate
E. morrisii R. T. Baker
12 & 20.VII.67 10 ap
E. nova-anglica D. & M.
5.VII.67 scarce
E. nutans F. Muell.
6.I.67
E. occidentalis Endl.
12.IV.67 2 ap 3 ny
E. orpeti Hort.
25.III.67 6 ap
E. pimpiniana Maiden
25.I.67 abundant
E. salicifolia × *coccifera* × *pauciflora*
30.I.67 scarce
E. shiressii M. & B.
20.VII.67 4 ap
E. smithii R. T. Baker
7.VII.67 10 ap
E. stellulata Sieber
20.VII.67 many ap
E. stoatei C. A. Gardner
21.I.67 moderate
E. 'Torqwood'
23.I & 30.VI.67 scarce
Eucommia ulmoides Oliv.
1.II.67 abundant
Eupatorium sp.
7.I & 21.II.67 scarce
Euryops pectinatus Cass.
17.III.67 abundant
Fatshedera lizei Guillaumin
4.III.67 abundant
Fatsia japonica D. & P.
23.III.66, 24.VI & 31.X.67 abundant
Ficus sp.
30.XII.66 1 al 3 ny
F. iteophylla Miq.
22.II & 3.VI.67 scarce
F. lacor Buch.-Ham.
3.VI.67 3 ny
F. nitida Blume
23.III.66 scarce
Forsythia europaea D. & B.
18.III.67 3 al 7 ap ny
F. suspensa Vahl
20.IX.67 4 ap 17 ny
Fuchsia 'California'
30.VIII & 7.IX.67 ± 35 al 45 ap ny
F. 'Display'
7.IX.67 20 ap 3 ny
F. 'Mephisto'
30.VIII.67 30 ap ny
F. 'Minnesota'
28.IX.66 30 ap and 30.VIII.67 abundant
R. 'Red Spider'
30.VIII.67 2 al 50 ap ny
Gamolepis chrysanthemoides DC.
18.I & 22.IV.67 abundant
Gardenia cornuta Hemsl.
16.X.67 3 al 1 ap 2 ny
G. jasminoides Ellis
17.III.67 abundant
5.V & 30.VI.67 scarce
G. jasminoides 'Veitchii'
20.X.66 ± 85 al ap
16.X.67 16 al 1 ap 15 ny
G. spatulifolia S. & H.
15.III, 16.VI & 11.X.67 scarce
G. thunbergia Linn.
10.I, 20.IV, 4.V & 20.VI.67 abundant
Greigia sylvicola Standley
20.X.67 ± 50 ap ny
Grevillea 'Poorinda Leanne'
11.IV.67 1 al 3 ap 5 ny
G. 'Red Glow'
11.IV.67 2 ap 8 ny
Gymnosporia royleana M. Laws
1.II.67 moderate
Halleria lucida Linn.
13.II & 17.X.67 moderate
Hamelia erecta Jacq.
31.X.67 abundant

Harpephyllum caffrum B. & K.
27.I.67 moderate
Harpullia arborea Radik
6.VIII & 28.IX.66 moderate
Hauya matudai Lundell
7.II.67 moderate
Heteromeles arbutifolia M. Roem
16.VI.66
Hibiscus sp.
8.VIII.66 abundant
Hypericum canadense Linn.
10.IV.66 scarce
H. hircinum Linn.
10.III.67 moderate
H. hookerianum W. & A.
2.V.67 2 ap
H. revolutum Vahl.
10.III.67 moderate
Ilex rotunda Thunb.
6.VII.66
Impatiens holstii E. & W.
27.X.67 1 al ± 70 ap ny
Kalanchoe pinnata Pers.
11.I.67 abundant
Kleinia repens Haw.
25.IV.67 moderate
Koelreuteria paniculata Laxm.
3.IV.67 moderate
Kolkwitzia amabilis Graebn.
5.V.67 moderate
Lagerstroemia speciosa Pers.
30.VIII.67 abundant
Lantana camara Linn.
27.VI.66
L. kisi A. Rich
20.VI.67 40 ap ny
Laurus canariensis W. & B.
3.IV.67 moderate
Lavatera olbia Linn.
18.III.67 4 al 3 ap
Leptospermum scoparium 'Grandiflorum'
12.IV.67 2 ap 6 ny
Leucadendron sabulosum Salter
16.VIII.67 abundant
Leucothoe axillaris D. Don
7.II.67 moderate
Lippia urticoides Steud.
7.I & 21.II.67 moderate
Maesa lanceolata Forsk.
20.X.66 moderate
Magnolia grandiflora Linn.
13.VI.67 abundant
M. liliflora Desr.
27.III.67 scarce
Malus 'Transcendent'
14.IV.66
Mandevilla 'Alice Du Pont'
18.III.67 scarce
Mapouria alba Muell.
1.III.67 abundant
Marianthus lineatus F. Muell.
9.XI & 28.XII.66, 23.I and 23.X.67 abundant 30.VI.67 scarce
Markhamia nutans
29.X.66 and 16.II.67 moderate
Melaleuca armillaris Sm.
27.II.67 6 ny
M. elliptica Labill.
13.IV.67 5 ap
M. hamulosa Turcz.
17.IV.67 4 al
M. lateriflora Benth.
26.III & 14.IV.67 scarce
M. quinquenervia (Cav.) S. T. Blake
26.I & 13.IV.67 scarce
M. platycalyx Diels
14.IV.67 1 al 3 ap
Meryta sinclairii Seem.
1.III.67 abundant
Metrosideros lucida A. Rich
26.II.67 abundant
Michelia figo Spreng.
7.VII.66
Microcitrus australis Swingle
9.III.67 scarce
Montanoa bipinnatifida C. Koch
29.X.66 50 ap
21.II.67 abundant
Murraya paniculata (Linn.) Jack.
19.VII & 13.VIII.66 scarce
5.VII.67 4 ap
Myrsine africana Linn.
3 & 22.IV.67 abundant
Nothopanax arboreum Seem.
I.VII.66
Nymphaea capensis Thunb.
14.IV.66 & 28.I.67 moderate

Olearia gunniana Hook.
28.XII.66 & 25.I & 26.IV.67 moderate
Olmediella betschelerii Loesen
16.II.67 moderate
Ophiopogon jaburan Lodd.
13.V.66
Osmanthus fortunei Carr
13.VI.67 scarce
Osteomeles schwerinae C. K. Schneider
1.II.67 moderate
1.V.67 1 al 50 ap ny
Oxalis crassipes Urb.
3.IV.67 1 al 2 ap
Paulownia tomentosa Steud.
6.IV.67 1 al 2 ap
Phalaris arundinacea Linn.
6.V.67 scarce
Philadelphus subcanus Koehne
23.X.66 15 al ny
Phillyrea media Linn.
18.III.67 abundant
Photinia glabra Decne.
7.VII.66 abundant
Pithecolobium langsdorfii Benth.
5.VI.67 5 ny
Pittosporum crassifolium Soland.
14.IV.67 4 al 3 ny
P. daphniphylloides Hayata
21.X.66 & 1.II.67 abundant
P. floribundum W. & A.
4.III.67 abundant
P. glabratum Lindl.
8.VI.66 10 ap
P. heterophyllum Franch.
23.X ± 60 al ap & 11.XI.66 30 al ap
P. napaulensis R. & W.
27.III ± 25 ap ny & 13.VI.67 40 ap mostly ny
P. odoratum Merrill
27.I.67 abundant
P. rhombifolium A. Cunn.
27.IX.66 & 8.V.67 6 ap
P. tobira Ait.
13.IV & 28.XII.66 abundant
13.VI.67 4 al 5 ap
P. undulatum Vent.
14 & 30.III.67 abundant
P. viridiflorum Sims.
13.II & 16.X.67 scarce
3.IV.67 moderate
Plumbago capensis Thunb.
15.VI.67 1 al 1 ap 4 ny
Potentilla verna Linn.
27.X.67 1 al 1 ny
Prostanthera nivea A. Cunn.
25.I moderate 14.IV 1 al 10 ap ny
7.VII.67 3 al 7 ap
Protea sp.
14.IV.67 1 al 40 ap ny
Prunus caroliniana Ait
24.II.67 scarce
P. cerasifera 'Hollywood'
3.VI.67 8 ap ny
P. lyonii Sudworth
3.IX.66
Pseudopanax ferox T. Kirk
20.XII.66
P. lessonii C. Koch
19.XII.66 abundant
Psoralea pinnata Linn.
3.IV.67 scarce
Puya floccosa E. Moor.
25.IV.67 4 ap
P. spathacea Mez.
20.VI.67 abundant
Pyracomeles vilmorinii Rehder
18.X.67 5 ap
Pyrus communis Linn.
24.III.67 abundant
P. 'Winter Nelis'
1.VI.67 4 al 6 ap
Radermachia sinica Hemsl.
4.II moderate & 12.V.67 4 ap
Randia rudis E. Mey.
6.IV 2 al 5 ap & 16.X.67 3 ny
R. spinosa Karst.
28.XII.67 1 al 4 ny
Raphiolepis indica Lindl.
1.II scarce & 10.X.67 ± 45 al ap ny
R. indica 'Rosea'
31.I moderate & 3.V.67 3 ap
Rhamnus crocea Nutt.
7.III scarce & 20.VI.67 8 ap
Rhus sp.
28.I.67 scarce

R. lancea Linn.
30.I & 15.II scarce, 5.IV abundant 25.VII.67 12 ap ny

R. viminalis Ait.
27.I moderate, 13.II abundant 22.VI.67 scarce

Ribes aureum Pursh
27.III ± 25 ap & 26.VI.67 abundant

Ruellia brittoniana Leonard
29.XII.67 3 ny

Schefflera venulosa Harms.
25.III, 30.VI and 13.IX.66 moderate

Schinus terebinthifolius Raddi
31.I.67 scarce

Schotia brachypetala Sond.
3.IV.67 scarce

Scolopia crenata Clos.
11.VIII abundant 20.XII.66 & 2.II.67 scarce

S. ecklonii engleri Gilg.
3.VII.67 5 al 5 ap

Securinega fluggeoides Muell.
31.X.67 10 ap ny

Senecio megaglossus F. Muell.
5.IV.67 scarce

Stranvaesia davidiana Decne.
20.X.66 ± 60 al ap ny

Syncarpia glomulifera Niedenzy
25.I & 6.VII.67 scarce

S. hillii Bailey
13.IV.67 1 al 5 ap ny

Tabernaemontana elegans Stapf.
23.VI.67 4 al many ap ny

Tecoma sambucifolia H. B. & K.
16.II.67 moderate

T. shirensis Baker
3.IV abundant & 22.VI.67 16 ap

Tetrapanax papyriferum C. Koch
8.III.67 abundant

Triplaris brasiliana Cham.
5.VI.67 6 ap 6 ny

Ulmus americana Linn.
13.VI.67 3 al 2 ap

Umbellularia californica Nutt.
24.IV.67 abundant

Vernonia guineensis Benth.
6.XI.67 6 al 1 ny

Viburnum glomeratum Maxim
13.IV.66

V. japonicum Spreng.
7.VII.66

V. lobophyllum Graebn.
6.VI.66

V. rigidum Vent.
6.VII.66

V. sieboldi Miq.
7.VII.66 scarce

V. suspensum Lindl.
26.III & 18.VII.66

V. tinus Linn.
13.IV.66

V. tinus 'Purpureum'
1.IX.66 scarce

Viminaria juncea Hoffmgg.
2.IV.67 ± 40 al ap

Xylosma congestum (Lour.) Merrill
9 & 17.III.67 scarce

X. venosum N. E. Brown
21.II.67 moderate

Zizyphus jujuba Lam.
16.V.67 1 al 3 ap

Z. spina-christii Georgi
15.IV.66 & 27.II.67 1 al ± 30 ap ny

Aphis ceanothi Clarke

Ceanothus thyrsiflorus Eschw.
11.I, 15.II & 20.IV.67 about 15 ap 20.VI.67 abundant 25.X.67 5 al 100 ap ny & 21.XII.67 4 al 25 ap ny

Aphis cercocarpi Gillette & Palmer

Cercocarpus betuloides Nutt.
27.VI.67 30 al many small ny

C. ledifolius Nutt.
27.III.67 30 al ap

Aphis coreopsidis Thomas

Baccharis pilularis DC.
27.X.67 12 ap ny

Nyssa sinensis Oliver
3.V.67 50 ap ny

Aphis craccivora Koch, Cowpea Aphid

Acacia jonesii M. & M.
8.VI.66

Bauhinia purpurea Linn.
24.II.67 50 ap ny

B. vahlii W. & A.
24.II.67 abundant

B. variegata Linn.
28.IV.67 abundant

Chamaecyparis lawsoniana 'Kilmacurragh'
19.V.67 2 al accidental (F.W.Q.)

Colutea cilicica B. & B.
10.VIII.67 2 al many ap

Daubentonia tripetti Poit.
23.VIII.66 abundant

Genista cinerea DC.
23.V.67 abundant

G. duriaei Spach.
23.V.67 3 ap

Gleditsia caspica Desf.
1.VI.67 4 ap

G. triacanthos inermis Linn.
28.IV.67 3 ap

G. triacanthos 'Sun Burst'
1.VI.67 25 ap

Indigofera australis Willd.
30.VII.66 abundant
26.I & 2.IV.67 scarce

I. dosua Buch.-Ham.
31.X.67 scarce

I. gerardiana R. Grah.
10.X.66 abundant

I. pulchella Roxb.
36.X.67 scarce

Lotus berthelotii Masf.
9.III.67 many ap parasitized by *Lysephlebius testaceipes* (Marsh det.)

Phaseolus caracalla Linn.
16.III.67, 25.X.67
1 al 60 ap ny

Robinia hispida Linn.
1.VI.67 1 al 12 ap ny & 15.VIII.67 75 al ap ny

R. kelseyi Hutchins
1.VI.67 4 ny

R. pseudoacacia Linn.
29.VIII.66 & 25.IV67 abundant

Tephrosia glomerulifera Meissn.
31.VIII.67 abundant

T. vogelii Hook
5.IV & 3.XI.67 abundant

Thuja plicata Donn
19.V.67 accidental (F.W.Q.)

Aphis fabae Scopoli, Bean Aphid

Amaranthus tricolor Linn.
5.VII.67 abundant

Amorpha fruticosa Linn.
28.IV.67 abundant

Cassia corymbosa Lam.
30.X.67 2 ap 7 ny

Centranthus ruber 'Alba'
21.X.66

Enchylaena tomentosa R. Br.
3I.III.67 abundant

Euonymus japonicus Thunb.
14.III & 5.VII.67 scarce

Hardenbergia monophylla Benth.
25.III.67 scarce

Ilex sikkimensis Kurz.
5.V.67 15 ap

Pseudopanax lessonii C. Koch
1.II.67 moderate

Salvia apiana Jepson
24.III.67 abundant

Solanum mauritianum Blanco
30.XII.66

Sonchus oleraceus Linn.
27.XII.66 2 al 10 ny

Viburnum odoratissimum Ker-Gawl
5.V.67 abundant

Wisteria sp.
12.IV.66

Aphis gossypii Glover, Cotton or Melon Aphid

In 1971 (Proc. Ent. Soc. Wash. 73(1): 9–16) we published a list of the host plants of this aphid. It was collected from 204 plants. The dates are given for each collection and the relative abundance of the aphid is indicated.

Aphis hederae Linn., Ivy Aphid

Hedera helix Linn.
18.I, 16.VI, 25.VII & 5.X.67 all abundant

Aphis helianthi Monell

Cupressus lusitanica Mill.
10.III.67 (F.W.Q.) 2 al accidental

Aphis nasturtii Kaltenbach

Callitris murrayensis Gard.
7.III.67 (F.W.Q.) 1 al

Aphis nerii (Fonscolombe), Oleaster & Milkweed Aphid

Araujia sericifera Brot.
28.VII.67 abundant

Nerium oleander Linn.
7.VIII & 28.IX.66, 26.VII, 26.IX & 8.XI.67 abundant

Aphis oestlundi Gillette

Oenothera biennis Linn.
23.V.67 abundant

Aphis pomi DeGeer, Apple Aphid (30 hosts)

Cotoneaster buxifolia Wall
26.X.67 1 al 30 ap ny
C. congesta Baker
21.X.66 5 al 6 ap ny
C. dammeri Schneid.
20.X.66 abundant
C. denticulata H. B. & K.
9.IX.66 abundant
C. disticha Lange
7.VII, 9 & 27.IX.66
15.VIII.67 moderate
C. lactea W. W. Smith
16 & 26.X.67 abundant
C. microphylla Wall.
26.X.67 abundant
C. pannosa Franch.
4.X.67 abundant
C. rotundifolia Wall
6.VII & 9.IX.66 with ant *Iridomyrmex humilis* (Mayr.) (det. D. R. Smith)

Malus sp.
27.VI & 10.VIII.67 abundant
10.X.67 4 al 6 ap ny
M. baccata Loisel.
14.IV & 8.VII.66 & 10.VIII.67 scarce
M. halliana Koehne
16.VIII.67 abundant
M. 'Hopa'
7.VII.67 abundant
15.VIII.67 scarce
M. 'Pettingill'
1.VI.67 scarce
M. pumila Mill.
27.VIII.66
M. toringoides Hughes
4.VIII.67 scarce
M. 'Transcendent'
10.IX.67 scarce
Pittosporum brevicalyx Gagnep
31.X.67 scarce

P. crassifolium Soland.
23.X.67 abundant
P. formosanum Hayata
31.X.67 scarce
P. moluccanum Miq.
28.XII.66 abundant
P. phillyraeoides DC.
26.X.67 scarce
P. tobira Ait
4.IV.66 & 10.I.67 scarce
with ant *Iridomyrmex humilis* (Mayr.)
(det. D. R. Smith)

Prunus lyonii Sudworth
6.X.66 scarce
Pyrus calleryana Decne.
7.VII.66
P. communis Linn.
27.VI.67 abundant
P. kawakamii Hayata
23.X and 15.XI.66 abundant
P. malus Linn.
24.III.67 abundant & 27.VIII.67 scarce
Sorbus aria edulis Wenzig
24.V.67 2 al 10 ap

Aphis spiraecola Patch, Spiraea Aphid (About 40 hosts)

Cotoneaster denticulata B. & N.
27.IX.66 abundant
C. disticha Lange
27.IX.66 scarce
Dodonaea cuneata Rudge
31.III.67 scarce
Eucalyptus sp.
24.VII.67 scarce
E. caesia Benth.
19.VII.67 abundant
E. salmonophloia F. Muell.
25.III.67 abundant (Estop)
E. urnigera Hook.
13.VII.67 scarce
Forsythia 'Beatrix Farrand'
7.IX.66 a few al ny
Nothopanax arboreum Seem
23.X.67 abundant
Persea americana Mill.
27.III.67 scarce
Pyracantha sp.
20.IV.67 scarce
P. crenata-serrata (Hance) Rehder
15.XI.66 abundant
P. crenulata 'Chinese Brocade'
11.VIII.66 scarce with ant *Iridomyrmex humilis* (Mayr) (det. D. R. Smith) 6.V & 15.VIII.67 scarce
P. koidzumi Rehder
9.IV.66 & 19.VI.67 abundant
with above ant
P. rogersiana aurantiaca Bean
15.VIII.67 scarce

Spiraea sp.
14.IV.66
S. bella Sims
21.X.66 moderate 1.II.67 abundant
4.V.67 scarce
S. blumei G. Don
7 & 27.IX & 23.X.66 abundant
15.VIII.67 moderate
S. bumalda Burv.
15.VI.67 scarce
S. crenata Linn.
20.X.66 scarce 1.V.67 abundant
S. gemmata Zab.
26.IX.66 scarce, 21.X & 19.X.II abundant 1.II & 12.V.67 scarce 16.VIII.67 abundant
S. hypericifolia Linn.
23.V.67 scarce
S. longigemmis Maxim.
1 & 26.IX & 19.XII.66 abundant
1.II, 4 & 12.V.67 scarce
S. nipponica Maxim.
30.X.67 moderate
S. nipponica tosaensis Makino
27.IX.66 abundant 20.XII.66 scarce 5.V.67 moderate & 10.VIII.67 scarce
S. trichocarpa Nakai
5.IX.66 moderate 20.X.66 abundant 11.XI.66 scarce 31.I & 28.IV.67 abundant 2.V & 8.III.67 moderate

S. ulmifolia Scop.
7 & 27.IX.66 scarce 20.XII.66 abundant 8.V.67 scarce 15.VIII.67 moderate
S. vanhouttei Zab.
14.III.67 moderate 15.VI.67 abundant 25.VIII & 5.X.67 scarce
Viburnum glomeratum Maxim.
20.XII.66 scarce & 3.V.67 moderate
V. japonicum Spreng.
1.V.67 moderate with ant *Iridomyrmex humilis* (Mayr.)
V. awabukii K. Koch
20.IV.67 abundant
V. suspensum Lindl.
20.X.66 abundant
V. tinus Linn.
20.XII.66 abundant
V. tinus 'Eve Price'
20.XII.66 abundant
V. tinus 'Lucidum Variegatum'
20.X.66 abundant
V. tinus 'Purpureum'
20.XII.66 moderate

Aulacorthum (Acyrthosiphon) solani (Kaltenbach), Foxglove Aphid

In 1971 (Proc. Ent. Soc. Wash. 73(2):120–123) we published a list of the host plants of this aphid. These total 64. With each collection the date or dates are given together with an indication of the relative abundance of the aphid.

Brachycaudus crataegifoliae (Fitch)

Crataegus oxycantha 'Paul's Scarlet'
8.VI, 26.VII & 17.X.67 abundant
C. pubescens Steud.
17.X.67 abundant

Brachycaudus maidiradicis (Forbes), Corn Root Aphid

Aster sp.
6.VII.66

Brachycolus atriplicis Linn., Boat Gall Aphid

Atriplex semibaccata R. Br.
30.X.67 abundant

Brevicoryne brassicae (Linn.), Cabbage Aphid

Brassicae oleracea acephala DC.
14.III.67 abundant

Calaphis sp.

Betula alleghaniensis Brit.
1.VII.66
B. papyrifera Marsh.
1.VII.66
B. maximowicziana Regel.
1.VII.66
B. verrucosa Ehrh.
1.VII.66

Calaphis betulella (Kaltenbach)

Betula papyrifera Marsh.
2.V.67 moderate

Calaphis castanea Fitch

Castanea dentata Borkh.
16.V.67 scarce

Calaphis granovskyi Palmer

Betula alleghaniensis Brit.
2.V.67 scarce
B. davurica Pall
8.VIII.67 scarce
B. papyrifera Marsh.
2.V.67 scarce
B. papyrifera kenaica (Evans) Henry
8.VIII.67 scarce
B. maximowicziana Regel.
1.VII.66 & 8.VIII.67 scarce
B. platyphylla Sukaczew
3.V.67 scarce
B. platyphylla japonica (Miq.) Hara
27.V.67 moderate
B. utilis D. Don
3.V.67 moderate
B. verrucosa Ehrh.
1.VII.66 scarce

Cavariella aegopodii (Scopoli)

Salix babylonica Linn.
1.V.67 scarce
S. babylonica 'Crispa'
6.V.67 scarce

Chaetosiphon (Pentatrichopus) fraegifolii Cockerell, Strawberry Aphid

Rosa sp.
12.V.67 scarce 16.VI.67 moderate

Chaitophorus sp.

Salix sp.
14 & 16.IV.66 moderate

Chaitophorus viminalis Monell

Salix sp.
24.VII.67 abundant

Cinara sp.

Pinus douglasiana Martinez
4.XI.66 (J.O.P.)
P. michoacana Martinez
5.XI.66 (J.O.P.)
P. patula Schiede & Deppe
17.V.67 scarce (J.O.P.)
P. pseudostrobus Lindl.
5.XI.66 (J.O.P.)

?Cinara apini Gillette & Palmer, Spotted Short-haired Limber Pine Aphid

Pinus douglasiana Martinez
29.XII.66 (J.O.P. det. as near)

Cinara atra Gillette & Palmer, Black Pinon Aphid

Pinus michoacana Martinez
18.VII.66 several al ap
P. pseudostrobus Lindl.
6.VII.66 2 ap & 5.X.66 8 al

Cinara carolina Tissot[2]

Pinus patula S. & D.
31.I.67 scarce (J.O.P.)
P. taeda Linn.
5.XI & 31.XII.66 and 1.III.67 abundant (J.O.P.)

[2] Tissot and Pepper believe this will have to become a synonym of *Cinara atlantica* Wilson.

The ant *Prenolepis imparis californicus* Wheeler was taken with both species.

Cinara cupressi Buckton

Juniperus scopulorum 'Blue Haven'
16.V.67 4 ap (F.W.Q.)
Pinus pinea Linn.
10.III.67 moderate (F.W.Q.)
Widdringtonia schwarzii Masters
6.IV.67 moderate (F.W.Q.)

Cinara curvipes (Patch), Bow-legged Fir Aphid

Cedrus deodara Loud.
31.III.67 30 al ap ny (A.N.T.)

Cinara juniperina (Mordvilko)

Juniperus bermudiana Linn.
16.V.67 moderate (J.O.P.)
J. chinensis 'Mint Julep'
9.II & 17.V.67 scarce (J.O.P.)
J. chinensis sargentii Henry
9.II.67 scarce (J.O.P.)
J. chinensis 'Wintergreen'
17.V.67 scarce (J.O.P.)
J. horizontalis 'Lividus'
9.II & 17.V.67 scarce (J.O.P.)
J. horizontalis 'Plumosa'
6.II & 17.V.67 abundant (J.O.P.)
J. horizontalis 'Wiltonii'
9.II & 17.V.67 scarce (J.O.P.)
J. chinensis 'San Jose'
17.V.67 moderate (J.O.P.)
J. occidentalis 'Sierra Silver'
8.II & 17.V.67 scarce (J.O.P.)
J. sabina 'Arcadia'
9.II.67 scarce (J.O.P.)
J. sabina 'Blue Danube'
6.II.67 scarce (J.O.P.)
J. scopulorum 'Blue Haven'
16.V.67 3 ap (J.O.P.)
J. scopulorum 'Erecta Glauca'
6.II, 15.V & 27.XII.67 abundant (J.O.P.) with ant *Prenolepis imparis californicus* Wheeler
J. scopulorum 'Staver'
9.II & 17.V.67 scarce (J.O.P.)
J. scopulorum 'Table Top Blue'
9.II.67 scarce (J.O.P) with ant *Iridomyrmex humilis* (Mayr.)
J. virginiana 'Burkii'
1.III.67 6 ap (J.O.P.)
J. virginiana 'Cupressifolia'
6.II & 16.V.67 many ap (J.O.P.)
J. virginiana 'Silver Spreader'
6.II.67 scarce (J.O.P.)

Cinara tujafilina Del Guercio, Arborvitae Aphid

Callitris cupressiformis Vent.
20.I, 7 & 26.III.67 scarce (J.O.P.)
C. drummondii B. & H.
29.XII.66, 20.I & 6.III.67 scarce (J.O.P.)
C. endlicheri (Parl.) S. T. Blake
30.I.67 scarce (J.O.P.)
C. morrisonii R. T. Baker
20.XI.66 and 20.I, 24.III & 18.X.67 moderate (J.O.P.)
C. propinqua R. Br.
7.III & 10.VII.67 scarce (J.O.P.)
C. robusta R. Br.
6.III.67 moderate (J.O.P.)
Calocedrus decurrens (Torp.) Florin
26.IV.67 moderate (J.O.P.)
Chamaecyparis lawsoniana 'Allumii'
4.III.67 scarce (J.O.P.)
Cupressus sempervirens 'Stricta'
27.II.67 scarce (J.O.P.)
Kunzea pomifera F. Muell.
10.XI.66 (J.O.P.)
Thuja occidentalis 'Cristata'
1.II.67 scarce (J.O.P.)

T. orientalis Linn.
20.IX.66 & 4.V.67 abundant (J.O.P.) with ant *Iridomyrmex humilis* (Mayr.)
T. plicata Don
4.III.67 scarce (J.O.P.)
Widdringtonia juniperoides Endl.
6.X.67 moderate (J.O.P.)
W. schwarzii Masters
29.XII.66 (J.O.P.)

Coloradoa rufomaculata (Wilson), Pale Chrysanthemum Aphid

Chrysanthemum 'Corvair'
15.V.67 1 ap 1 al (J.O.P.)
C. 'Marble Top'
15.V.67 1 al several ap (J.O.P.)

Dactynotus spp.

Chrysanthemum 'Corvair'
15.V.67 scarce
Eriocephalus africanus Linn.
27.I & 22.IV.67 scarce
Felicia amelloides Schlechter
18.I moderate & 30.XII.67 scarce
Gamolepis chrysanthemoides DC.
18.I, 14.III, 22.IV, 23.VI, 29.XII.67 abundant-scarce
Gazania uniflora Sims.
29.XII.67 scarce
Montanoa bipinnatifida C. Koch
29.X, 5.XI, & 14.XII.66, 21.II, 28.IV.67 abundant-scarce
Olearia gunniana Hook
28.XII.66, 25.I & 26.IV.67 moderate
O. lyrata Hutchinson
28.XII.66, 26.IV & 12.VII.67 abundant-scarce
O. passerinoides Benth.
25.I, 2 & 26.IV, 2.X.67 abundant
O. pimeleoides Benth.
25.I & 26.IV.67 moderate
O. viscidula Benth.
25.I, 7.III & 26.IV.67 abundant
Rudbeckia laciniata Linn.
1.XI.66 & 6.V.67 scarce
Solidago gigantea Ait.
20.X.66
Tithonia sp.
10.XI, 14.XII.66

All of these collections have been sent to Dr. A. Tom Olive. He reported that a large red species from *Olearia* is a new species. *Olearia* is a Composite native to Australia, Tasmania and New Zealand.

Dactynotus ambrosiae Complex

Pittosporum phillyraeoides DC.
21.VI.67 1 al 1 ap (F.W.Q.)
Senecio petasitis DC.
7.IV.66 several (Olive)

Eriosoma crataegi (Oestlund)

Pyracantha koidzumi Rehder
18.X.67 scarce

Eriosoma lanigerum (Hausmann), Wooly Apple Aphid

Malus sp.
10 & 11.X.67 abundant

Essigella californica Essig, Monterey Pine Aphid

Pinus lumholzii R. & F.
3.X.66 6 al (det. V.F.E. as near)
P. occidentalis Sw.
4.X.66, 1.III, 19.V.67
15 ap 3 al (V.F.E.)

P. radiata D. Don
31.XII.66 scarce (V.F.E.)

P. roxburghii Sarg.
1.III & 19.V.67 scarce (V.F.E.)

Essigella pini Wilson, Speckled Pine Needle Aphid

Pinus douglasiana Martinez
4.III.67 many ap (F.W.Q.)

P. massoniana Lamb.
L.III.67 several ap (F.W.Q.)

Essigella close to **patchiae** Hottes

Pinus pseudostrobus Lindl.
4.II.67 abundant

Note on *Essigella* spp. During 1966–1968 we sent several hundred vials of *Essigella* on many species of *Pinus* to Dr. V. F. Eastop, Dept. Entomology, British Museum (Natural History). He has in his possession what is undoubtedly the largest collection of this genus from the greatest number of *Pinus* spp. in existence. He writes that he hopes to work these up in the course of time but it will entail many dozens of careful measurements.

Euceraphis gillettei Davidson

Alnus japonica (Thunb.) Steud.
2.V.67 several ap (F.W.Q.)

A. rhombifolia Nutt.
1.V & 16.VI.67 a few ap al (F.W.Q.)

Euceraphis punctipennis Zetterstedt

Betula latifolia Tausch.
2.V.67 moderate (F.W.Q.)

B. platyphylla Sukaczew
3.V.67 several al ap (F.W.Q.)

B. platyphylla japonica (Miq.) Hara
2.V.67 moderate (F.W.Q.)

Eulachnus agilis (Kaltenbach) and/or **E. rileyi** (Williams)

Casuarina equisetifolia Linn.
25.IV.67 abundant

Pinus bungeana Zucc.
31.X.66 a few ap 2 al

P. canariensis Smith
14.XI & 29.XII.66 abundant, 22.II, 27.XII.67 abundant

P. caribaea Morelet
3.X.66

P. densiflora S. & Z.
4.XI.66 scarce

P. greggii Engelm.
30.X.66 & 7.IV.67 abundant

P. halepensis Mill.
15.IX & 3.X.66 & 27.XII.67 moderate

P. massoniana D. Don
3.X & 4.XI.66 40–50 all stages

P. pinea Linn.
15.IX & 4.XI.66, 14.II, 10.III.67 abundant 11.X.67 scarce

P. strobus Linn.
4.XI.66 40 all stages with ant *Iridomyrmex humilis* (Mayr.)

P. silvestris Linn.
31.XII.66 15 ap

P. taeda Linn.
3.X.66 abundant

P. taiwanensis Hayata
31.XII.66 abundant

P. thunbergii Parl.
3.X & 4.XI.66 abundant 29.XII.66 scarce 31.I.67 12 ap, 2.III.67 scarce & 28.IV.67 12 ap

Hyadaphis foeniculi Passerini, Honeysuckle & Parsnip Aphid

Lonicera sp.
30.III.66 ny only
L. fragrantissima L. & P.
21.X & 19.XII.66 & 1.II.67 abundant
L. implexa Ait.
18.III.67 abundant 11.X.67 1 ap 4 ny

Hyadaphis pseudobrassicae (Davis), Turnip Aphid
(European workers have called this *Lipaphis erisymi* (Kalt.)

Matthiola incana R. Br.
25.III.67 abundant

Kakimia essigi Gillette & Palmer, Black-backed Columbine Aphid

Aquilegia longissima G. & W.
15.II.67 abundant

Macrosiphoniella ludovicianae (Oestlund), Dark-leaved Wormwood Aphid

Artemesia douglasiana Bess
4.III.67 al ap pupae (F.W.Q.)

Macrosiphoniella sanborni (Gillette), Chrysanthemum Aphid

Chrysanthemum indicum 'Cultivar'
15.III.67 moderate

Macrosiphum spp.

Artemesia douglasiana Bess
14.IV.66 & 9.X.67 abundant
Caesalpinia peltophoroides Benth.
5.VI.67 1 ap 1 ny
Chaenomeles sinensis Lindl.
15.V.67 1 ap
Chrysanthemum maximum 'Marconi'
15.V.67 3 ap
Eriocephalus africanus Linn.
22.IV.67 scarce
Eucalyptus macrandra F. Muell.
26.III.67 abundant
E. pulverulenta Sims.
6.VII.67 5 al many ap (Estop)
Euonymus japonicus Linn.
20.IV.67 5 ap
Gleditsia triacanthos inermis Linn.
28.IV.67 1 ap
Hibiscus mutabilis Linn.
19.XII.66 1 ap 1 ny
Indigofera dosua Buch.-Ham.
31.X.67 2 al 20 ap
I. gerardiana R. Grah.
6.V.67 6 ap 1 al
I. pulchella Roxb.
31.X.67 30 ap ny 5 al
Lampranthus spectabilis N. E. Brown
3.IV.67 2 al 5 ny
Papaver orientale Linn.
11.V.67 3 al 6 ap
Pilea cadierei G. & G.
6.II.67 moderate
Rhagodia nutans R. Br.
24.III.67 1 al 1 ap

Macrosiphum (Sitobium) avenae Fab., English Grain Aphid

Thuja plicata Donn
19.V.67 1 al accidental (F.W.Q.)

Macrosiphum californicum (Clarke)

Betula coerulea Blanchard
1.V.67 5 ap (F.W.Q.)
Callistemon salignus Sweet
13.IV.67 2 ap (F.W.Q.)
Eucalyptus coccifera Hook
11.VII.67 10 ap (V.F.E. det as starvation forms)
E. cneorifolia DC.
14.IV.67 1 al 7 ap
E. conglobata anceps Maiden
14.IV.67 8 al (F.W.Q.)
Salix sp.
14 & 16.IV, 15.IX.66, 15.II, 27.III abundant 1.V.67 40 al al 28.VI.67 abundant
S. babylonica Linn.
1.V.67 moderate
S. babylonica 'Crispa'
1.IX.66 abundant 6.V.67 scarce
S. taxifolia H. B. & K.
8.III.67

Macrosiphum euphorbiae (Thomas), Potato Aphid

In 1971 (Proc. Ent. Soc. Wash 73(2):123–127) we published a list of the host plants of this aphid. These total 107. The date or dates are given with each collection with an indication of relative abundance of the aphid.

Macrosiphum (Sitobium) fragariae (Walker)

Hypericum revolutum Vahl
10.III.67 a few al ap (MacG.)

Macrosiphum geranii (Oestlund)

Pinus douglasiana Martinez
1 al accidental (F.W.Q.)

Macrosiphum pennsylvanicum Pepper

Achillea millefolium Linn.
23.V.67 several ap ny

Macrosiphum pteridis Wilson

Callitris robusta R. Br.
1 al (F.W.Q.)
Nephrolepis exaltata Schott.
15.III.67 2 al 12 ap 15 ny (coll. by J. A. Munro) (det. H. A. Robinson with query)

Macrosiphum (Sitobium) rhamni (Clarke)

Rhamnus crocea Nutt.
7 & 27.III, 20.IV, 20 & 26.VI, 10.VII.67 abundant-scarce

Macrosiphum rosae (Linn.), Rose Aphid

Bencomia moquiniana W. & B.
5.IV.67 2 al 1 ap
Ilex sp.
5.IV.66 only al
I. cornuta L. & P.
12.IV.66 & 3.V.67 moderate
Rosa sp.
23.III, 5.IV, 15.VII & 26.XII.66 scarce-abundant 8.III.67 abundant 16.V.67 1 al 4 ap 27.XII.67 abundant

Masonaphis spp.

Actinostrobus pyramidalis Miq. (SPN gives *Callitris actinostrobus* as a synonym)
5.IV.67 abundant
Callitris drummondii Benth.
19.VII.67 10 ap
C. endlicheri (Parl.) S. T. Blake
2.IV.67 a few ap & 21.VII.67 scarce
C. morrisonii R. T. Baker
24.III.67 scarce
C. propinqua R. Br.
10.VII.67 20 ap
C. rhomboidea R. Br.
21.XI.67 1 al 4 ap
C. robusta R. Br.
19.VII.67 3 ap
Cupressocyparis leylandii Dall.
15.VI.67 30 ap
Cupressus funebris Endl.
1.III.67 abundant
Eucalyptus caesia Benth.
29.VI.67 1 al 70 ap
E. stoatei C. A. Gardner
5.VII.67 scarce
Juniperus chinensis 'Japonica'
13.VI.67 1 al 25 ap
J. chinensis 'San Jose'
17.V.67 20 ap
J. scopulorum 'Table Top Blue'
17.V.67 20 ap
Melaleuca graminea S. Moore
14.IV.67 3 al 4 ny
Taxodium mucronatum Tenore
28.IV.67 1 pupa 1 ap, 16.VI.67 1 al 4 ap ny

Masonaphis lambersii MacGillivray

Azalea sp.
15.II.67 scarce
Ilex cornuta 'Burfordii'
23.VIII.67 several ap (MacG.)

Masonaphis (Ericobium) morrisonii (Swain)
(Identifications made by MacG. and F.W.Q.)

Actinostrobus pyramidalis Miq.
24.VII.67 12 ap
Callitris endlicheri (Parl.) S. T. Blake
21.VII.67 scarce
C. murrayensis Miq.
7.III.67 12 ap 19.VII.67 4 ap
C. oblonga Rich.
20.VII.67 12–15 ap
C. preissii Miq.
7.III.67 abundant
C. propinqua R. Br.
7.III.67 scarce
C. rhomboidea R. Br.
21.VII.67 1 al 2 ap
C. robusta R. Br.
20.I.67 abundant 24.III.67 1 al 12 ap
C. verrucosa R. Br.
21.VI.67 1 al 12 ap
Calocedrus decurrens (Torr.) Florin
19.V.67 scarce
Casuarina lepidophloia F. Muell.
10.VII.67 scarce
Chamaecyparis lawsoniana 'Kilmacurragh'
19.V.67 scarce
Cupressocyparis leylandii Dall.
16.III.67 10 ap
Cupressus arizonica Greene
1.III.67 26 ap ny, 20.IV, 19.V.67 3 ny, 19.VI.67 abundant
C. funebris Endl.
19.V.67 9 ap ny
C. glabra Sudw.
19.V.67 2 ny
C. lusitanica Mill.
11.XI.66 & 1.III.67 abundant 10.III.67 7 ap
C. sempervirens Linn.
26.VII.67 scarce
C. sempervirens 'Stricta'
23.V.67 2 ny 21.VII.67 2 ap
C. torulosa corneyana Mast.
1.III.67 60 ap
Juniperus bermudiana Linn.
6.II & 16.V.67 abundant

J. chinensis 'Robusta Green'
17.V & 23.VIII.67 scarce
J. horizontalis 'Wiltoni'
17.V.67 1 ap
J. occidentalis 'Sierra Silver'
17.V.67 10 ap
J. scopulorum 'Blue Haven'
3.X.66 & 23.VIII.67 scarce
J. scopulorum 'Erecta Glauca'
25.VIII.66 & 15.V.67 abundant
J. virginiana 'Burkii'
1.III.67 2 al ap
J. virginiana 'Cupressifolia'
16.V.67 21 ap
Metasequoia glyptostroboides H. & C.
26.VI.67 1 al
Sequoia sempervirens Endl.
17.V & 17.VI.67 many al ap
26.VI.67 12 ap
Sequoiadendron giganteum (Lindl.) Buch.
11.I, 26.IV and 14.VI.67 moderate
Thuja plicata Donn.
4.III.67 scarce 19.V.67 moderate
Widdringtonia dracomontana Stapf.
24.VII.67 2 ap 2 ny
W. juniperoides Endl.
8.VII.67 scarce
W. schwarzii Masters
6.IV.67 3 al 4 ap
23.VI.67 moderate

Melanocallis caryaefoliae Davis, Black Pecan Aphid
(Richards places this in *Tinocallis*)

Carya illinoinensis C. Koch
9.X.67 abundant

Monellia costalis (Fitch), Black-Margined Aphid

Carya illinoinensis C. Koch
9.X.67 abundant
this is a melanistic form of *M. caryella* Fitch

Monelliopsis californica Essig

Juglans nigra Linn.
15.V.67 5 al 6 ap, 9.X.67 25 al ap (Bissell)
Pterocarya fraxinifolia Spach.
8.XI.67 6 al 4 ny (Bissell)

Myzocallis discolor Monell, Eastern Dusky-Winged Oak Aphid

Quercus agrifolia Nee
25.III.66

Myzocallis punctata Monell, Clear-Winged Oak Aphid
(Including the dark form *M. alhambra* Davidson)

Daubentonia tripetii Poit
24.V.67 3 al (accidental)
Ficus elastica 'Decora'
22.II.67 3 al several pupae
F. glomerata Roxb.
22.II.67 3 al 3 pupae
F. parcellii Veitch
22.II.67 1 al 2 pupae
F. pretoriae Burtt.-Davy
22.II.67 1 pupa
F. stephanocarpa Warb.
22.II.67 2 ap 1 al
F. wightiana Benth.
22.II.67 several al
Quercus agrifolia Nee
25.III.66

Q. engelmannii Greene
20.III & 20.IV.66, 21.II, 8.III, 12 & 20.IV, 23.X.67 moderate

Q. ganderi C. B. Wolf
8.III.67 scarce

Q. virginiana Hill. × *lyrata* Watt.
8.III.67 scarce

Myzocallis walshii (Monell)

Quercus engelmannii Greene
20.IV.66

Myzus hemerocallis Takahashi

Hemerocallis aurantiaca major Baker
15.II.67 abundant

H. 'Hybrid'
9.X.67 9 ap ny

Myzus lythri Schrank, Mahaleb Cherry Aphid

Callitris propinqua R. Br.
7.III.67 accidental

Myzus ornatus Laing, Ornate Aphid

In 1971 (Proc. Ent. Soc. Wash. 73(2):127–131) we published a list of the host plants of this aphid which totaled 110. With each collection the date or dates is given together with an indication of the relative abundance of the aphid.

Myzus persicae (Sulzer), Green Peach Aphid

In 1970 (Proc. Ent. Soc. Wash. 72(3):294–312) we published a list of the host plants of this aphid. It was found on 560 plants or 42% of the 1332 plants on which aphids had been collected. The date or dates with each collection are given together with an indication of the relative abundance of the aphid.

Myzus (Sitobium) rhamni Clarke

Morinda jasminoides A. Cunn.
26.IV.67 abundant (MacG.)

Myzus varians Davidson, Variable Peach Aphid

Clematis 'Hybrid'
15.X.66

C. ligusticifolia Nutt.
26.VII.67 15 ap ny

Nasonovia (Hyperomyzus) lactucae (Linn.), Sowthistle Aphid

Sonchus oleraceus Linn.
14.VI.67 abundant

Neoceruraphis vibernicola (Gillette), Snowball Aphid

Viburnum odoratissimum Ker.-Gawl.
19.XII.66 & 16.III.67 many al ap

V. sargentii Koehne
27.III.67 abundant

V. suspensum Lindl.
2.III.66 40 al ap ny

Neophyllaphis podocarpi Takahashi

Podocarpus gracilior Pilg.
12.IX.66 50 al ap ny

P. macrophyllus D. Don
15.X.66 many ap al

Neotoxoptera violae Pergande, Violet Aphid

Dianthus barbatus Linn.
31.X.67 20 ap ny (L.M.R.)

Thevetia peruviana Merrill
3.I.67 1 al accidental

Ovatus crataegarius (Walker), Mint Aphid

Mentha citrata Ehrh.
4.X.67 2 ap 1 ny
M. longifolia Huds.
4 & 30.X.67 60–70 ap ny
M. piperita Linn.
4.X.67 35 ap ny

M. pulegium Linn.
23.V.67 2 al 3 ny
M. spicata Linn.
4.X.67 2 al 15 ap ny

Pentalonia nigronervosa Cockerell

Ensete V ventricosum (Welw.) Chees.
I.XI.66 many al ap
Musa bulbissima Auth.
I.XI.66 2 al 50 ap ny

M. rosacea Jacq.
1.XI.66 50 ap ny 1 al
M. velutina H. Wendl.
1.XI.66 3 al 10 ap

Pleotricophorus gnaphalodes Palmer

Artemesia nutans Willd.
23.V.67 abundant (H.R.L.)

?Pterocomma salicis (Linn.)

Salix babylonica Linn.
1.V.67 1 al 2 ap

?Pterocomma smithiae (Monell), Willow Grove or Black Willow Aphid

Salix taxifolia H. B. & K.
8.III.67 abundant

Rhopalosiphum padi Linn., Oat Bird Cherry Aphid

Sambucus mexicana Presl.
15.III.67 accidental (MacG.)

Siphonotrophia cupressi Swain, Cypress Aphid

Cupressus glabra Sudw.
5.X.66 & 19.V.67 scarce
C. lusitanica Mill
1.III & 22.V.67 scarce
C. torulosa corneyana Mast
22.V.67 scarce
Juniperus chinensis Linn.
5.X.66 25 ap

J. chinensis 'Torulosa'
4.X.67 3 ap 4 ny
Widdringtonia juniperoides Endl.
8.VII.67 8 ap
W. schwarzii Masters
29.XII.66 20 ap

Stegophylla quercifoliae Gillette, Wooly Oak Aphid

Quercus agrifolia Nee
17.V.67 abundant (F.W.Q.)
Q. engelmannii Greene
12.V.67 moderate (F.W.Q.)

Takecallis arundicolens (Clarke)

Arundinaria amabilis McClure
8.III.67 abundant
A. simonii A. & C. Riviere
8.III.67 abundant 7.VI.67 scarce
Bambusa multiplex Raeusch.
7.VI.67 moderate
Phyllostachys aureosulcata McC.
8.III.67 scarce
P. vivax McClure
8.III.67 scarce
Pseudosasa japonica Makino
26.XII.66
Sasa pygmaea Mitf.
26.XII.66, 31.I.67 abundant
8.XI.67 scarce

Takecallis arundinariae Essig

Arundinaria amabilis McClure
8.III.67 abundant
A. simonii A. & C. Riviere
8.III.67 abundant
Bambusa sp.
8.III.67 scarce
B. multiplex Raeusch.
12.IV.66
B. multiplex 'Chinese Goddess'
8.III.67 moderate
B. multiplex 'Stripestem Fernleaf'
8.III.67 scarce
B. oldhamii Munro
26.XII.66
Chimonobambusa marmorea Makino
8.III.67 scarce
Phyllostachys sp.
26.XII.66 & 7.VI.67 moderate
P. aurea A. & C. Riviere
27.XII.66 & 31.I, 27.II, 8.XI and 29.XII.67 abundant
P. aureosulcata McClure
8.III.67 scarce
P. bambusoides S. & Z.
7.VI.67 moderate
P. bambusoides castillonii Houseau de Lehaie
26.XII.66 & 8.III.67 abundant
7.VI.67 moderate
P. dulcis McClure
8.III.67 moderate
P. flexuosa A. & C. Riviere
8.III.67 abundant
P. meyeri McClure
14.XII.66
P. nigra Munro
1.III.67 scarce
P. sulphurea viridis Young
8.III.67 moderate & 7.VI.67 scarce
P. vivax McClure
8.III.67 abundant
Sasa japonica Makino
4.XII.66
S. pygmaea Camus
28.II.67 scarce

Tamalia coweni (Cockerell), Manzanita Leaf-Gall Aphid

Arctostaphylos manzanita Parry
15.XI.66 many ap al and leaf galls

Tinocallis caryaefoliae—see **Melanocallis**

Toxoptera aurantii (Fonscolombe), Black Citrus Aphid

In 1971 (Proc. Ent. Soc. Wash. 73(3):324–326) we published a list of the host plants of this aphid in the Arboretum. It was collected from 47 plants distributed in 25 genera and 19 different plant families. The dates are given for each collection and the relative abundance of the aphid is indicated.

Tuberculatus ulmifolii (Monell), Elm Leaf Aphid
(Has also been placed in *Myzocallis*)

Ulmus americana Linn.
4.X.67 20 al ap ny

Tuberculoides n. sp., Dickson in Ms.

Quercus myrsinaefolia Blume
1.VI.67 4 al 25 ny (F.W.Q.)

Tuberculoides maureri Swain

Quercus acutissima Carruth
8.V.67 3 al
Q. engelmannii Greene
12.IV.67 abundant
5.VII.67 35 ap
Q. ganderi C. B. Wolf
8.III.67 scarce
Q. virginiana Mill. × *lyrata* Walt.
8.III & 1.VI.67 scarce

Tuberolachnus salignus (Gmelin), Giant Willow Aphid

Salix sp.
16.IV.66
S. babylonica Linn.
13.XII.66 abundant
S. babylonica 'Crispa'
17.XI.66 abundant
S. discolor Muh.
13.V & 13.XII.66, 1.V.67 scarce
S. taxifolia H. B. & K.
8.III.67 abundant

Wahlgreniella nervata (Gillette), Rose and Barberry Aphid

Arctostaphylos densiflora M. S. Baker
7.VI.67 20 ap (MacG.)
A. pumila Nutt.
24.III.67 abundant (MacG.)
A. pumila 'Radient'
24.III.67 abundant (MacG.)
A. stanfordiana Parry
24.III.67 abundant 7.VI.67 30 ap (MacG.)

Wahlgreniella nervata arbuti Davidson

Arbutus unedo Linn.
4.II & 14.III.67 abundant
8.V.67 30 ap 13.VI.67 50 ap
(some det. by MacG.)

CAREOSPINA QUERCIVORA, A NEW GENUS AND SPECIES OF MOTH INFESTING LIVE OAKS IN CALIFORNIA[1]
(LEPIDOPTERA: INCURVARIIDAE)

DONALD R. DAVIS, *Department of Entomology, Smithsonian Institution, Washington, D. C. 20560*

ABSTRACT—**Careospina**, new genus, is proposed for **C. quercivora**, new species, described from the coastal ranges of California. The larvae are known to infest at least two species of live oaks, feeding at first as leaf miners and then later as leaf skeletonizers after constructing portable, larval cases. The cases are lenticular in shape and are formed from oval sections cut from the leaves of the host. The species is believed to undergo one generation per year with the adults emerging from late spring to mid-summer.

The moths discussed in this article were first collected and reared over thirty years ago by Dr. R. M. Bohart of the University of California, Los Angeles. Bohart sent his material to Dr. Annette Braun who recognized the insect as an undescribed species of Incurvariidae near the genus *Lampronia*. Since then Dr. L. R. Brown and C. O. Eads of the University of California at Riverside have studied the life history of this species. The results of their work were summarized in a well illustrated bulletin of that Institution on the insects affecting the oaks of southern California (1965). I am indebted to Dr. Brown for some of the study material incorporated into the present paper as well as for numerous photographs of immature stages.

Recently the biology of this and certain other oak-feeding Lepidoptera have been under intensive investigation by Dr. Paul Opler of the University of California at Berkeley. His request of a name for this moth for a publication soon to appear has prompted the present paper. I am grateful to Dr. Opler for most of the specimens examined of this species and also for information concerning its life history. I am currently revising the American species of Incurvariinae and will include a more lengthy review of the biology of this new species in that report. The reader should also be cautioned that the familial name, Incurvariidae, although commonly used over the years by a number of authors, does not have priority and may be synonymized in my forthcoming revision.

Careospina, n. gen.

Type-species.—Careospina quercivora, n. sp.

Adult.—Small, slender bodied moths; wing expanse approximately 7–10 mm.

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[1] Immediate publication secured by full payment of page charges—Editor.

Fig. 1. *Careospina quercivora*, n. sp., holotype, male, wing expanse 10 mm.

Head (figs. 3–4): Densely hairy, entirely rough. Antennae simple, 0.6–0.8 the length of forewing, 32–36 segmented; sensory setae short, 0.5 the diameter of flagellum; pecten present, consisting of approximately 6–10 scattered setae from venter of scape; antennal sockets well separated, the intersocketal distance usually more than 2.2 the diameter of socket. Ocelli absent. Compound eyes large, spherical; vertical diameter equal to interocular distance across frons. Mandibles present, greatly reduced. Galeae short, approximately equal to length of labial palpi. Maxillary palpi long, nearly 2.0 the length of labial palpi, usually folded in repose, five segmented; fourth segment the longest, nearly 3.0 the length of fifth. Labial palpi three segmented.

Thorax: Wings relatively narrow, greatest width approximately 0.25 the length, apices subacute; microtrichiae (aculeae) evenly scattered over both wings. Forewings 12-veined; all veins arising separate from discal cell except 7 and 8 which are stalked about 0.25–0.35 their lengths; accessory and intercalary cells faintly present. Prothoracic tibia without an epiphysis.

Male genitalia: Uncus simple, reduced in size. Viniculum-saccus broadly triangular. Valvae relatively slender; ventral margin with a single pecten present. Juxta broad. Aedeagus relatively short and stocky; cornuti present.

Female genitalia: Apex of ovipositor depressed, broad and stout, accuminate. Apophyses relatively stout. Ductus bursae shortened, seldom extending beyond cephalic ends of anterior apophyses when ovipositor extended. Signum absent.

Discussion.—With our present knowledge, this genus and species stand relatively remote from nearly all other incurvariine taxa. On the basis of certain morphological features and particularly with regard to general biology, *Careospina* demonstrates closest affinities to another monotypic, American genus, *Paraclemensia*. Similar to *Paraclemensia*, *Careospina* lacks an epiphysis and the apex of the female ovipositor is relatively broad and depressed. The two genera also

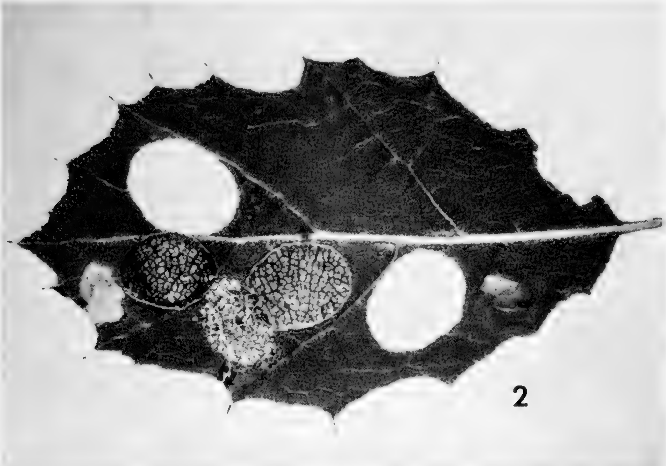


Fig. 2. Lower surface of leaf of coast live oak (*Quercus agrifolia*) showing injury and two larval cases of *Careospina quercivora*, n. sp. (after Brown and Eads).

share similar palpal segmentation. They differ most markedly in that *Paraclemensia* possesses broader wings (greatest width approximately 0.35 the length) and has lost vein 5 (M2) in the forewing. *Paraclemnsia* also has eyes that are considerably smaller in size, and the juxta of the male is of a more complex, deeply furcated form, much different from the rather simple type present in *Careospina*.

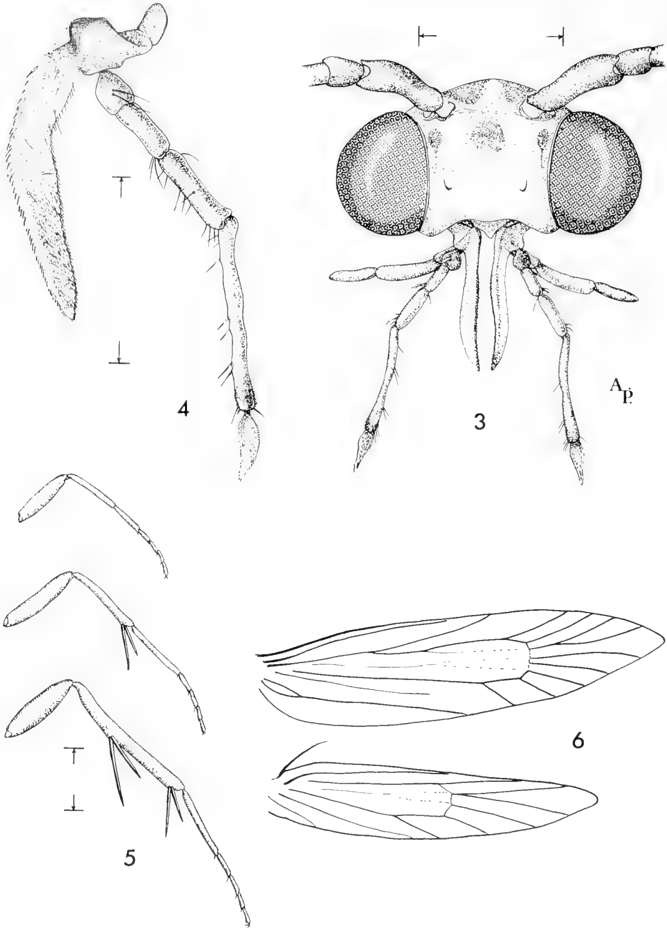
Biologically the two genera demonstrate a basic life history which is rather unique for the Holarctic Incurvariidae. The larvae of both *Paraclemensia* and *Careospina* commense as leaf miners but soon begin to skeletonize the leaves of the host plant after first constructing portable cases. This type of behavior, although rare in genera of the northern hemisphere, seems to prevail more in the Australian species (Common, 1970) and is partially reminiscent to that of a closely related family, the Heliozelidae.

The generic name, *Careospina*, has been derived from latin (and treated as feminine) and refers to the fact that the epiphysis (spina) is absent (careo).

Careospina quercivora, n. sp.

Adult (fig. 1).—Wing expanse: ♂, 7–9 mm; ♀, 7–10 mm.

Head: Pale stramineous. Antennae 0.65–0.75 the length of forewing; scape



Figs. 3–6. *Careospina quercivora*, n. sp.: 3, frontal view of head; 4, left maxilla; 5, legs; 6, wing venation. Scale = 0.5 mm.

and pedicel stramineous, flagellum fuscous, completely scaled. Maxillary and labial palpi stramineous; apex of second segment of labial palpi with a scattered brush of 4–6 long bristles.

Thorax: Dorsum fuscous, slightly iridescent. Venter paler, more brownish. Tarsal segments indistinctly ringed with light brown. Forewings uniformly fuscous with a slight bronzy luster except for a single, small whitish spot on hind margin near tornus (frequently obscure in rubbed specimens). Hindwings paler than forewings, grayish.

Abdomen: Fuscous above; paler, more grayish ventrally.

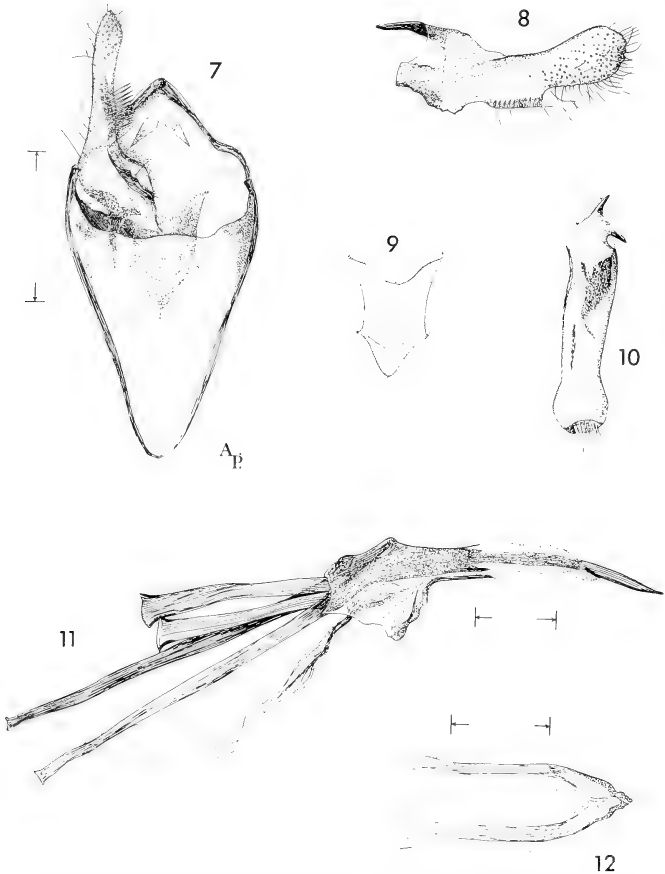
Male genitalia (figs. 7–10): Uncus reduced to a small, acute lobe. Vinculum and saccus triangular, relatively short, approximately equalling valvae in length. Valvae slender, sacculus slightly expanded; a single pecten consisting of 12–20 spines arranged in a single row midway along ventral margin. Juxta slightly longer than broad (length about 1.5 the width); base bluntly rounded, more narrow than caudal end. Aedeagus about as long as valvae, stocky, with two large cornuti present.

Female genitalia (figs. 11–12): Apex of ovipositor depressed, cutting edges serrate, bilaterally incised immediately below tip. Cephalic end of posterior apophyses flared. Ductus bursae slightly thickened, appearing somewhat rugose midway along length.

Holotype.—Tapia Park, Los Angeles County, California, ♂, coll. June 11, 1957, emerged July 7, 1957, by C. Eads and L. Brown, on *Quercus agrifolia*, USNM 72077; in the United States National Museum of Natural History.

Paratypes.—CALIFORNIA: Contra Costa Co.: Mt. Diablo, 2900 ft.: ♂, coll. Feb. 24, 1968 by P. Opler on *Quercus wislizenii*, emerged June 10, 1968 (UCB). Kern Co.: Keene: 5♂, 5♀, coll. Feb. 17, 1968 by P. Opler on *Quercus wislizenii*, emerged May 12–28, 1968 (UCB); 2♂, 2♀, coll. Feb. 17, 1968 by P. Opler on *Quercus wislizenii*, emerged May 7–30, 1968 (USNM); 6♂, 4♀, coll. March 28, 1968 by P. Opler on *Quercus wislizenii*, emerged July 6, 1968 (UCB); ♂, coll. May 31, 1968 by P. Opler, emerged May 30, 1968 (USNM); 2♀, coll. June 2, 1968 by P. Opler, emerged June 14–21, 1968 (UCB); ♀, coll. June 2, 1968 by P. Opler, emerged June 10, 1968 (USNM). Los Angeles Co.: Same data as holotype: 2♂ (USNM); ♂, ♀ (UCR). Westwood Hills: ♂, June 11, 1941, ♀, July, 1941, coll. by R. M. Bohart (AFB); ♀, July 1941 coll. by R. M. Bohart (USNM). San Bernardino Co.: 1 mi. W. Forest Home: 6♂, 5♀, coll. Mar. 29, 1968 by P. Opler on *Quercus wislizenii*, emerged June 12–July 17, 1968 (UCB); ♂, ♀, same date except emerged July 17, 1968 (USNM). Upper Lytte Cr.: 2♂, coll. April 25, 1943, emerged June 26 and July 5, 1943, ♀, coll. May 30, 1942, emerged July 13, 1942, on *Quercus wislizenii* (USNM). San Mateo Co.: San Mateo Memorial Park: ♀, coll. July 25, 1962 by C. A. Toschi (UCB). Described from a total of 29 males and 25 females.

Hosts.—FAGACEAE: "*Quercus agrifolia* Nee," (Brown and Eads, 1965); "*Quercus wislizenii* A.DC.," (from specimen labels). Opler (in



Figs. 7–12. *Careospina quercivora*, n. sp.: 7, male genitalia, ventral view; 8, right valve, lateral view; 9, juxta, ventral view; 10, aedeagus; 11, female genitalia, lateral view; 12, apex of ovipositor, dorsal view. Scale = 0.25 mm.

litt.) has indicated that most of his rearings of this moth were from the chapparal scrub form of *Quercus wislizenii*, variety *frutescens* Engelm.

Flight Period.—Early June to late July; univoltine. The flight period as given may be somewhat inaccurate as most, if not all, adult records are based on laboratory rearings. Misled by the slow and extremely variable development of the larvae, Brown and Eads (1956) concluded that there were two generations per year. However, the species appears to be only univoltine, with adults emerging from late spring to mid-summer.

Distribution.—Presently known from the coastal ranges of California, including Santa Cruz Island, from Riverside County north to Marin County and the San Francisco Bay area.

Life History.—Although oviposition probably occurs from late June throughout most of July, young larvae do not become noticeable until mid September and continue to appear on into winter as late as January as noted by Opler (in litt.). According to Brown and Eads (1965), the larva first constructs a serpentine mine which is gradually enlarged into an irregular blotch. All mesophyll tissue is consumed thereby creating a full depth mine.

At the conclusion of the mining stage, the larva constructs a flattened case by first cutting an oval patch out of both the upper and lower epidermal layers of the mine and then sewing them together around the edges with silk. The initial case measures approximately 5 mm long and 3 mm wide, and frequently has a slight constriction at the middle. The larva lives in this case for the remainder of its larval existence, dragging it about over the leaf and occasionally to other leaves as it feeds. After locating a suitable feeding spot, the larva usually anchors the case to the leaf with silk before commencing to feed. From this stage on the feeding injury caused by the larva is that of a skeletonizer and is primarily, but not entirely, restricted to the lower leaf surface. The entire leaf area covered by the larval case is normally skeletonized although sometimes the central portion covered by the case is left intact, thus leaving a partially or completely ringed-out portion on the leaf so characteristic of *Paraclemensia acerifoliella.*

As the larva matures, more oval sections are cut from the leaf and added to the top of the old case in the manner of a shelter, with the larva alternately inverting the entire case each time to accommodate the latest addition. Eventually the larva secures the shelter firmly for the last time to the underside of a leaf, branch of some other suitable site and pupates. Brown and Eads report that the leaves of the coast live oak (*Quercus agrifolia*) normally fall in the spring, and that pupation may occur either before or after leaf fall. The length of the pupal period appears to be relatively short, perhaps no longer than two weeks. Emergence of the adult has never been observed in nature, although more than likely it begins in early to mid June and continues into late July.

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CRANEIOBIA LAWSONIANAE DE MEIJERE, NEW SYNONYM OF JANETIELLA SISKIYOU FELT

(Diptera: Cecidomyiidae)

Chamaecyparis lawsoniana (A. Murr.) Parl. (Cupressaceae), the Port-Orford-Cedar, is a native of southwestern Oregon and northwestern California. It grows well elsewhere, however, and was introduced into Europe, where many ornamental varieties of this tree have been cultivated. Seeds of those varieties occasionally are sent to the U.S. but require treatment at the port of entry because of the presence of cecidomyiid larvae. In the past I have identified those larvae found in the seeds as *Craneiobia lawsonianae* de Meijere (1935, Tijdschr. Ent. 78:129), a species originally described from adults reared from *C. lawsoniana* seeds in the Netherlands. K. M. Harris, of the Royal Horticultural Laboratories, Wisley, England, pointed out to me the probability that de Meijere's species was the same as *Janetiella siskiyou* Felt (1917, J. New York Ent. Soc. 25:194), which was described from a female and larva taken from seeds of *C. lawsoniana* in Oregon. Upon checking, I find that Felt's type series, and a male collected subsequently from Oregon, are identical to larvae and adults taken repeatedly in Quarantine at Hoboken, N.J., in shipments of seed from Italy. Both series fit de Meijere's original description and figures of *C. lawsonianae*, and the latter is therefore a new junior synonym of *J. siskiyou*. This species was apparently introduced into Europe from America with the plant seeds.—Raymond J. Gagné, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560.*

AN UNUSUAL HABIT FOR A FLY OF THE FAMILY EPHYDRIDAE

The great majority of the species of the family Ephydridae are found in the adult stage on or very close to moist earth. The larvae of a few species live in herbaceous vegetation, such as the species of *Hydrellia*, which mine in aquatic or emergent vegetation, and those of *Clanoneurum*, *Mosillus*, and *Psilopa*, which feed upon such plants as Chenopodiaceae. The adults of these genera may be found on the plants upon which their larvae feed.

Late in July and early in August along Cabin John Creek, near Bethesda, Maryland, a dozen specimens of *Ditrichophora canifrons* Cresson were taken by scraping the edge of a collecting net along the trunks of trees from 2 to 7 feet above the ground. This was done in an effort to collect *Medetera* spp. (*Dolichopodidae*), which may be regularly taken in such situations. The ephydrid was stated by Cresson (1942, Trans. Amer. Ent. Soc. 68:121) to be a rare species from Quebec, New York, and Pennsylvania. There are also specimens in the U.S. National Museum from the Great Smoky Mountains National Park, Tennessee, and Penland, Mitchell County, North Carolina.—GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560.*

PARASITISM OF MILKWEED BEETLES, TETRAOPES
(DIPTERA: TACHINIDAE—COLEOPTERA: CERAMBYCIDAE)

Apparently no insect parasites have been recorded from the Nearctic cerambycid genus *Tetraopes*. Chemsak (1963, U. Calif. Publ. Ent. 30(1):7), in his "Taxonomy and bionomics of the genus *Tetraopes*," stated that none have been reported, and no records have been found for a nearly completed host-parasite catalog of North American Tachinidae (Paul H. Arnaud, Jr., in litt.). Therefore, we believe the following to be the first recorded parasite of *Tetraopes*.

Five specimens of the red milkweed beetle, *Tetraopes tetrophthalmus* (Forster) [det. G. B. Vogt] were collected by one of us (Braun) at Beltsville, Md., on July 13 and 14, 1971, and kept in a jar with a leaf of the food plant. One beetle was moribund on the 17th and another on the 18th, at which time two small puparia and one maggot were found in the jar. The maggot had pupated by the 19th. The first two puparia yielded flies on the 29th, but the third died. Dissection of the two beetles showed that only one had apparently been parasitized. Large numbers of the beetles were subsequently held for observation, but no more parasites were found.

The parasites are *Hyalomyodes triangulifer* (Loew), which is known from several families of Coleoptera and from a few other insects, almost all of them leaf-feeders. Sabrosky and Braun recently summarized the host records when recording it as the first known tachinid parasite of Lampyridae (1970, Ent. News 81:185–187).—CURTIS W. SABROSKY, *Systematic Entomology Laboratory, U.S. Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560,* and BERNARD H. BRAUN, *Pesticide Chemicals Research Branch, Agricultural Research Center, Beltsville, Maryland 20705.*

A CORRECTION TO STURTEVANT'S PAPER ON THE SEMINAL RECEPTACLES, ETC., OF THE DIPTERA, 1926

When the A. H. Sturtevant collection became the property of the U.S. National Museum in 1970, the specimens of the genus *Strauzia* became available to me. In reviewing the material before incorporating it into collections, I noted that only one specimen had a portion of the abdomen. The specimen was a female labeled "*Straussia longipennis* var. *perfecta* Loew," but is actually *Euleia fratria* (Loew). The wing pattern, size, and general appearance of these two species are astonishingly similar. Determinations of *Strauzia longipennis* should be checked for this error.

The description of the seminal receptacles and accessory glands reported by Sturtevant (1926, Jour. N.Y. Ent. Soc. 33:195–215; 34:1–21, pls. I–III) as that of *Straussia longipennis* on page 215 and in fig. 7 on pl. I therefore evidently refer to *Euleia fratria* (Loew), the well-known leafminer of celery and other umbelliferous plants.—GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560.*

EUARESTA RETICULATA (HENDEL), NEW COMBINATION

(DIPTERA: TEPHRITIDAE)

The species originally described as *Trypanea reticulata* Hendel, 1914, is apparently fairly common in Colombia, Ecuador, Peru, and Bolivia. Apparently it has never been reared, but it has been taken on the foliage of several economic plants. It seems desirable to point out that the species is very similar to the type of the genus *Euaresta* Loew, 1873 (*Trypeta festiva* Loew, 1862), of North America, and even more similar to another North American species, *Euaresta aequalis* (Loew, 1862). Both of these species have been reared from Compositae.

Trypanea reticulata was referred to *Plaumannimyia* Hering, 1938 (type, *P. pallens* Hering, 1938) by the author of that genus in 1941 and was retained therein by Aczél, 1949 and Foote, 1967. Comparison of Ecuadorian and Colombian specimens with *Euaresta festiva* and *E. aequalis* yields no distinguishing characters of generic significance. Chaetotactic and alar characters agree well, but more significantly, the male postabdomen has the broad, apically flattened and striate conformation of *Euaresta* and the swollen forefemur of the males of *Euaresta* is also present in *reticulata*. Examination of specimens of *P. pallens* will be necessary in order to determine whether the genus *Plaumannimyia* is tenable. The genus was compared by its describer with *Paroxyna* and no mention of *Euaresta* was made. References to all pertinent literature may be found in M. Aczél (1949, Acta Zool. Lilloana 7:177–328) and R. H. Foote (1967, A Catalogue of the Diptera of the Americas South of the United States, Dept. Zool., Secr. Agr., São Paulo, fasc. 57).—GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560.*

ON THE IDENTITY OF AGONOPHORUS DAHLBOM

(HYMENOPTERA: DIAPRIIDAE)

Dahlbom, in 1857 (Öfvers. Kongl. Vetensk-Akad., Förh. 14:289), briefly described the genus *Agonophorus* although without including any species. In 1967 Dessart (Rec. So. Austral. Mus. 15:353) stated that on a visit to Lund he had seen a specimen among Dahlbom's unclassified material labeled "*Agonophorus*" and that this specimen belonged in *Ismarus* Haliday, 1835 (Proctotrupoidea, Diapriidae). Through the kindness of Dr. Carl H. Lindroth, of Lund University, I have had the opportunity to examine three specimens placed by Dahlbom under his generic label "*Agonophorus*" and identified by him, respectively, as "*rugulosus* Foerst." (described by Foerster in *Ismarus*), "*campanulata* Hal." (the author was actually Herrich-Schaeffer although the species was later treated by Haliday; it is the type-species of *Entomia* Herrich-Schaeffer, 1840, which is a synonym of *Ismarus*), and "*flavicornis* Thoms." (described by Thomson in *Entomia*). In my opinion all three specimens were correctly identified by Dahlbom, and in order that the identity of *Agonophorus* may be definitely settled I am naming *Ismarus rugulosus* Foerster its type-species. As indicated by Dessart, *Agonophorus* Dahlbom must be treated as a junior synonym of *Ismarus* Haliday.—CARL F. W. MUESEBECK, *Department of Entomology, Smithsonian Institution, Washington, D.C. 20560.*

BOOK REVIEWS

The Classification, Evolution and Dispersal of the Winter Stonefly Genus Allocapnia. By Herbert H. Ross and William E. Ricker. 1971. Illinois Biological Monographs 45, University of Illinois Press, Urbana, Chicago, and London. 166 pp. Paperback $8.95.

One of the more interesting assemblages of insects in eastern North America is that of the winter stoneflies. With the advent of fall their nymphal development is rapidly completed and emergence takes place on warmer days during winter. One often finds the adults of *Allocapnia*, a major element of this fauna, walking on snow and ice in the vicinity of small rivers and brooks on warm winter days.

The authors have taken advantage of the propensity of over two hundred of us who enjoy getting outdoors for a little collecting on a nice winter's day. In this manner 150,000 examples from 3,000 localities were accumulated in about ten years. There is no doubt that this is one of the best documented attempts to reconstruct the phylogeny and dispersal of a group of insects.

The first, systematic, part of the book explores the ancestry of the genus, presents keys to the species for both sexes, and establishes species groups. Diagnoses, figures of the male and female genitalia, and distributions with maps are given for all species. From this point the authors then discuss in detail the phylogeny and geographic dispersal of the genus and species groups.

Finally the genus is treated from the standpoint of the geologic age of the genus and its various dispersals. Considering the genus as a whole, its probable ancestry is in common with that of the *vidua* group of *Capnia* and probably dates to the late Pliocene. The authors conclude that the speciation pattern seems to be associated with the alternation of cold glacial and warm interglacial periods of the Pleistocene and similar events in late Pliocene.—OLIVER S. FLINT, JR., *Department of Entomology, Smithsonian Institution, Washington, D.C., 20560.*

The Anthomyiidae of California Exclusive of the Subfamily Scatophaginae (Diptera). By H. C. Huckett. 1971. Bulletin of the California Insect Survey, vol. 12. University of California Press, Berkeley, Los Angeles, and London. 121 pp., 111 figs. $5.00.

The high quality of the Bulletins of the California Insect Survey is more than amply maintained in this number. It is especially welcome as the first comprehensive work on the group for the western part of North America besides the same author's work on the Muscidae (sensu latior) of northern Canada, Alaska, and Greenland (1965, Mem. Ent. Soc. Canada, no. 42). I fully agree with Huckett's statement in the introduction of the new work: ". . . the literature cited is notably inadequate for meeting the current needs of classification and identification."

Many of the species treated are found far beyond the limits of the State of California. All of the North American subfamilies and tribes are keyed and in the keys to 30 genera and subgenera only 8 of those found in the continent are not included (*Circia*, *Myopina*, *Pseudochirosia*, *Emmesomyia*, *Macrophorbia*, *Neohylemyia*, *Hylemya* subgenus *Crinurina*, and *H.* sg. *Pycnoglossa*). A total of 205 species and subspecies are treated. No new species are described and only 1 new synonym is brought forth (*Alliopsis californiensis* Huckett, 1966, under *Hydrophoria brunneifrons* [Zetterstedt, 1838]), on p. 78. A misprint cites the date of the Zetterstedt species as 1938.

Bulletin 12 will remain an important work on this highly economic family for a long time.—GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560.*

SOCIETY MEETINGS

783rd Regular Meeting—December 10, 1970

The 783rd regular meeting of the Entomological Society of Washington was called to order by President Krombein on December 10, 1970 at 8:00 p.m. in Room 43, USNM. Thirty-seven members and 12 guests were in attendance. Minutes of the previous meeting were approved after corrections.

Following the introduction of new member *D. M. Caron*, President Krombein called for annual reports from Society officers. T. J. Spilman presented the treasurer's report in the absence of treasurer A. K. Burditt. Editor P. Marsh presented his report and those of D. Smith, corresponding secretary, and R. Gordon, custodian. It was moved, seconded and carried that the reports be accepted.

Next, Nominating Committee Chairman G. L. Hutton presented the slate of officers for 1971.

President Elect—C. W. Sabrosky
Recording Secretary—D. M. Caron
Corresponding Secretary—D. R. Smith
Treasurer—T. J. Spilman
Editor—P. M. Marsh
Custodian—R. D. Gordon
Program Chairman—F. E. Wood
Membership Chairman—H. I. Rainwater

It was moved, seconded and carried that the slate be accepted. There were no nominations from the floor. It was moved, seconded and carried that the nominations be closed. Then it was moved, seconded and carried by unanimous vote that the entire ballot be accepted.

Next, President Krombein read from the constitution concerning procedures for the election of Honorary Members and the Honorary President. He stated the Executive Committee had unanimously approved the nomination of Mr. Carl F. W. Muesebeck for Honorary President of the Entomological Society of Washington. This was moved, seconded and carried by unanimous vote of the members present. Similarly, Dr. Avery Hoyt was unanimously approved by the Executive Committee as a nominee for honorary membership. It was moved, seconded and carried by unanimous vote of the members present. Dr. Hoyt was escorted to the podium by L. G. Davis. He then thanked the Society for so honoring him.

The speaker of the evening, Dr. Karl Maramorosch, Boyce Thompson Institute for Plant Research, Yonkers, New York, was introduced by President Krombein. His talk entitled, Mycoplasma Diseases of Insects and Plants, was a fast-paced, interesting, and well-illustrated summary of what is now known about the mycoplasma-like organisms found in insects and plants.

The first note of the evening was presented by R. I. Sailer who exhibited 15 specimens of a new encyrtid parasite, *Hexacladia* sp., which emerged on September 8, 1970 from an adult female northern green stink bug, *Acrosternum hilare* (Say), collected August 13, 1970 from a soybean field near Independence, Kansas. Two more adult female northern green stink bugs collected at the same time died December 10, 1970. One contained larvae and the other pupae of *Hexacladia* sp. These 2 bugs may have been parasitized in the laboratory since they were exposed to the encyrtids which emerged earlier.

A. B. Gurney referred to a note given at the November meeting by Dr. Messersmith on a local mantid of the genus *Tenodera* which had eaten part of one of its front legs. It has been found that in 1892 Riley & Howard (Insect Life 4:349) called attention to reports of such occurrences by raptorial orthopteroids, and used the term "self-multilation." Chopard (Biologie des Orthopteres, Encycl. Ent. 20: 319–320) also has referred to this habit as occasionally seen, mainly in some Tettigoniidae; he used the French word "autopsalize."

Following the introduction of visitors, President Krombein presented the report of the retiring president in which he thanked all who had helped make the past year a success for the Society. Then, past presidents A. B. Gurney and R. H. Foote escorted President Edson J. Hambleton to the podium where he was presented the gavel by retiring President Karl Krombein. The meeting was adjourned by President Hambleton at 9:50 p.m.

Respectfully submitted, JOHN A. DAVIDSON, *Recording Secretary.*

784th Regular Meeting—January 7, 1971

The 784th regular meeting of the Entomological Society of Washington was called to order by president Edson J. Hambleton on January 7, 1971 at 8:00 P.M. in Room 43, USNM. Fifty-six members and twenty-eight guests were in attendance. Following introduction of the new recording secretary, D. M. Caron, the minutes of the previous meeting were read and approved with one correction.

President Hambleton called upon Mr. Carl F. W. Muesebeck, new honorary President of the Entomological Society of Washington. Honorary President Muesebeck thanked the society for the honor.

President Hambleton next called upon Mrs. Helen Sollers-Riedel to discuss highlights of the proposed amendments to the by-laws of the society circulated at December 10, 1970 meeting in accord with Section 10 of the existing by-laws. Following discussion it was moved and seconded that the proposed amendments be accepted. The motion carried.

President Hambleton announced the members of the hospitality committee for the coming year. Mrs. Sollers-Riedel will be chairman and Mrs. Doyle Reed, Mrs. Alan Stone, Ted Bissell, Oliver Flint and George Steyskal complete the committee. A sheet requesting name and telephone number of those who could help for individual programs was circulated and a sealed envelope with $4.66 was passed to the new chairman from T. J. Spilman.

The members were next informed of the passing of some dear friends and fellow associates. President Hambleton and Mrs. Sollers-Reidel spoke on the passing and many accomplishments of Dr. Bailey Pepper of Rutgers. Victor Adler announced the recent death of E. L. Gooden, Beltsville Physicist and John R. Keller an Entomologist last located in Arizona. C. Sabrosky announced the passing of Chille Carpenter, a retired Librarian at the Museum.

H. I. Rainwater, membership chairman presented the names of *Ronald Sterne Wilkinson* and *Charles Van Orden Covell, Jr.* for membership.

President Hambleton introduced the speaker for the evening, immediate past President Karl Krombein. Dr. Krombein presented excellent slides of plant and wildlife of Kenya during his recent 5 week visit to that country to secure insect specimens for the Smithsonian. Dr. Krombein also illustrated the collection of a fungus growing termite nest for the public display of the Museum. He also had available for closer inspection the reproductives chamber, a portion of the fungus chamber and comb and preserved specimens of the queen, king and other members of the nest.

The first note of the evening was from T. J. Spilman who introduced the members to a new book "Directory of Coleoptera collections of North America (Canada Panama)" prepared by Ross H. Arnett, Jr. and G. Allan Samuelson.

R. I. Sailer showed a large adult bug *Acanthocephala terminalis* Dallas that he collected as a nymph November 6 in Georgia; of special note was the size of a tachinid fly pupa that emerged from the still living adult. This was first noted January 5.

Dr. E. Gerberg next offered larvae, pupae and adult specimens of an African mosquito *Toxorhynchites brevipalpis*. He indicated that this was a predaceous species and that it would not bite.

G. Steyskal offered a drawing of a new sepsid fly species of undescribed genus that probably represents a new subfamily.

Following the introduction of several guests the meeting was adjourned at 10 P.M. by President Hambleton. Refreshments were served.

Respectfully submitted, DEWEY M. CARON, *Recording Secretary*.

785th Regular Meeting—February 4, 1971

The 785th regular meeting of the Entomological Society of Washington was called to order by president Edson J. Hambleton on February 4, 1971 at 8:00 P.M. in Room 43, USNM. Thirty-six members and sixteen guests were in attendance on a stormy evening. The minutes of the previous meeting were read and approved with a correction. President Hambleton opened the meeting by thanking those members who volunteered their services to the hospitality committee for a future meeting. He also requested that persons presenting notes and specimens at meeting prepare their remarks to aid the recording secretary, maintain accuracy and to help insure that meeting minute corrections are kept to a minimum.

The speaker for the evening, Dr. Donald Messersmith, Associate Professor of Entomology at the University of Maryland was introduced by President Hambleton. Dr. Messersmith presented a well illustrated account of his 1969 nature tour of Colombia, South America. Some of the 2000 plus specimens collected on the trip were demonstrated and several were projected on closed circuit television. Dr. Messersmith also demonstrated the use of the television for teaching purposes at the University.

Dr. Bickley presented the first note for the evening. He reported that J. B. Dimond has an interesting report entitled "The Periodical Literature Used by Entomologists" in the Bulletin of the Entomological Society of Canada 2(4):110–112, December 1970. The frequency of citation of periodicals may indicate those that are most used and probably the most important periodical resources in a given field. Dr. Dimond searched the reference lists in all papers published in the 1969 volumes of the Canadian Entomologist, the Journal of Economic Entomology and the Annals of the Entomological Society of America. There were 6,955 citations encompassing 770 periodicals. The journals just mentioned were cited most. In fourth and fifth places were Nature and the Journal of Insect Physiology. The Proceedings of the Entomological Society of Washington placed tenth.

R. I. Sailer next continued his note from the January meeting. Dr. Sailer reported that an adult tachinid fly identified by Sabrosky as *Tricopoda lanipes* emerged from the pupae January 28; the specimen was exhibited. The adult bug that served as host for this fly, *Acanthocephala terminalis* Dallas, remained alive. Both the host bug and the fly parasite have similar ranges according to Dr. Sailer; other species also serve as hosts for the fly.

Dr. R. Mitchell pointed out two different color patterns and color sequences of Monarch butterfly caterpillars. Although the larval patterns were different, the emerging adults appeared to represent just the single species *Danaus plexippus*. On close examination a Monarch chrysalis revealed a small fly standing on the chrysalis.

Frank Campbell offered a report on three past presidents and a new book. He complimented past President Helene Sollers-Riedel on having caused the complete list of past presidents of Ent. Soc. Wash. to be published on page 512 of the December 1970 Proceedings.

The three earliest living past presidents, with whom he had talked recently, can no longer attend meetings of the Society. He wanted to remind younger members of these distinguished retirees. They are as follows:

(1) *John E. Graf* (81), President 1929 and 1930.
Known in entomology for leadership in truck crop insect pest research in Bureau of Entomology, USDA.
Retired 1958 as Assit. Secretary, Smithsonian Institution.
Health fair, would welcome visitors at his D.C. residence.

(2) *Bennett A. Porter* (78), President 1935.
Known in entomology for leadership in fruit and vegetable insect pest research. Honorary member ESA.
Retired 1962 as Chief, Fruit and Vegetable Insect Research Branch, ERD, ARS.
Health fair, vision impaired, would welcome visitors at his Silver Spring residence.

(3) *Stanley B. Fracker* (81), President 1936.
Known in entomology for early research on Lepidoptera, later administration of plant quarantine and control activities. Moved away from entomology to high-level administration and foreign advisory assignments in the USDA and National Academy of Sciences.
Retired 1961 from NAS.
Health broken, he must receive care in a D.C. nursing home. Visiting not advisable.

Dr. Campbell also called attention to a new book, "Insect Ultrastructure," a 1970 report of a symposium of the Royal Entomological Society of London. It is well-illustrated with scanning and non-scanning electronmicrographs.

Dr. C. Sabrosky asked that members hold June 3 for the annual get together to be called an annual banquet.

Following introduction of guests including a number of Entomology students from Maryland the meeting was adjourned at 10 P.M. Refreshments were served.

Respectfully submitted, DEWEY M. CARON, *Recording Secretary.*

786th Regular Meeting—March 4, 1971

The 786th regular meeting of the Entomological Society of Washington was called to order by President Edson J. Hambleton on March 4, 1971 in Room 43, U.S.N.M. Thirty nine members and twenty guests were in attendance.

The meeting was opened with a call for the presentation of notes and exhibitions of specimens. Dr. W. W. Wirth exhibited and briefly discussed walking sticks parasitized by ceratopogonid midges. The "stick ticks" as they are called remain on the walking sticks until the eggs are fully developed.

With the arrival of the recording secretary and speaker the minutes of the previous meeting were read and approved. Three names were presented for membership. The proposed members were *Aubrey G. Scarbrough* of Towson State College, *Russell M. DeCoursey* of University of Connecticut and *Manya B. Stoetzel* of University of Maryland.

President Hambleton and Dr. Sabrosky provided information on an advance notices on an International Congress of Systematic and Evolutionary Biology. The meeting to take place in Boulder, Colorado is projected for 1973.

President Hambleton discussed the Society participation in 6 area High School Science fairs. Judges will be appointed to examine the entries and select those exhibits to be presented to the membership. President Hambleton also announced the Nominating Committee members and asked that members having suggestions for next years officers present them to the committee. The committee consists of A. B. Gurney, L. Davis and A. K. Burditt.

President Hambleton introduced the speaker, Dr. Carl W. Rettenmeyer. An abstract follows of his talk.

Adaptations of Arthropods for Living Among Army Ants.—Although army ants of the subfamily Dorylinae have a reputation as highly aggressive and carnivorous ants, they also have a greater number of arthropods living with them than any similar size group of ants. This apparent paradox can be partially explained by a combination of behavioral-ecological features of the army ants and numerous adaptations of the myrmecophiles or ant-guests. The Neotropical army ants have the following ecological characteristics: (1) very large colonies ranging from about 50,000 to over one million adults, (2) the food of the adults and larvae is almost completely arthropods, (3) broods are large and periodic or synchronized in age and development, (4) colonies are nomadic with most emigrations occurring when a colony has a brood of larvae, (5) worker ants are blind or can see only differences in light intensity, (6) chemical trails are followed whenever the ants leave the nest, (7) new colonies are found only by division of previous army ants colonies, and (8) most army ants species have a large geographical range.

The main evolutionary trends among the myrmecophilous arthropods primarily fall into two categories: (1) defensive adaptations to avoid attacks by their ant hosts, and (2) adaptations for emigrating with the ants. There is little evidence that any of the guests are beneficial to the ants. However, most guests have probably evolved from harmful predators to inquilines with decreasing effects on their hosts.—CARL W. RETTENMEYER.

Presentation of notes and exhibitions of specimens continued following questions for Dr. Rettenmeyer. Kellie O'Neill exhibited alligator weed thrips introduced into this country from Argentina and now used in Florida for control of alligator weed. Adult specimens were described and their life history outlined.

Miss Louise Russell exhibited a protective device for tiny pinned insects such as psyllids. The device devised by Mr. A. L. Capener consists of a gelatin capsule with block arranged in such a manner as to enclose the insect when complete yet provide adequate viewing of the specimen.

During introduction of guests, Dr. Carl B. Huffaker, of the University of California, spoke about some developments in Entomology. He announced a multidisciplinary approach to crop pests in the IBP. Six areas will receive attention to develop integrated control programs aimed at all pests in an effort to reduce the pesticide load. The six areas are cotton, soybeans, citrus, pome & stone fruits, alfalfa and pine forests. Dr. Huffaker also announced establishment of a training program and an international center of biological control with NSF & Ford Foundation monies. Two other subjects discussed were efforts to convert some of the military facilities of Pine Bluff, Ark. & Ft. Dietrich, Md. into laboratories to study the pathogens of insect pests and AID programs of integrated control in developing countries.

The meeting closed at 10 P.M. Refreshments were served.

Respectfully submitted, DEWEY M. CARON, *Recording Secretary.*

787th Regular Meeting—April 1, 1971

The 787th regular meeting of the Entomological Society of Washington was called to order by President Edson J. Hambleton on April Fool's Day in Room 43, USNM. Thirty four members and 19 guests were in attendance. Minutes were read and approved.

Dr. Wood announced that R. Gagné and T. Bissell comprise the remaining members of the program committee.

Dr. Sabrosky of the By-Laws committee distributed notification of proposed changes of By-Laws unanimously approved by the Executive committee. He explained the proposed changes and fielded questions on them.

Membership Chairman Rainwater presented three names for membership. They were *Mike L. Williams* of Maryland State Board of Agriculture, *George L. Godfrey* of Univ. of Illinois and *William L. Peters* of Florida A&M.

Dr. Sabrosky announced the annual dinner (banquet) June 3 at Interstate Inn. A buffet dinner is planned and will cost $5.75. Dr. Clifford Berg will address the group on snail killing flies; L. Davis will be toastmaster.

New member *Manya B. Stoetzel* was presented to the membership.

President Hambleton introduced the speaker for the evening, Dr. Jack Colvard Jones of the Entomology Department, University of Maryland. An abstract of his talk follows.

The Sexual Behavior of *Aedes aegypti* (L.).—A brief review of our knowledge concerning the sexual behavior of mosquitoes, with special reference to *A. aegypti*, was presented. The major topics included (1) the anatomy of the reproductive system, (2) changes in behavior with age of males and females, and (3) types of sexual behavior. The differences in findings obtained with forced mating and cage mating were contrasted.—J. C. JONES.

Mrs. Helen Sollers-Riedel announced passage of a birthday card for Mr. Fischer for his 93rd birthday. Interested persons were asked to sign.

Dr. Karl Krombein had a series of slides on the cicada emergence of 1970. The series depicted the emergence of the adult from the nymphal skin and the first two larval stages.

As evidence that it is still alive and thriving Dr. R. I. Sailer again exhibited the male *Acanthocephala terminalis* that he showed the Society at its Jan. 7, 1971 meeting. A tachinid, *Trichopoda lanipes* had issued from this correid bug on Jan.

5, 1971. Dr. Sailer hopes to determine whether the bug is reproductively functional and asked that anyone finding a female of this species make it available to him alive.

Dr. John Davidson displayed a copy of *Fauna, The Zoological Magazine*, a new magazine devoted to natural history. He especially drew attention to an article on blood sucking Malayan moths.

President Hambleton demonstrated a copy of "A List of the Aphids of District of Columbia, Maryland & Virginia" by society members Leonard and Bissell.

President Hambleton read a letter from W. Murdock of the Entomological Society of America regarding the Registry of Certified Entomologists. President Hambleton also read a notice regarding letters and a reception honoring the retirement of Dr. George Langford of Md. State Board of Agriculture.

Following introduction of guests and thanking of the refreshments committee the meeting adjourned at 9:50. Refreshments were served.

Respectfully submitted, DEWEY M. CARON, *Recording Secretary.*

788th Regular Meeting—May 6, 1971

The 788th regular meeting of the Entomological Society of Washington was called to order by President Edson J. Hambleton on May 6, 1971 in Room 43, USNM. Thirty-six members and 19 guests were in attendance. Minutes of the April meeting were read and approved.

Dr. Sabrosky on behalf of the By Laws Committee explained the proposed changes of the By Laws and the reasons for actions of the committee. It was moved and seconded that the proposed changes be voted on in total. Passed. After a discussion of other business it was moved that the By Law changes as presented at the last meeting be approved. Passed.

Dr. Sailer, representing membership Chairman Rainwater presented 3 names for membership. They were: *Anatoliy I. Smetnik*, Agricultural Attaché of the USSR Embassy in Washington, *Norman Lin*, Brooklyn, N.Y. and *Eric J. Kitely* of Quebec, Canada.

Dr. Sabrosky presented a pep talk for the annual banquet. Tickets, according to R. Gagné, ticket chairman, are now available at the announced ticket outlets.

President Hambleton introduced the 3 science fair winners who had brought their exhibits to the meeting. Mr. Steven Lee, an 8th grader at Kenmore Jr. High School, Arlington, was a northern Virginia winner. His exhibit was entitled "Butterflies and Moths." Mr. Lee explained his data collection and care of silkmoth cocoons. He also highlighted his exhibit that included native and exotic butterfly specimens and sections on protective coloration and the butterfly life cycle.

Wayne Spong, Jr., a 9th grader at Greenbelt Junior High was a Prince George's junior class winner. His exhibit entitled "A Study in Apiculture" was richly appointed with aspects of the life cycle of the bee and included an observation bee hive. Mr. Spong outlined the biology of the 3 castes and explained some of the features of his exhibit.

Richard L. Taylor, a 10th grader at Gwynn Park Senior High presented his exhibit entitled "The Interaction Between Fruit Flies." Mr. Taylor explained his experimental technique using a white eye mutant and wild type fruit flies *Drosophila melanogaster*. He discussed his results which favored the white eyed type when competition was present and offered a possible hypothesis. He also highlighted his exhibit.

President Hambleton presented all exhibitors with a hand lens and offered words of encouragement towards further educational development in science. All exhibits were viewed before and after the program by members and guests.

President Hambleton introduced the speaker for the evening Dr. James R. Brazzel of USDA, ARS. Dr. Brazzel spoke about the Pest Management Program. He discussed the background of the federal Pest Management Program and presented several aspects considered to be directly within Agriculture. He outlined the scouting programs on tobacco in North Carolina and cotton in Arizona that have been funded. He indicated some of the problems encountered and spoke of the future promise for the program.

Ted Bissell presented the first note of the evening passing a vial of thousands of maggots collected from oak willow catkins. He noted that this was the third year that thousands of the tiny insects had covered his car. He felt his car would not be adversely affected but wondered about the tree.

T. J. Spilman announced the passing of Mr. Warren S. Fisher. Mr. Fisher had received a birthday card signed by members at the April meeting and acknowledged the card in a beautiful handwritten card.

Following introduction of guests, including the families of the exhibitors, the meeting was adjourned at 9:45 P.M. Refreshments were served.

Respectfully submitted, DEWEY M. CARON, *Recording Secretary.*

789th Regular Meeting—June 3, 1971

The 789th regular meeting of the Entomological Society of Washington was the annual spring banquet. One hundred thirty-five members and guests gathered at the Interstate Inn in College Park, June 3 to enjoy an excellent buffet cocktail hour and dinner. Lou Davis served admirably as toastmaster.

Dr. Clifford O. Berg, Cornell University, presented the program feature with an illustrated talk on snail killing flies. Dr. Berg featured South American studies of life history and biology of the flies and spoke of the important aspect of control of the number one world health problem, Schistosomiasis.

One piece of business included the second reading of names for membership of *Anatoliy I. Smetnik*, *Norman Lin* and *Eric J. Kitely* and the first reading of *Bill Seal* of Plant Protection, ARS.

Information for Contributors

Publication in the Proceedings is reserved for members only. Publication of papers by non-members may be obtained after acceptance at a cost to the author of $25.00 per printed page. Regular papers are published in approximately the order that they are received. Manuscripts should not exceed 30 typewritten pages including illustrations (approx. 15 printed pages). Excess pages beyond 15 per article will be charged to the author at the rate of $25.00 per page. Papers of less than a printed page may be published as space is available at the end of longer articles.

Manuscripts for publication, proof and other editorial matters should be addressed to the *Editor* (for address, see inside front cover of this issue).

Typing—All manuscripts must be typed on bond paper with double-spacing and ample margins. Carbon copies or copies on paper larger than $8\frac{1}{2} \times 11$ inches are not acceptable. Do not use all capitals for any purpose. Underscore only where italics are intended in the body of the text, not in headings. Number all pages consecutively. References to footnotes in the text should be numbered consecutively and typed on a separate sheet.

First page—The page preceding the text of the manuscript should include (1) the complete title, (2) the order and family in parentheses, (3) the author's name or names, (4) the institution with city, state and zip code or the author's home city, state and zip code if not affiliated, (5) in the upper left hand corner, the complete name and address to which proof is to be sent.

Abstract—All manuscripts, including notes of one page or less, must be accompanied by an abstract suitable for publication. The abstract must be typed on a separate sheet following the title page, should be brief (not more than 3% of the original), and written in whole sentences, not telegraphic phrases.

Names and descriptions of organisms—The first mention of a plant or animal should include the full scientific name with the author of a zoological name *not* abbreviated. Descriptions of taxa should be in telegraphic style.

References—Citations in the text of papers longer than one printed page should be by author and date and should refer to a list of concluding REFERENCES listed alphabetically. See a recent issue of the Proceedings for style of references. In shorter articles, references to literature should be included in parentheses in the text.

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of the
ENTOMOLOGICAL SOCIETY of WASHINGTON

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OF WASHINGTON

ORGANIZED MARCH 12, 1884

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PROCEEDINGS OF THE

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Vol. 74 JUNE 1972 No. 2

NOTES ON SPECIES OF NORTH AMERICAN LEUCANIA WITH THE DESCRIPTION OF A NEW SPECIES

(LEPIDOPTERA: NOCTUIDAE: HADENINAE)[1]

JOHN G. FRANCLEMONT, *Department of Entomology, Cornell University, Ithaca, New York 14850*

ABSTRACT—*Leucania juncicola* Guenée, 1852, is placed as a synonym of *Leucania scirpicola* Guenée, 1852, and *Leucania adjuta* (Grote), 1874, heretofore regarded as a synonym of *L. juncicola*, is confirmed as a valid species. *Leucania* **infatuans** is described as a new species; in the past it had been confused with *L. adjuta* (*olim juncicola*).

When Kimball was working on the lepidoptera of Florida for the "Arthropods of Florida and Neighboring Land Areas," I furnished him with determinations in some groups; one of which was the genus *Leucania.* Since that time I have had occasion to review the identifications of some of the species, and in one instance, I have come to a different conclusion. At the time I first noticed that the "species" we were calling *Leucania juncicola* was actually two very distinct species, I thought that *juncicola* Guenée could be applied to one of the species and *adjuta* Grote to the other. This proves not to be possible because the name *juncicola* was misapplied by J. B. Smith.

Leucania adjuta (Grote)

Heliophila adjuta Grote, 1874. Bull. Buffalo Soc. Nat. Sci. 2:158. Type locality: "Alabama."

Following Smith, 1893, p. 188, this species was erroneously treated as a synonym of *Leucania juncicola* Guenée. Smith based his conclusions on a specimen for which Walker, 1856, p. 96, gave the data as, "*a.* United States. Presented by E. Doubleday, Esq." Walker only questionably determined the specimen as a variety of *juncicola.* Butler, 1890, p. 661, associated Grote's type of *adjuta* with the specimen that Walker had considered a possible variety of *juncicola*, and he wrote, "The true *juncicola* seems to be very closely allied to, if distinct from,

[1] Immediate publication secured by full payment of page charges—Editor.

L. scirpicola." Smith, during a visit to the British Museum, somehow concluded that the Doubleday specimen had been seen by Guenée, and he refers to it, 1893, p. 188, as "apparently determined by Guenée." Smith further states, "The specimen agrees well with the description [*juncicola*] and may, I think, be fairly considered as as representative of *juncicola* which, then, is the same as *adjuta.*" It is difficult to understand how Smith could have made this statement. He could not have made a critical comparison between the original description of *juncicola* and the species that he identified as *juncicola.* Hampson, 1905, p. 532, made no mention of the Doubleday specimen in his list of specimens of *Cirphis juncicola* in the British Museum (Natural History); however, he accepted the synonymy of *adjuta* with *juncicola.* As of this moment, I have not been able to trace the specimen, but Hampson may have moved it to the series of another species.

It is surprising that no worker in the past considered Butler's comment and made a study of Guenée's description of *juncicola* and specimens of the species identified as such. If they had, they would have realized that Guenée was too knowledgeable a lepidopterist to have described a species of the general appearance of *scirpicola* immediately after a species with a forewing pattern very similar to, almost identical with, that of *Leucania humidicola* Guenée, and to have said that that species, *scirpicola*, was extremely similar in markings to *juncicola.* ("Elle est extrèmement voisine de la *Juncicola* por les dessins; . . . .")

The characters given by Guenée in his description of *juncicola* and which preclude the application of that name to either the species identified as *adjuta* or the new species described herein are: 1) the color, yellowish-gray, color of dried reed ("gris-jaunâtre ou couleur de roseau desséché, ..."); the present species has the forewing similar to that of *pallens* and *humidicola*; 2) the fine black flecks (atoms); this species has no such flecking of black scales nor does the new species; 3) the median vein black; it is white with a brownish shade below in this species! 4) a small, oblong, white spot in the blackish shade; this species has a black dot at the end of the cell; 5) hindwing dirty white without border or dusky tint (even in the female); the photographs of the moths show that both *adjuta* and the new species have some of the veins of the hindwing infuscate, and the general color in the new species is pearly white and in *adjuta* light to dark fuscous, especially toward the outer margin; 6) two lateral lines of black scales on the ventral surface of the abdomen; there are no such lines in either *adjuta* or the new species. All the characters given by Guenée are present in the species identified as *scirpicola* by American workers.

Leucania adjuta occurs from northern Florida to eastern Texas and north to the Carolinas; it strays, at least, as far north as Cape Cod in the fall. I have taken it at Arlington, Virginia from the 31st of August to the first of November. In southern Alabama I took it from the 13th of March to the 16th of April in 1943 and in coastal South Carolina as early as the latter half of March.

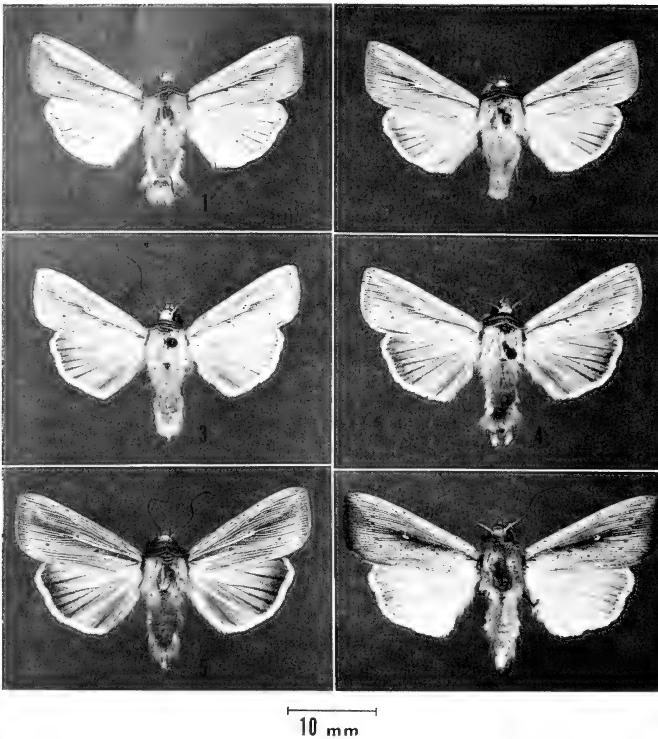
Leucania infatuans, n. sp.

Leucania juncicola Kimball (*nec Guenée*), 1965. The Lepidoptera of Florida, Arthropods of Florida and Neighboring Land Areas, 1: 91, pl. 12, fig. 11.

This species is very similar to, and closely related to, *Leucania humidicola* Guenée, 1852; it differs from that species by its larger size and the more or less evident marginal infuscation and the dark scales on the outerhalf of some of the veins of the hindwing. In the United States it has been confused with *adjuta*, but it differs from that species in the brighter tint of yellow of the forewing and the white ground color of the hindwing. In *adjuta* the ground color of the hindwing is distinctly fuscous, and the veins are more extensively dark scaled.

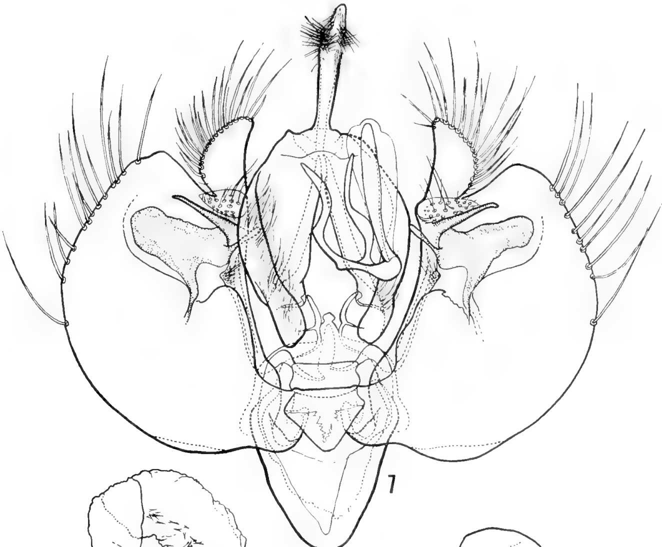
Description: Head with palpal segments one and two light brown on outer-side and with a heavy scattering of black scales, third segment black below, inner side whitish; front with a broad band of light brown scales on lower third, above this a band of whitish scales, then a narrow band of brown scales followed by a narrow band of yellowish scales; vertex yellow with brown scales between the antennae. Thorax with collar (patagia) yellow with four conspicuous lines of black scales tipped with white, lower most line least conspicuous and basally pinkish brown; behind collar a mid dorsal tuft of pinkish brown, white tipped scales; tegulae and disk of thorax yellow, former with a few black scales. Forewings light, straw yellow with some reddish brown reflections in some lights; t. p. line indicated on costa by black scales and at least by black scale dots on M_2 and Cu_2, often by vague indications of a few black scales on some of the other veins; median vein (Cu) white to end of cell, a brown shade with some conspicuous black scales below median vein, a black dot below median vein, a little beyond middle of cell, and another black dot at the end of the white line on the median vein; a vague dark shade from apex to end of cell at veins M_2, M_3, and Cu_1; terminal black dots between some of the veins; veins white with narrow lines of reddish brown scales on both sides. Hindwing somewhat hyaline, pearly white and sometimes with a slight dusky cast; a fuscous terminal line and black dots between the veins; at least some of the veins with dark scaling on the outer half. Lower surface of wings shining white; a black dot on costa at inception of t. p. line; disk of forewing light reddish; a blackish line below subcosta; terminal black dots between the veins on both forewing and hindwing.

Male genitalia as figured; similar to those of *humidicola*, but differing in the longer, more linear uncus and in the broader cucullus of the valve; the armature of the vesica very similar to *humidicola*, but differing in the greater number of cornuti in the two clusters of heavy cornuti. The male genitalia of *adjuta* have a long, linear cucullus and a subquadrate clasper plate instead of ligulate one; the vesica of *adjuta* is armed with only two or three stout cornuti with blunt, rounded apices.



FIGS. 1–2. *Leucania infatuans*, n. sp.: 1, HOLOTYPE, male, Oneco, Manatee Co., Florida, 21 March 1957, J. G. Franclemont (Franclemont Collection); 2, paratype, female, same data as holotype. Figs. 3–5. *L. adjuta* Grote: 3, male, Camp Rucker, Ozark, Alabama, 16 April 1943, J. G. Franclemont (Franclemont Collection); 4, male, Arlington, Virginia, 19 October 1950, J. G. Franclemont (Franclemont Collection); 5, male, Wedge Plantation, McCellanville, Charleston Co., South Carolina, 12 October 1968, reared ex ovo, J. G. Franclemont (Franclemont Collection). Fig. 6. *L. scirpicola* Guenée, male, Oneco, Manatee Co., Florida, 20 March 1955, J. G. Franclemont (Franclemont Collection).

Female genitalia of typical form for the genus; similar to *humidicola*, but with the ductus bursae two and one-half times as long as in that species and with the appendix bursae more massive. In *adjuta* the ductus bursae is about two-thirds as long as that in *infatuans* and the appendix bursae arises from just below the middle of the ductus bursae; both ductus bursae and appendix bursae less massive than in *infatuans*.



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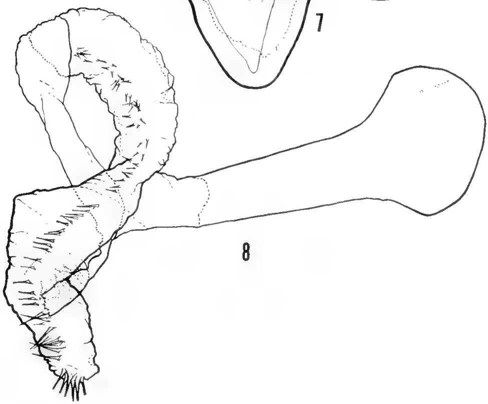

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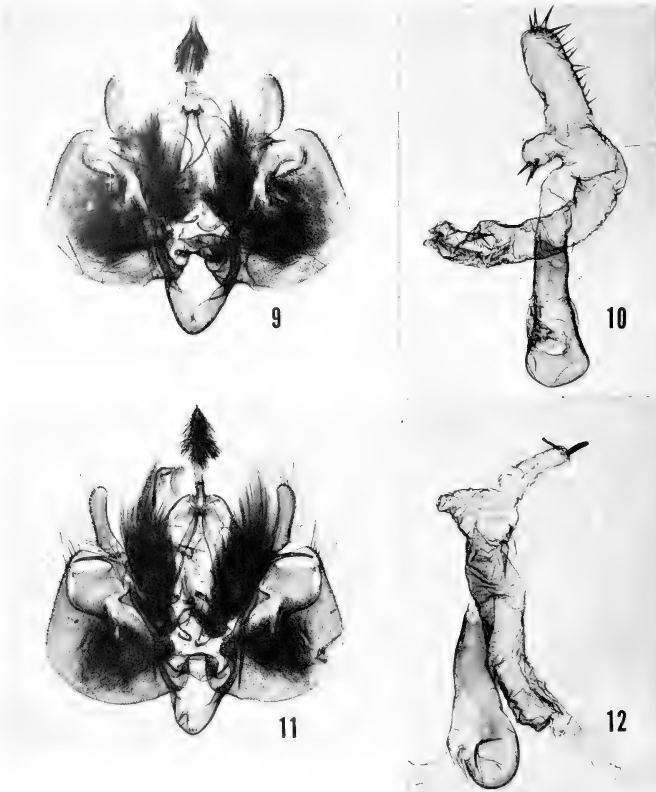
Figs. 7–8. *Leucania infatuans*, n. sp.: 7, male genitalia with aedoeagus removed, Oneco, Manatee Co., Florida, 22 May 1953, reared ex ovo, J. G. Franclemont, slide JGF 3508; 8, aedoeagus of male genitalia, slide JGF 3508.

TYPE: Male. Oneco, Manatee County, Florida, 21 March 1957, J. G. Franclemont (Franclemont Collection).

PARATYPES. 27 males and 41 females. Oneco, Manatee County, Florida, 21 March–4 April, 1953–1957, J. G. Franclemont. 31 males



FIGS. 9–10. *Leucania humidicola* Guenée: 9, male genitalia with aedoeagus removed, Moengo, Boven, Cottica R., Surinam, May 14, 1927, Cornell Univ. Lot 760 Sub 49, slide JGF C625 (Cornell University Collection); 10, aedoeagus of male genitalia, slide JGF C625. Figs. 11–12. *L. adjuta* Grote: 11, male genitalia with aedoeagus removed, Camp Rucker, Ozark, Alabama, 15 March 1943, J. G. Franclemont, slide JGF 2430; 12, aedoeagus of male genitalia, slide JGF 2430.

and 27 females. Oneco, Manatee County, Florida, 19–25 May, 1953. Reared from ova, larvae fed on *Dactylis glomerata* L., J. G. Franclemont (Franclemont Collection). Paratypes will be distributed to other collections.

Other specimens are before me from as far south as Florida City, Dade County, Florida and as far north as Elfers, Pasco County, Florida. The species appears to be limited to the southern two-thirds of peninsular Florida.

Leucania scirpicola Guenée

Leucania scirpicola Guenée, 1852. Histoire Naturelle des Insectes, Species Général des Lépidoptères, vol. 5 (Noctuélites vol. 1), p. 84.
Type locality: "Floride. Coll. Doubleday. Amérique boréale. Coll. Bdv. Deux ♂."

Leucania juncicola Guenée, 1852. Histoire Naturelle des Insectes, Species Général des Lépidoptères, vol. 5 (Noctuélites, vol. 1), p. 83. NEW SYNONYM.
Type locality: "Amérique septentrionale. Coll. Bdv. Une ♀."

Leucania pendens Smith, 1905. Can. Ent. 37:66.
Type locality: "Chokaloskee, Florida."

Leucania calpota Smith, 1908. Jour. New York Ent. Soc. 16:95.
Type locality: "Harris County, Texas."

The type of *Leucania juncicola* is apparently lost. There is no record that it was present in the Boisduval collection when Charles Oberthür obtained that collection, and it was not in the material that William Barnes purchased from the Charles Oberthür estate.

A careful study of the original description of *L. juncicola*, see the comments under *L. adjuta*, proves that *juncicola* is the female sex of *scirpicola*, described from the male sex only. The species is moderately variable. The forewing color may be dark and intense or pale; in those specimens with the forewings light in color, the fringe is almost devoid of dark scales. The hindwings may show a uniform ground with almost no indication of dark shading toward the outer margin.

Although *Leucania juncicola* has page precedence, I am designating it a junior synonym of *Leucania scirpicola* because it would cause undue confusion to change the name from one species to another.

The drawings are by Mrs. Margaret Menadue, and the photographs are by the author.

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TERRITORIAL BEHAVIOR AMONG MALES OF THE SOCIAL WASP POLISTES EXCLAMANS VIERECK

(HYMENOPTERA: VESPIDAE)

NORMAN LIN, *225 Foster Ave., Brooklyn, New York 11214*

ABSTRACT—Territoriality among males is described in *Polistes exclamans* Viereck. Such behavior has apparently been previously unknown in social wasps. Territories are set up on sides of buildings in the fall. During this time of year Mendelian populations are formed and mating occurs. Territoriality in *P. exclamans* probably functions in increasing efficiency in mating. Aggregating probably maximizes genetic diversity.

Although territorial behavior has been noted among males of solitary wasps such as the genera *Sphecius*, *Tachytes* (Lin, 1963), *Astata* (Minkiewicz, 1934), *Stictia* (Evans, 1966), and *Tachysphex* (Kurczewski, 1966), such behavior as far as I could determine has not previously been noted among social wasps. Territorial behavior does occur among males of the subsocial carpenter bees *Xylocopa appendiculata circumvolans* Smith (Watanabe, (1958) and *X. virginica virginica* (L.) (personal observation) and among males of social bumblebees in the genus *Bombus* (Dodson, 1962; Free and Butler, 1959).

Territory is defined in this paper as a defended area. The present observations of territorial behavior in a social wasp are but one more case of such behavior in Hymenoptera. Numerous descriptions of mating and other behavior in the literature on Hymenoptera suggest that territorial behavior may be involved and it appears that such behavior will prove to be common in this group.

Data for the following study were gathered in Lawrence, Kansas, on October 9, 1962, October 25–26, 1963, and November 6–10, 1963. Specimens of *Polistes* were observed on and flying about three buildings, the two closest buildings being nearly one-half mile apart. Nearly all wasps were located on and in front of south facing walls which were in the sun and received the most warmth. On each of eight days in which *P. exclamans* Viereck (det. H. E. Evans) was observed, it was warm and sunny; temperatures obtained from the Lawrence weather station ranged from 68°F. to 86°F. during the periods of observation. Undoubtedly temperatures in the sun in front of buildings were greater. According to Eickwort (1969), males and future queens of *P. exclamans* emerge in the autumn about the same time as the above observations; she collected nests containing both sexes during September and October.

Territorial activity was noted on seven days between 1:00 and 4:00 PM. On the one occasion that wasps were found during morning hours, territorial behavior was not observed.

Numbers of wasps varied from 200 or more, to less than five. Aggregations were usually mixed, consisting of males of *P. exclamans* and *P. annularis* L. (det. H. E. Evans), the latter usually in considerably smaller numbers (see Table 1). All wasps in the aggregations were apparently engaging in territorial behavior. Territoriality was a form of arena behavior in which aggregated individuals maintained small territories or courts. Territorial Hymenoptera manifesting arena behavior appear to be relatively common. Such is the case in *Sphecius* (Lin 1963), *Tachytes* (Lin and Michener, in press) and various other Hymenoptera. *P. annularis* was observed at least once in the aggregation about each building. The limited amount of data suggest that numbers of wasps in these aggregations tend to decrease from about mid October to mid November (Table 1). Such decrease is not unexpected since males are known to die off at this time of year (Michener and Michener, 1951; Yoshikawa, 1963). Rau and Rau (1918) observed a mixed aggregation of males of *P. annularis* and queens of *P. rubiginosus* Lepeletier on a sunny afternoon on 13 October, 1915, which seemingly were engaged in behavior of the sort described in this paper. These wasps (approximately 25 in number) also confined their activities to a sunny south wall.

Two building were visited by the observer almost daily in 1962 and 1963 but wasps were only noticed under conditions indicated. The data suggest that flying of wasps about sunny sides of buildings in October and November, and the showing of territorial behavior by males, is primarily an afternoon activity occurring on warm sunny days.

Territorial Sites and Perching Behavior

Males flew about and perched on walls of buildings, seldom on horizontal surfaces. Perching males form approximately a 45° angle with the surface, head upward. Close examination of over 50 wasps revealed that the same individuals continually returned to specific locations for perching. Though wasps were not marked, flights away from and back to territories were typically short and consequently easily followed by the observer. Wasps leaving their perches were usually back within seconds. Wasps usually left to chase passing conspecific males; however, "spontaneous" flights with no apparent external flight stimulus also occurred. Typical male behavior may be illustrated by following a particular male. Wasp 1 had a conspicuous perch, a raised disk about three-quarters of an inch in diameter, part of a stained glass window of a church. This wasp was observed on 10/9/62 between 2:10 and 2:30 PM, and presumably the same wasp was observed between 3:05 and 4:00 PM. In these intervals wasp 1 left its perch and returned more than 60 times (about 20–40 times between 2:10 and 2:30 PM and at least 40 times between 3:05 and 4:00

Table 1. The numbers of males of *P. exclamans* and *P. annularis* observed and the conditions under which they were found.

Date	Time	Temp.	Building	*P. exclamans*	*P. annularis*
10/9/62	2:10– 2:30				
	3:05– 4:00	86°	1	200–250	6–10
10/25/63	1:30– 2:40	78°	2	25–30	0
10/26/63	10:20–10:35	72°	2	3	2
11/6/63	1:00– 2:15	68°	2	3–5	0
11/7/63	3:20– 3:57	69°–70°	2	2–4	1 or 2
11/8/63	3:10– 3:20	69°–70°	3	ca. 6	ca. 3
11/9/63	3:00– 3:21	69°	3	10–15	1
11/9/63	3:27– 3:50	68°	2	ca. 4	0
11/10/63	2:30– 2:48	68°	2	ca. 6	1 or 2

PM). Data on other territories, primarily with conspicious perches, are shown in Table 2.

Perching next to perches as in *Sphecius* (Lin, 1963) or *Tachytes* (Lin 1963; Lin and Michener, in press) was also common. Wasp 1 occasionally perched as far as ten inches from its perch. About six attempts each were made to capture wasps 1 and 2 while on their perches, and after each attempt except the last, they returned to their perches.

Territorial Aggressive Behavior

The perching owner responds readily to intruders or potential intruders. Intention movements in response to intruders (*P. exclamans* and *P. annularis*) consist of a slight and rapid lunge of the body at the intruder. These apparently aggressive movements frequently percede aggressive flight at intruders; however, this is not necessarily the case, since intruders often fail to enter territories. A distance greater than 18 inches always appeared to be outside the territory. On several occasions when wasp 1 perched about ten inches from its perch, it showed no reactions to wasps flying closer to its perch. Chases usually occurred when intruders were about 18 inches or less from owners. Sometimes intruders got within several inches of owners before being pursued. These situations arose when owners were seemingly not at first in position to observe intruders. These data suggest that arenas were sometimes smaller than 20 and usually no larger than 36 inches in diameter. *P. exclamans* maintained aggressive pursuit as far as six feet, but aggressiveness could only be evoked in the considerably smaller area of the arena. In *S. speciosus* (Drury) aggressiveness could be maintained for distances greater than 75 feet. The cicada killers' territory was sometimes as large as 16 feet in length and six feet in width.

Aggressive flight is readily recognized because territorial males fly directly at intruders. This flight terminates in several possible responses:

Unsuccessful pursuit: The owner flies after the intruder, does not gain on it sufficiently to come within striking distance, and returns to the territory. This reaction was directed against conspecific males and males of *P. annularis*.

Butting: The owner bangs into the intruder, then returns to the territory. Butting occurred when *P. annularis* was attacked.

Grappling: Grappling occurred when conspecific males were involved. Locked together, they either separated almost immediately in their original location, fell nearly to the ground and separated, or fell to the ground and separated frequently after a few seconds of combat. Two males which presumably had grappled were found wrestling on the grass adjacent to the building and they continued wrestling for about 45 seconds when they were collected. One grappling pair fell to a window ledge while wrestling. They separated almost immediately, but the owner flew back to the intruder on the ledge and they again wrestled for about a second. A third pair also fought on the ground for a number of seconds. Of 22–27 grapples observed, six resulted in the pair falling to the ground. Regrappling occurs occasionally; otherwise one or both males return to their particular territorial perch, or one pursues the other briefly and then one or both return to their perch.

Aggressive conspecific males flew directly at the owner and were met in a similarly aggressive manner by the owner. Such wasps always grappled when they met, and were not observed to circle each other and fly upward together prior to grappling as was sometimes the case in *Sphecius* (Lin, 1963).

Non-aggressive conspecific intruders were recognized by their flight which was not directed at the owner of the territory. In most cases (47), such intruders were unsuccessfully pursued. Butting was observed once and grappling twice. The lone occurrence of butting appeared to be an aborted grapple; the intruder was caught when flying generally toward the territory. In the cicada killer (Lin, 1963), that butting which appeared to be a consequence of aborted grappling almost always occurred when the intruding cicada killer was non-aggressive, presumably because it is harder for the wasps to lock together when one is "trying" to escape. Unsuccessful pursuits ranged from six inches to six feet. Most unsuccessful pursuits were about 12 inches. Presumably the reason why unsucessful pursuit is so common is that one wasp cannot fly appreciably faster than another.

Non-aggressive *P. annularis* males flying through territories of *P. exclamans* males were either unsuccessfully pursued or if contact was

Table 2. The tendency of individual males of *P. exclamans* to return to a particular territory and a particular territorial perch.

Date	Wasp	Building	Territorial perch	* Number of Observed Perchings
10/9/62	1	1	Three quarter inch circular disk	More than 60
10/9/62	2	1	Small cavity in wall	52
10/9/62	3	1	Localized portion of wall	Many times**
10/9/62	4	1	Localized portion of wall	Many times** 73
10/25/63	5	2	Horizonal surface of a door handle	Many times**
11/6/63	6	2	Window ledge	Many times**
11/7/63	7	2	Light bulb	
11/7/63	8	2	Window	About 50 times
11/9/63	9	3	Window	32

* The total number of perchings was doubtless greater, since the period of observation of any individual was always limited.

** 40 times or more.

made, *P. annularis* was butted. Butting seemed "deliberate," unlike in the case of a conspecific. *P. exclamans* males were not observed to make any attempt to grapple with *P. annularis* males. Possibly only visual or chemical identification of conspecific males release grappling behavior in males of *P. exclamans*. Similar behavior was observed in cicada killers which never were observed to attempt grappling with other species including an aggressive *Tachytes distinctus* Smith. Aggressive contacts between these two wasps consisted of mutual butting (Lin, 1963). *T. distinctus* (Lin and Michener, in press) is the same with regard to butting and grappling.

The relative frequencies of the different end-responses for encounters involving non-aggressive conspecific males of *S. speciosus* and *P. exclamans* were nearly identical, and the relative frequencies of the end-responses for encounters involving aggressive conspecific males were the same in both species, with 100% of the responses falling in the same category (Table 3). Without exception, both species showed the same terminating response or responses for the two comparable aggressive situations.

Sometimes a wasp pounces on a perching territory owner, quickly flies off, or is chased off with the owner in pursuit. A *P. exclamans* owner was pounced on about three times by conspecifics. A *P. annularis* pounced on a *P. exclamans* two times within a minute. Sometimes a territory owner pounces on a perching wasp seemingly not an owner, at least in the area where it was attacked. A *P. exclamans* owner returned to pounce on a conspecific wasp which it had just left on a window ledge after grappling and they wrestled again. A *P. exclamans* owner pounced on a *P. annularis* which had just landed in the former's territory, and then chased the *P. annularis*. The owner then returned to its perch and repeated the previous behavior when it encountered a perching conspecific male in its territory. Owners were never observed to yield their perch to aggressive intruders. Both types of pouncing situations occur among cicada killers (Lin, personal observation).

There is some evidence that the males of *P. annularis* are territorial. One male *P. annularis* landed a number of times at a localized perch next to a pipe on the side of one of the buildings. Males of *P. exclamans* pounced on the *P. annularis* about five times and the *P. annularis* chased them each time and then returned to its perch. The *P. annularis* also chased them when they came close.

Functions of Territory in **Polistes**

Although no data were gathered on mating behavior in *P. exclamans*, indirect evidence indicates that the territory probably functions in increasing efficiency in mating as in *S. speciosus* (Lin, 1963, 1966). Territoriality in *P. exclamans* occurs in October and November during that relatively small portion of the seasonal cycle when typical Mendelian populations are formed and mating is possible, i.e. when reproductive females and males representing more than one colony make their appearance, congregate together, and reproduce. Males from a given colony range from 13 to 39 (Eickwort, 1969). Even if all the males of various colonies were present on 10/9/62, apparently more than 10 colonies would have been represented. This species is known for its large sibling groups. According to Yoshikawa (1963), mating behavior in *Polistes* is usually seen in early November. The above reproductive stage of *Polistes* is essentially the condition found during a major part of the adult seasonal cycle of the cicada killer and many nest aggregating wasps and bees concomitant with which is the occurrence of territoriality.

The territory perhaps functions by spacing males, thereby maximizing encounters between sexually responsive males and females which also favors early copulation. Spacing perhaps also reduces interference by superfluous males during precopulatory behavior. A conspicuous territoral perch probably provides an obvious referent for the owner, and may thereby facilitate rapid learning of territory and boundaries.

The establishment of Mendelian populations by aggregation of

Table 3. The relative frequencies of the different end-responses in the different types of aggressive situations for *P. exclamans* (1962 and 1963), and *S. speciosus* (1958 and 1959). Data on *S. speciosus* was taken from Lin (1963).

Intruder	Total Encounters	Unsuccessful Pursuit	Treat	Butting	Grappling
Non-aggressive *P. exclamans* males	50	94% (47)	0% (0)	2% (1)	4% (2)
Aggressive *P. exclamans* males	4	0% (0)	0% (0)	0% (0)	100% (4)
Non-aggressive *P. annularis* males	11	36% (4)	0% (0)	64% (7)	0% (0)
Non-aggressive *S. speciosus* males	70	85% (60)	0% (0)	5% (4)	8% (6)
Aggressive *S. speciosus* males	22	0% (0)	0% (0)	0% (0)	100% (22)
Other non-aggressive insects	34	58% (20)	35% (12)	5% (2)	0% (0)

Polistes males and queens from different nests, largely insures that each queen will mate, and diminishes the tendency toward inbreeding. Mechanisms which preserve and augment heterozygosity seem to be particularly important in organisms with male haploidy.

Acknowledgments

I want to thank Drs. H. E. Evans and E. O. Wilson for critically reading the manuscript, and Dr. Kennith Armitage for his assistance in obtaining the Lawrence weather records.

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SWEETOLETHAEUS, A NEW GENUS OF LETHAEINI FROM SOUTH AFRICA, WITH THE DESCRIPTION OF TWO NEW SPECIES, ONE FROM TERMITE NESTS

(HEMIPTERA: LYGAEIDAE)[1]

JAMES A. SLATER, *Section of Systematic and Evolutionary Biology, Biological Sciences Group, University of Connecticut, Storrs, Connecticut 06268*

ABSTRACT—A new genus, **Sweetolethaeus**, is described in the lygaeid tribe Lethaeini. Two new species **S. macchiaensis** (type species) and **S. termiticolus**, both from South Africa, are described. Descriptions of nymphs of both species are included. S. *termiticolus* was taken in a nest of the termite *Trinervitermes trinervoides* and shows morphological features believed to be associated with this habitat.

When I published my study of South African Lygaeidae in 1964 I had before me three specimens of a small lethaeine from the Brinck-Rudebeck expeditions which I was unable to place taxonomically. The extensive collections by my colleague Dr. M. H. Sweet in the southwestern Cape Province in 1967 revealed this to be a common species in the area.

Subsequently Dr. William Coaton placed in my hands for study a series of specimens taken in a mound of the termite *Trinervitermes trinervoides* (Sjöst.) at Phillipstown, Cape Province which prove to be congeneric with the species noted above. These two species are undescribed and represent a new genus described below. All measurements are in millimeters.

[1] This work was supported by National Science Foundation Grant GB7968.

Sweetolethaeus n. gen.

Head, pronotum and scutellum with small discrete punctures, intervening areas smooth and non-rugulose, area between punctures wider than diameter of punctures; punctures of clavus and corium conspicuously larger than those of head, pronotum and scutellum; surface subshining, not polished, a pair of widely separated ovoid iridescent areas present on head basally; head strongly convex, tylus little exceeding juga, latter carinate laterally; eyes small, in contact with anterior margin of pronotum, ocelli minute, placed much closer to eyes than to one another; bucculae short, ovoid; antennae slender, segments 1 and 2 terete, 3 and 4 narrowly fusiform; pronotum subquadrate, lateral margins distinctly explanate, more strongly so on anterior ½, transverse impression absent, no anterior "collar" area present; posterior margin distinctly concave; scutellum flat, lacking a median carina; clavus with 4 rows of punctures, lateral corial margins explanate, apical margin convex, hemelytra lacking closed basal cells, the next to mesal vein strongly sinuate, membrane with a distinct transverse crease near base; posterior margin of ♂ abdominal sternum 7 lacking spines; fore femora moderately incrassate with 2–4 sharp spines below; posterior margin of metapleuron angulate; scent gland auricle short and bluntly rounded.

Type species: *Sweetolethaeus macchiaensis*, n. sp.

Sweetolethaeus is quite closely related to *Noteolethaeus* Woodward and Slater, especially to *N. leeui* Woodward and Slater, despite the considerable difference in superficial appearance. The two taxa agree in possessing a strongly convex head with minute ocelli, in the lack of a distinct anterior pronotal collar (vaguely developed in *Noteolethaeus*), in having an explanate lateral pronotal margin, a concave posterior pronotal margin, a convex apical corial margin, in lacking closed cells in the membrane of the fore wing, in having a small lobate scent gland auricle, similar spines on the fore femora and fusiform third and fourth antennal segments. The two genera are readily separable by (1) the smooth dorsal surface of *Sweetolethaeus* with the small punctures (extremely reduced in *termiticolus*) well separated from one another whereas in *Noteolethaeus* the punctures are coarse, closely set, with the intervening areas irregularly raised to give a strongly rugose appearance to the dorsal surface, (2) the four distinct rows of claval punctures in *Sweetolethaeus* (these sometimes irregular in *termiticolus*), (3) lack of a transverse pronotal impression in *Sweetolethaeus* as well as (4) less strongly elevated corial veins (5) more strongly lobate bucculae and (6) very feebly sinuate lateral corial margins.

Sweetolethaeus is a typical member of the Lethaeini, possessing all of the characteristics used by Ashlock (1964) in his redefinition and limitation of the tribe.

From such related genera as *Lethaeus* Dallas, *Neolethaeus* Distant and *Lophoraglius* Wagner the present genus may be separated by the lack of closed cells in the wing membrane and the concave posterior

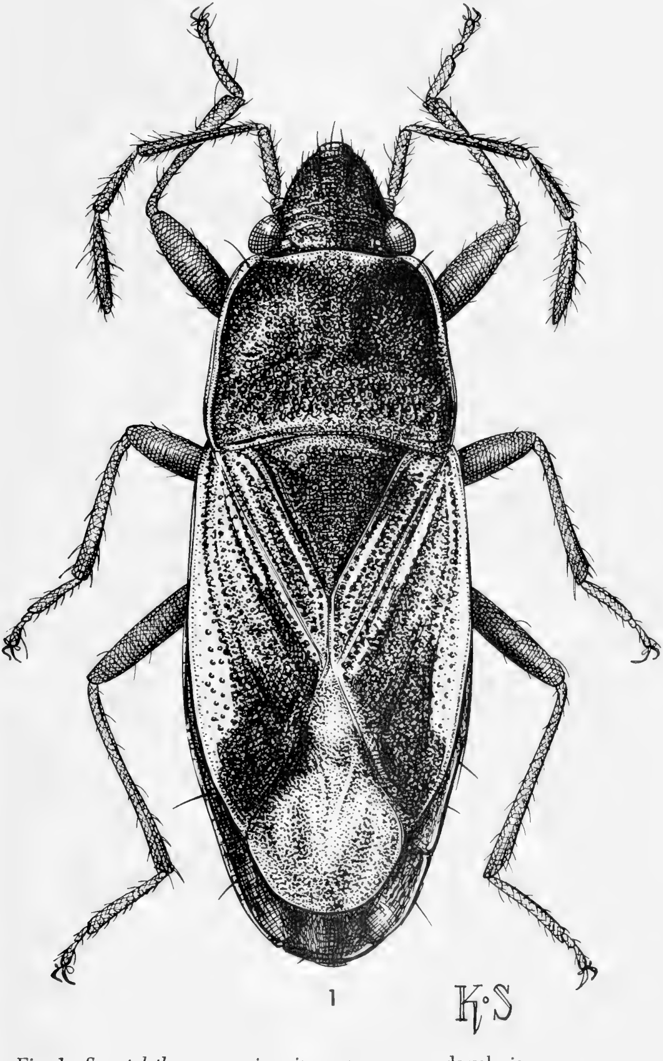


Fig. 1. *Sweetolethaeus macciaensis*, n. gen., n. sp., dorsal view.

pronotal margin. In addition it differs from *Lophoraglius* by lacking a distinct anterior pronotal collar, a transverse pronotal impression, a polished dorsal surface and by the minute ocelli; from *Neolethaeus* by the pronotal collar, by the lack of spinose projections on the posterior margin of abdominal sternum seven in males, and the presence of at most a single distal spine on the posterior femora; and from *Lethaeus* by the explanate lateral pronotal margin and presence of a large seta near the antero-lateral pronotal margins.

Sweetolethaeus bears some habitus resemblance to *Lamproceps* Reuter, but is not actually closely related. It may readily be distinguished by the presence of four rather than three rows of claval punctures, the distinctly explanate lateral pronotal margins, lack of elongate upstanding hairs on the dorsal surface, pronotal punctures present and as large as those on scutellum (in *Lamproceps* the pronotum is almost impunctate and the scutellum has large conspicuous punctures over the entire surface), a rounded lobate metathoracic scent gland auricle (rather than posteriorly hookshaped), and a concave rather than straight posterior pronotal margin.

This genus is named in honor of Dr. Merrill H. Sweet of Texas A. & M. University in recognition of his major contributions to the systematics and ecology of the Rhyparochrominae.

Key to the Species of **Sweetolethaeus**

1. An elongate seta present near each antero-lateral pronotal angle; 3–4 stout spines present on 1st antennal segment; conspicuous posterior tibial spines present along entire shaft .... *macchiaensis*
   Elongate seta absent near each antero-lateral pronotal angle; 1st antennal segment lacking stout spines; conspicuous hind tibial spines restricted to distal ⅕ of shaft .... *termiticolus*

Sweetolethaeus macchiaensis, n. sp.
(Fig. 1)

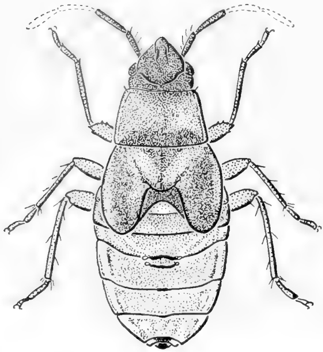
Elliptical; head, pronotum and scutellum dark brown to black, apex of tylus, anterior margin of pronotum on either side of midline and anterior ½ of explanate lateral pronotal margin contrastingly testaceous; hemelytra striped and mottled with dark brown and testaceous markings (see fig. 1); ventral and pleural surfaces nearly uniformly dark chocolate brown; femora dark red-brown, strongly contrasting with bright yellow tibiae and tarsi; antennal segments 1 and 2 reddish brown, 3 and 4 paler yellowish brown; body surface appearing nearly glabrous (extremely short minute hairs present in punctures), a single elongate seta present near anterior end of pronotal explanate margin; head, pronotum and scutellum nearly evenly and finely punctate, area of calli almost completely impunctate, clavus with 4 rows of punctures, the median rows placed closer to one another than to lateral row and coalescing anteriorly, corium with a closely set row of punctures adjacent to claval suture and laterad of cubital and radial veins, irregularly punctate over remainder of corial surface.

Head short, broad, slightly declivent, anteriorly broadly rounded, eyes sessile, head width less than width across anterior pronotal margin, bucculae visible from above, tylus with 3 distinct anteriorly directed setae, length head .40, width .76, interocular space .50; pronotum slightly narrowed anteriorly, lateral margins feebly sinuate, explanate margins more broadly developed on anterior ½, disc nearly flat, length pronotum .74, width 1.28; scutellum large, flat, lacking a median elevation, length scutellum .82, width .80; claval commissure much shorter than scutellar length (length .40), corium very slightly convex to level of posterior end of claval commissure, hence tapering distad, membrane attaining apex of abdomen, distance apex clavus—apex corium .72, apex corium—apex abdomen .50; thoracic pleura and sterna subshining, evaporative area large, occupying mesal (ventral) ⅔ of metapleuron with dorsal margin evenly truncate and extending onto posterior area of mesopleuron to acetabular fracture; fore femora moderately incrassate, armed below on distal ⅓ with 4 spines, the 3 distal spines short, sharp and set close to end of femora, hind femora with a single small spine below near distal end, hind tibiae with sharp spines present along entire shaft; bucculae large, short and strongly lobate, not extending nearly to antennal bases, produced considerably ventrad of labium; labium extending well between mesocoxae, length labial segments I .50, II .40, III .33, IV .34; antennae slender, segments 1 and 2 terete, 3 and 4 narrowly fusiform, segment 1 bearing 3–4 long sharp spines, length antennal segments I .32, II .56, III .40, IV .46; total length 3.48.

Holotype: ♂, REPUBLIC OF SOUTH AFRICA: *Cape Province*: Kirstenbosch Gardens, Cape Town, 29 January 1968 (J. A. & S. Slater, T. Schuh, M. H. Sweet). In National Collection of Insects, Pretoria.

Paratypes: REPUBLIC OF SOUTH AFRICA: *Cape Province*: 25 ♂, 13 ♀ same data as holotype Nos. 19, 21—11 ♂, 9 ♀ Hermanus, Feb. 1, 1968 (S.S.S.S.)[2] No. 167—1 ♂, 1 ♀ Hermanus, Fernkloof Nat. Res., Feb. 3, 1968 (S.S.S.S.)—1 ♀ Hermanus Lagoon, 20.XII.1950 (Brinck & Rudebeck) Loc. No. 91—7 ♂, 1 ♀ 2 mi. S. Goukamma, Knysna, Feb. 8, 1968 (S.S.S.S.) No. 184—3 ♂, 7 ♀ Gydo Pass, 10 mi. N. Ceres, El. 3340′ (M.H.S.)[3] No. 39—1 ♂ Cape Pt. Nat. Res., Cp. Point, Sept. 15, 1967 (M.H.S.) No. 3—3 ♂, 10 ♀ same locality, Jan. 30, 1968 (S.S.S.S.) No. 96—1 ♂ same locality, 7 mi. N. Cape Point, El. 450′, Oct. 11, 1967 (M.H.S.) No. 26—7 ♂, 7 ♀ Noordhoek Beach, Cape Peninsula, Jan. 23, 1968 (S.S.S.S.)—1 ♀ Bains Kloof Pass, Summit, Jan. 21, 1968 (S.S.S.S.)—1 ♀ 6 mi. E. Plettenberg Bay, El. 500′, Feb. 12–13, 1968 (S.S.S.S.)—1 ♀ Grootvatersbosch For. Res. 14 mi. N. Heidelberg, Feb. 5, 1968 (S.S.S.S.)—1 ♀ Algoa Bay, Capland, Oct. 27, 1868 (Dr. Brauns)—1 ♂ Oude Kraal, 20.X.1950 (Brinck & Rudebeck) Loc. No. 11—1 ♂ Signal Hill, El. 1100′, Cape Penin., 9 Oct. 1967 (M.H.S.) No. 24—6 ♂, 5 ♀ Cape Pt. Nature Reserve, 3 Dec., 1967 (M.H.S.) Nos. 96, 98—2 ♂, 3 ♀ Kirstenbosch Bot. Garden, 29 Sept., 1967 (M.H.S.) Nos. 19, 21—11 ♂, 12 ♀ same locality, El. 400′,

[2] J. A. and S. Slater, T. Schuh, M. H. Sweet.
[3] M. H. Sweet.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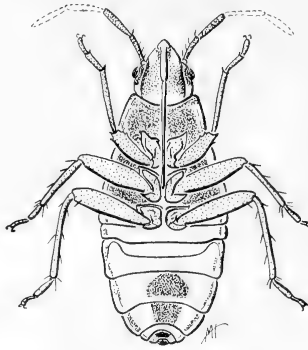
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Figs. 2–3. *Sweetolethaeus macchiaensis*, n. gen., n. sp., fifth instar nymph: 2, dorsal view; 3, ventral view.

Table Mt. W. Slope, Dec. 6, 1967 (M.H.S.) Nos. 101, 102— 12 ♂, 10 ♀ Muizenberg. Mt., El. 500′, Cape Penin. 9–13 Nov., 1967 (M.H.S.) No. 71—1 ♂ Kirstenbosch, Skeleton Gorge, El. 1000′, Table Mt., Oct. 30, 1967 (M.H.S.) No. 54—1 ♂, 1 ♀ Constantia, Cape Penin., 29 Sept., 1967 (M.H.S.) No. 18—1 ♂, 1 ♀ 13 mi. S. Oudtshoorn, E. 1300′, 20 Nov., 1967 (M.H.S.) No. 85—1 ♂ East Knysna Head, El. 200′, 22 Nov., 1967 (M.H.S.) No. 90—3 ♂ Saldanha Beach, 3 Nov., 1967 (M.H.S.) No. 57—1 ♂ just North Ceres, El. 1400′, 20 Oct., 1967 (M.H.S.) No. 42—2 ♂, 3 ♀ Swartberg Pass, 25 mi. N. Oudtshoorn, El. 5200′, 19 Nov., 1967 (M.H.S.) No. 81—1 ♂ Constantia near Alphen, Cape Penin., 350′, 10 Dec., 1967 (M.H.S.) No. 108—2 ♂ Muizenberg Mt., Cape Penin., El. 200′, 8 Oct., 1967 (M.H.S.) No. 23—6 ♂, 5 ♀ just W. of Knysna, 8 Feb., 1968 (S.S.S.S.) No. 185—1 ♂ 20 mi. S. Porterville, trib. Berg. River, 27 Jan., 1968 (S.S.S.S.)—1 ♀ Tradouw's Pass, El. 900′, 10 mi. N. Swellendam, 15 Nov., 1967 (M.H.S.) No. 72—1 ♀ 1 mi. W. of Clanwilliam, El. 450′, 6 Nov., 1967 (M.H.S.) No. 65—1 ♂ Stellenbosch, Capland, Sept. 30, 1925 (Dr. H. Brauns). In National Collection of Insects, Pretoria, Transvaal Museum, Lund University Museum, J. A. Slater and M. H. Sweet collections.

There is very little variation present in the type series. The antennae may be nearly uniformly pale yellowish brown or all dark reddish brown and the pale band along the anterior pronotal margin is sometimes complete across the meson. The entire series is essentially macropterous, although many specimens are submacropterous with the membrane slightly shortened and not reaching the apex of the abdomen.

S. macchiaensis appears to be restricted in distribution to the southern Cape in an area largely coincident with the distribution of the Cape Floral assemblage which is chiefly occupied by the macchia. This area has a very distinctive assemblage of rhyparochromine species, a number of which appear to have similar distributions, and some of which are endemic genera.

S. macchiaensis is a litter living species often found in grassy areas where it apparently feeds on grass seeds. Ecological information will be discussed by Dr. Sweet in a subsequent contribution.

This species is larger than *termiticolus* and it has much darker coloration, a much more conspicuously punctate head, pronotum and scutellum, much larger bucculae and is further distinguishable by the characters given in the key.

Fifth instar nymph: (alcohol) same locality as holotype (figs. 2, 3)

General coloration bright honey yellow on head, pronotum, scutellum, wing pads and appendages, infuscated with brown along anterior and posterior pronotal margins, distally on scutellum and wing pads; abdominal terga mottled with red with irregular pale transverse stripes across tergal sutures and as a longitudinal lateral stripe, 1st tergum with red lateral margin; dorsal abdominal scent gland areas narrowly dark brown as are 8th and 9th terga; below with a dark brown patch below each eye, thoracic pleura heavily infuscated with dark brown and a broad dark irregular brown area on abdominal venter midway between meson and lateral margins; sterna 5, 6 and 7 with a large quadrate mesal light brown patch.

Head connate, moderately convex across vertex, epicranial stem extremely short, almost absent, arms sinuate, length head .40, width .70, interocular space .48; pronotum quadrate, flat, all margins straight, length pronotum .56, width 1.0; mesothoracic wing pads broad, lateral margins explanate, extending midway over 3rd abdominal tergum, length wing pads .86; abdomen elliptical, scent gland opening between terga 3 and 4 very broad, that between 3 and 4 yoke-shaped, between 4 and 5 curving evenly anteriorly from meson to lateral openings, opening between terga 5 and 6 reduced to a minute dark central spot; labium attaining mesocoxae, length labial segments I .40, II .36, III .32, IV .30; length antennal segments I .20, II .47, III and IV missing; total length 3.16.

Second instar (?): (alcohol) 2 mi. S. Goukamma, Knysna area, Feb. 8, 1968 (S.S.S.S.)

Similar in color and structure to instar V, pronotum more heavily infuscated with brown; mesonotum completely pale brown as are a pair of laterally broadened transversely triangular patches on either side of midline of anterior margin of metanotum; scent gland openings between terga 3 and 4 and 5 slightly and evenly curving anteriorly from meson laterally, brown areas anterior to each opening broader than posterior darkened area; opening between terga 5 and 6 relatively larger than in instar V; abdomen nearly uniformly mottled with red; antennae relatively stout; segments 3 and 4 light red-brown as are patches on segments 1 and 2; length head .40, width .62, interocular space .42; length pronotum .36, width .84; length labial segments I .36, II .35, III .23, IV 32; length antennal segments I .24, II .32, III .23, IV .38; total length 2.80.

Sweetolethaeus termiticolus, n. sp.

Elliptical; head, pronotum and scutellum dark red-brown with anterior margin of pronotum between eyes, anterior ½ of explanate lateral margins, antennae and apex of tylus contrastingly testaceous; 4th antennal segment darker brown; femora light brown with distal ends, tibiae and tarsi yellow, tibiae somewhat infuscated mesally; hemelytra testaceous, marked with brown as in *macchiaensis*, but these markings diffuse light brown, membrane hyaline, lacking mesal brown patch; ventral and pleural surface dark red-brown; body nearly glabrous with scattered very short inconspicuous decumbent hairs, pronotum lacking an elongate seta at antero-lateral angles; head, pronotum and scutellum finely rugulose, lacking distinct punctures, punctures on wing very much smaller and less distinct than in *macchiaensis*, often obsolete.

Head short, broad, bluntly rounded anteriorly, bucculae not visible from above, tylus extending ½ way to distal end of 1st antennal segment, lacking distinct anteriorly directed setae, length head .42, width .70, interocular space .50; pronotum subquadrate, flat, lightly impressed in calli area, nearly twice as wide as long, length pronotum .58, width 1.06; length scutellum .70, width .70; hemelytra with claval commissure much shorter than scutellum (length .34), membrane reaching apex of abdomen, inner rows of punctures on corium irregular, distance apex clavus—apex corium .42, apex corium—apex abdomen .70; scent gland auricle as in *macchiaensis* but evaporative area less extensive, covering only ½ of metapleuron and with dorsal margin irregular, not truncate; fore femora moderately incrassate, armed below near distal end with 2 short sharp spines (in some specimens a single spine present), hind femora mutic, spines on tibiae confined to distal ⅕ (actually under very high magnification extremely small spines are present along entire shaft, but greatly reduced); bucculae short, ovoid, not or barely extending ventrad of labium; labium extending well between mesocoxae, length labial segments I .44, II .32, III .26, IV .26; antennae with segments 1 and 2 terete, 3 and 4 narrowly fusiform, segment 1 lacking sharp spines, at most with 2 setae present, length antennal segments I .22, II .42, III .32, IV .34; total length 3.04.

Holotype: ♂, REPUBLIC OF SOUTH AFRICA: *Cape Province*: 1 mi. SW Phillipstown, 23 Oct., 1963, Ex. nest *Trinervitermes trinervoides* (J. L. Sheasby). In National Collection of Insects, Pretoria.

Paratypes: 3 ♂, 3 ♀ same data as holotype. In National Collection of Insects, Pretoria and J. A. Slater collections.

There is very little variation in the type series other than in the reduction of the fore femoral spines which sometimes are very small or reduced to a single spine. The female paratypes are submacropterous, with the membrane not attaining the apex of the abdomen, reaching only onto the anterior half of tergum seven.

S. termiticolus is easily distinguishable from *macchiaensis* by its smaller size and lighter coloration (in the latter the head, pronotum, scutellum and wing markings are nearly black), by the lack of an elongate seta on each antero-lateral pronotal angle, the lack of stout sharp spines on the first antennal segment (three to four are present in *macchiaensis*), by lacking setae on the apex of the tylus, by having a finely rugulose rather than distinctly punctate head, pronotum and scutellum, by having the tibial spines confined to the distal one-fifth rather than present all along the shaft, by the much smaller bucculae, and by the relatively short and wide pronotum.

The type series from Phillipstown, which is in the false Upper Karroo (Acocks (1953) veld type 36), was collected by J. L. Sheasby in mounds of *Trinervitermes trinervoides* (Sjöst). Dr. Coaton informs me that this termite "constructs domed mounds of extremely hard dirt matrix with a highly cellular honey-combed interior. It is a harvester which emerges from foraging ports by night to glean grass, in the form of lengths of leaves, stems and seed heads which is stocked in the mounds. Reserve food material is concentrated mainly in the peripheral cells of the mound beneath the center crust where it matures prior to consumption. These termites feed on cellulose and it seems more than likely that unconsumed starchy seeds will remain in the periphery of the mound where the lygaeid nymphs and adults were found."

From this statement it seems probable that this species feeds on seeds accumulated by the termites. The lygaeid shows morphological features which indicate that it will prove to be adapted to a termite association. Most of the differences shown by *S. termiticolus* relative to *macchiaensis* are reduction features, presumably developed coincident with a sheltered habitat, such as the relatively pale coloration, loss of dorsal punctures, and loss of setae on the pronotum, antennae and legs. The cuticle also appears to be thinner and more delicate in this species.

I am aware of only a few previous indications of a lygaeid-termite association. Breddin (1904) described *Fontejanus wasmanni* from the nests of *Eutermes biformis* Wasmann in India and notes a specimen of *Horvathiolus delicatulus* Stål associated with *Termes natalensis* in the Sudan. In neither case is the nature of the relationship mentioned. Schumacher (1913) described *Lethaeus termitarum* from "Windhuk, Damaraland," stating only that it "leben bei den danebenstechenden Termiten." I have not been able to definitely associate this species, but from the description it may well be a true *Lethaeus* related to *lethierryi* Puton. It is a much larger species than *S. termiticolus* and evidently it is not congeneric.

At Pafuri in the northwest corner of Kruger National Park we took a series of a lethaeine related to the genus *Orbellis* Distant in runs or tubes of the termite *Schedorhinotermes lamaninus* (Sjöst.) under the bark of a large fallen limb of *Ficus sycamorus*. The lygaeids were present in both active and apparently abandoned runs but more numerous in the latter. This species was also abundant in large numbers on the ground adjacent to the fallen limb. Unfortunately our disturbance of the habitat made it impossible to determine the type of association involved.

Fifth instar nymph: (pinned) same locality as holotype.

General coloration honey yellow on head, pronotum, scutellum, wing pads and appendages; abdomen opaque white, scent gland openings and small mesal spot on terga 8 and 9 light brown, sterna 6 and 7 with broader light brown mesal spots, 8 and 9 with small mesal spots.

Form very similar to *macchiaensis* but scent gland opening between terga 3 and 4 nearly straight rather than yoke-shaped; length head .40, width .64, interocular space .48; length pronotum .48, width .92; length wing pad .86; length labial segments I .26, II .28, III .22, IV .20; length antennal segments I .22, II .38, III .28, IV .32; total length 2.82.

Fourth instar: (pinned) same locality.

Very similar to 5th instar; appendages nearly white; length head .38, width .58, interocular space .46; length pronotum .36, width .80; length wing pad .44; length labial segments I .28, II .24, III .20, IV .18; length antennal segments I .20, II .32, III .26, IV .32; total length 2.30.

Third instar: (pinned) same locality.

Very similar to 4th; length head .36, width .52, interocular space .42; length pronotum .25, width .78; length wing pad .34; length labial segments I .26, II .26, III & IV obscured; length antennal segments I .16, II .28, III .24, IV .30; total length 1.98.

The nymphs of this species can be separated from *macchiaensis* nymphs by the uniformly white abdomen which lacks the red mottled coloration, and (in the fifth instar) by the straight 4–5 scent gland opening which is yoke-shaped in *macchiaensis.*

Acknowledgments

I wish to express my deep appreciation to the following: Dr. W. L. Coaton (National Collection of Insects, Pretoria) for determination of the termites, information concerning the habits of *Trinervitermes*, allowing me to study the series of *Sweetolethaeus termiticolus* and for making facilities and financial support available in South Africa in 1967–1968; Mr. J. L. Sheasby (National Collection of Insects, Pretoria) for collecting the type series of S. *termiticolus*; Dr. M. H. Sweet (Texas A. & M. University) for making material of S. *macchiaensis* available to me and for much assistance in the field; Mr. Toby Schuh (University of Connecticut) and Mr. Samuel Slater for aid in the collecting and processing of material; Miss Karen Stoutsenberger (Gray Herbarium, Harvard University) and Miss Mary Hubbard (University of Connecticut) for preparation of the illustrations; Dr. Per Brinck (Lund University) and Dr. L. Vari (Transvaal Museum) for the loan of material; Mrs. Darleen Wilcox (University of Connecticut) for extensive aid in the preparation of the manuscript and to the University of Connecticut Research Foundation for financial assistance.

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A NEW SPECIES OF CULICOIDES FROM COLOMBIA

(DIPTERA: CERATOPOGONIDAE)[1]

DONALD H. MESSERSMITH, *Department of Entomology, University of Maryland, College Park, Maryland 20742*

ABSTRACT—This paper describes *Culicoides* **florenciae** n. sp. of the *debilipalpis* gp. It was collected near Florencia, Colombia, on the eastern slope of the eastern Andes by the Rio Hacha at 1000 m elevation. A comparison with closely related species is included.

While on a collecting trip in Colombia in August and September, 1969, I came upon a site on the eastern side of the Eastern Cordillera of the Andes which yielded an apparently new species of *Culicoides* of the *debilipalpis* group. The type habitat is the sandy bank of the Rio Hacha, a river which flows down the eastern side of the Eastern Andes and eventually empties into the Rio Orteguasa, a tributary of the Rio Caqueta. The collecting site was at about 1000 m elevation not far from the Garzón-Florencia road in the province of Caqueta. This is a densely forested, but inhabited region, containing typically amazonian vegetation.

While crossing a footbridge over the river, I became aware of these insects because of their painful bites. Upon descending to the river bank I was able to collect specimens from my exposed arms with an aspirator. The time of day was about 1500 on September 2, 1969. All specimens were feeding or beginning to feed when captured. They were preserved in 70% ethyl alcohol and later mounted on slides using the technique of Wirth and Blanton (1959).

[1] Scientific Article No. A1693, Contribution No. 4450 of the Maryland Agricultural Experiment Station, Department of Entomology.

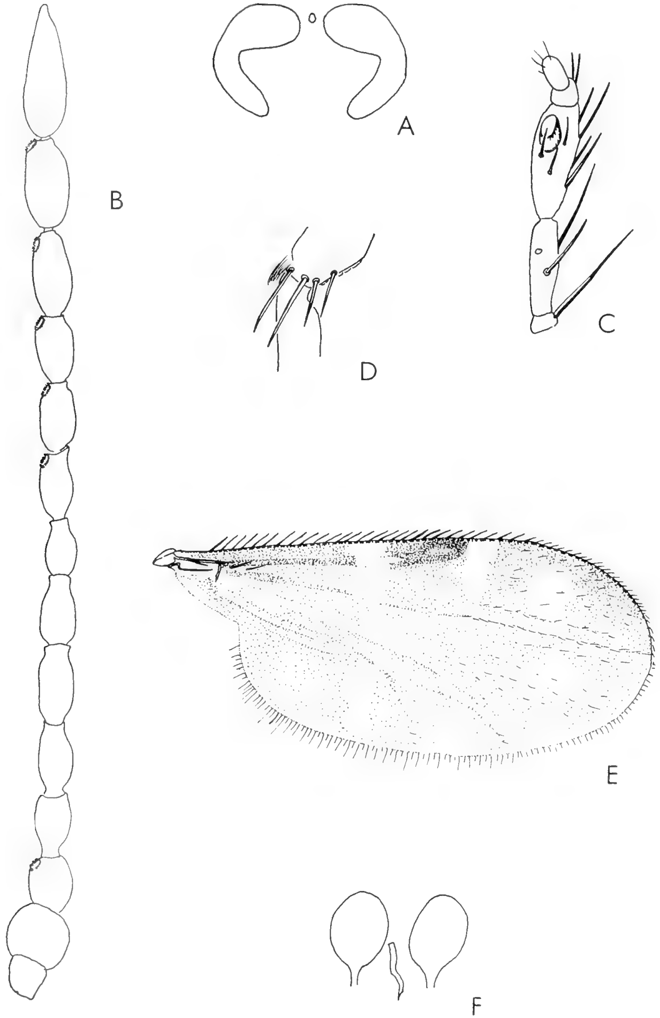

Fig. 1. *Culicoides florenciae*, n. sp., female: a, eye separation; b, antenna; c, palpus; d, tibial comb; e, wing; f, spermathecae.

Fig. 2. Collection site of *Culicoides florenciae*, n. sp. on the Rio Hacha near Florencia, Colombia. Photo by Mary Kilbourne.

Culicoides florenciae Messersmith, n. sp.
(Fig. 1)

Female.—Length of wing 1.05 mm.

Head: Eyes (fig. 1a) broadly separated. Antenna (fig. 1b) with lengths of flagellar segments in proportion of 23–24–27–30–30–28–28–30–28–31–35–34–50; AR 0.81; no sharp increase in lengths of segments in distal series except for terminal segment; distal sensory tufts prominent, located on segments 3, 10–14. Palpal segments (fig. 1c) with lengths in proportion 12–35–43–16–17, PR 2.7; third segment moderately swollen, with a deep, round sensory pit, with pit deeper than diameter of round pore opening. Proboscis moderately long, P/H ratio 0.97; mandible with 18 teeth.

Thorax: Brownish with no conspicuous pattern. Legs brownish, with pale band near the proximal end of the tibia on all legs, distal end of hind tibiae slightly paler than rest of leg; hind tibial comb with four spines, the second from the spur longest (fig. 1d).

Wing (fig. 1e): Pattern as figured; distal pale spot in cell R5 transverse, the

Table 1. A comparison of key characters of some selected species of the *Culicoides debilipalpis* group.*

Species	Wing length	CR	AR	Sensoria	Teeth	Spines
florenciae	1.05	0.56	0.81	3, 10–14	18	4
eadsi	0.81	0.57	0.78	3, 8–10	15	4
darlingtonae	0.86	0.61	0.86	3, 8–10	16	4
guerrai	0.95	0.62	0.83	3, 8–10	15	4
caucaensis	1.83	0.65	0.99	3, 9–14	20	4
tamboensis	1.23	0.61	0.85	3, 11–14	11	4

* See Wirth and Blanton (1959), p. 262 for other species characteristics.

poststigmatic pale spot constricted in the middle, but not separated; pale spot in anal cell transverse; distinct pale spots present behind medial fork and in front of mediocubital fork. CR 0.56; second radial cell narrow, but with distinct lumen; macrotrichia more numerous on distal half of wing than on basal half and in parallel rows bordering the medial fork. Halter pale. Rudimentary spermatheca present.

Abdomen: Dark brown. Spermathecae (fig. 1f) subequal, measuring 0.044 by 0.026 mm. and 0.045 by 0.029 mm.

Male.—Unknown

Distribution.—Colombia

Types.—Holotype female, Rio Hacha, Eastern Andes at 1000 m near Florencia, Caqueta, Colombia, 2 September 1969, Donald H. Messersmith (Type no. 71147 USNM). Paratypes 10 females, same data.

Discussion.—This species differs from all other members of the neotropical *debilipalpis* group and indeed from most nearby Panamanian *Culicoides* in having sensoria on segments 10–14. Only two Panama species (*C. patulipalpis* and *C. rangeli*) have sensoria so arranged (Wirth and Blanton, 1959), but these have only one spermatheca. Two Colombian species from the Andes described by Wirth and Lee (1967) show close affinities to *C. florenciae*. They are *C. caucaensis* which has sensoria on segments 3, 9–14 and *C. tamboensis* with sensoria on segments 3, 11–14. Both of these have two spermathecae and a rudimentary third, their wing patterns are similar to *C. florenciae* in some respects, but they are definitely not the same in wing length and other features. However, the wing of *C. florenciae* is longer than in others of the *debilipalpis* group and longer than the wings of *transferrans* group species. The CR and AR are also different from others in these groups. This species appears to be closely related to *C. darlingtonae* Wirth and Blanton (1971), because of its wing pattern. However, the poststigmatic pale spot is not divided, and the pale spot enclosed by the cubital fork does not touch M_{3+4}. The third papal segment is not as swollen. The spermathecae are more equal in size to one another than in *darlingtonae*. Table 1 compares this new species with Wirth and Blanton's new *debilipalpis* group species and with the two closely related Colombian species from the Andes.

I wish to express my appreciation to Dr. Willis W. Wirth for his advice and suggestions in the preparation of this paper and to Dr. F. Eugene Wood for making the drawings. Mrs. Mary Kilbourne took the photograph (fig. 2) and gave permission to use it for which I am grateful.

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SAWFLIES OF THE GENUS CROESUS LEACH IN NORTH AMERICA

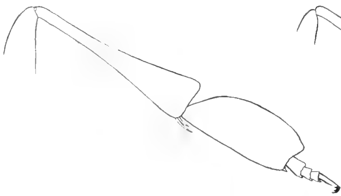
(Hymenoptera: Tenthredinidae)

David R. Smith, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—Adults and larvae of the four North American species of *Croesus* are keyed, described, and illustrated. One new species, *C.* **curvarius**, is described. The larvae are external feeders on the foliage of *Betula, Alnus, Castanea,* and *Corylus.*

The genus *Croesus* is a small group of holarctic sawflies characterized by the conspicuous, flattened hindbasitarsus and hindtarsus. Few sawflies have such an obvious spot character for separation. Larvae of *Croesus* are more commonly encountered than adults because, as in most sawflies, of their noticeable feeding habits. They feed externally on the foliage of *Betula*, *Corylus*, *Alnus*, and *Castanea* in North America, and, in Europe, other species have been found on *Acer*, *Carpinus*, *Fraxinus*, *Populus*, *Salix*, and *Sorbus* (Benson, 1958).

[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.



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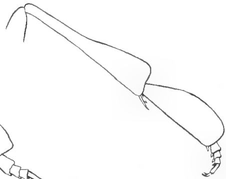

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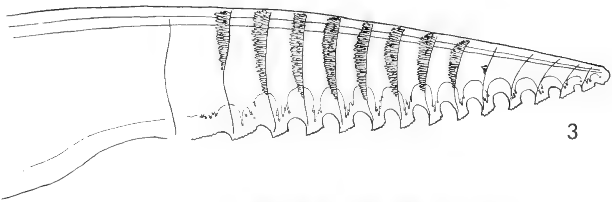

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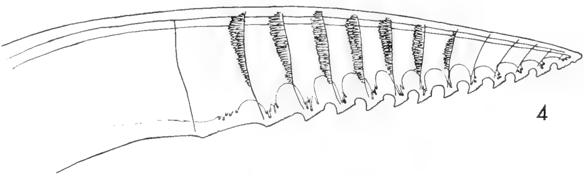

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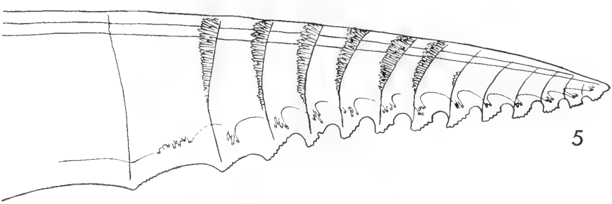

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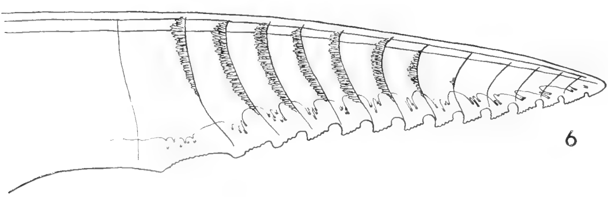

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The North American species have never been revised, and only three species were listed by Ross (1951). A fourth species is described here. All species are found in eastern North America, with only one, *latitarsus* Norton, ranging west to Utah, British Columbia, and Alaska. Another species, *varus* (Villaret), is known only from a single specimen taken at Montreal, Quebec in 1926. This European species may have been introduced, but its establishment on this continent is open to question.

Croesus Leach

Croesus Leach, 1817, Zool. Misc., Vol. 3, p. 129; Morice, 1906, Ent. Mon. Mag. 42:32; Rohwer, 1911, U.S. Bur. Ent. Tech. Ser. 20, p. 99; Enslin, 1915, Die Tenthredinoidea Mitteleuropas, Beit. Deut. Ent. Ztschr., p. 364; MacGillivray, 1916, Conn. Geol. Nat. Hist. Surv. Bull. 22, p. 121; Yuasa, 1922, Ill. Biol. Monog. 7, p. 83; Malaise, 1932, Arkiv. för Zool. 23:36; Ross, 1937, Ill. Biol. Monog. 34, p. 78; Ross, 1951, U.S. Dept. Agr., Agr. Monog. 2, p. 42; Takeuchi, 1952, A Generic Classification of the Japanese Tenthredinidae, p. 68; Wong, 1951, Ent. Soc. Ontario, 82nd Ann. Rept., p. 65; Lorenz and Kraus, 1957, Die Larvalsystematik der Blattwespen, p. 217; Benson, 1958, Handbooks for the Identification of British Insects, Vol. 6. pt. 2(c), p. 209; Benson, 1963, Ent. Tidskr. 84:18. Type-species.—*Tenthredo septentrionalis* Linnaeus. Monotypic.

The greatly expanded and laterally compressed hindbasitarsus and apex of the hindtibia (fig. 1, 2) will readily distinguish this genus from all other genera of Nematinae. The wing venation is typical of the Nematinae, with cross-vein 2r and the basal anal cell both absent in the forewing. The emarginate clypeus, bifid tarsal claw, and, in side view, the angulate frontal crest of the head are additional characters. The species of *Croesus* are very close to some species of *Nematus*, especially those placed in the *Erythrogaster* Group by Ross (1951), in general habitus of the genitalia of both sexes. The distinctive hindlegs of species of *Croesus*, however, may be used to separate *Croesus* and *Nematus* and to retain them as separate genera. Such an obvious character is welcome in a group where there are so few evident external features.

The larvae of *Croesus* species are typical of the Nematinae in having prolegs on abdominal segments 2 to 7 and 10 only and with an eversible gland on the venter of abdominal segments 1 to 7. The following combination of characters will help to separate the larvae from those of other Nematinae: (1) Tenth abdominal tergum with a pair of short caudal protuberances (fig. 14); (2) conical antennae; (3) spiracles not winged; (4) abdominal segments 2 to 9 each with 6 annulets, annulets 2 and 4 setiferous; (5) either with a transverse black stripe or

←

Figs. 1–2. Hindtibia and hindtarsus: 1, *Croesus latitarsus* Norton; 2, *C. curvarius*, n. sp. Figs. 3–6. Lancets: 3, *C. castaneae* Roh.; 4, *C. latitarsus*; 5, *C. curvarius*; 6, *C. varus* (Vill.).

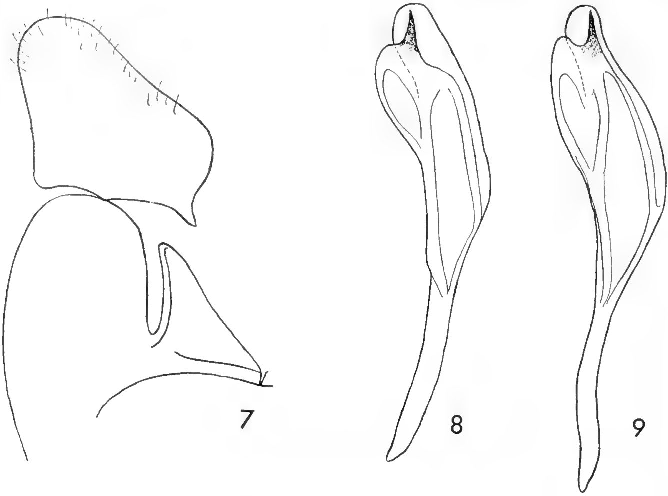

Fig. 7. Harpe and parapenis, *Croesus latitarsus* Norton. Figs. 8–9. Penis valves: 8, *C. latitarsis*; 9, *C. castaneae* Roh.

with not more than 3 black spots on each side of each segment of the body (figs. 15–16)[2]; and (6) free leaf feeders, as opposed to the gall forming Nematinae. The epipharynx, maxilla, and mandibles are as in figures 10 to 13 and are similar for each species.

About 13 world species are included in *Croesus*, four of which are found in North America. Benson (1963) gave a key to the world species or species complexes.

Key to Species
Adults

1. Female 2
   Male 5
2. Abdomen with red band; each femur orange [mesopleuron shining, with well-defined, separated punctures] .... *varus* (Villaret)
   Abdomen and each femur black 3

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[2] Specimens of a *Croesus* species reared from *Betula* in Virginia by Harold Greenbaum of the University of Florida differ from the species described here: The larva has a broad, dorsal, longitudinal black stripe running the length of the body and extending laterally to the spiracles, and the male has the abdomen and each hindfemur entirely black. The texture of the mesopleuron is apparently similar to that of *latitarsus*. According to Mr. Greenbaum, this may represent a distinct species.

3. Annuli 2 to 8 of lancet markedly curved backward toward dorsal margin (fig. 5) [mesopleuron roughened but shining, without well-defined, separated punctures; apex of hindbasitarsus straight (fig. 2)] ..... *curvarius*, n. sp.
   Annuli 2 to 8 of lancet nearly straight (figs. 3, 4) 4
4. Mesopleuron roughened, dull, not shining or with distinct punctures; hindbasitarsus with slight lobe at apex (fig. 1); lancet with lateral armature on annuli 2 to 8 and with serrulae as deep as broad (fig. 4) ..... *latitarsus* Norton
   Mesopleuron shining, with well-defined, separated punctures; hindbasitarsus straight at apex (fig. 2); lancet with lateral armature on annuli 2 to 9 and with serrulae deeper than broad (fig. 3) ..... *castaneae* Rohwer
5. Abdomen and hindfemur black[2] ..... *castaneae* Rohwer
   Abdomen red-banded; hindfemur orange 6
6. Mesopleuron roughened, dull, without well-defined punctures ..... *latitarsus* Norton
   Mesopleuron shining, with well-defined, separated punctures ..... *varus* (Villaret)

Larvae

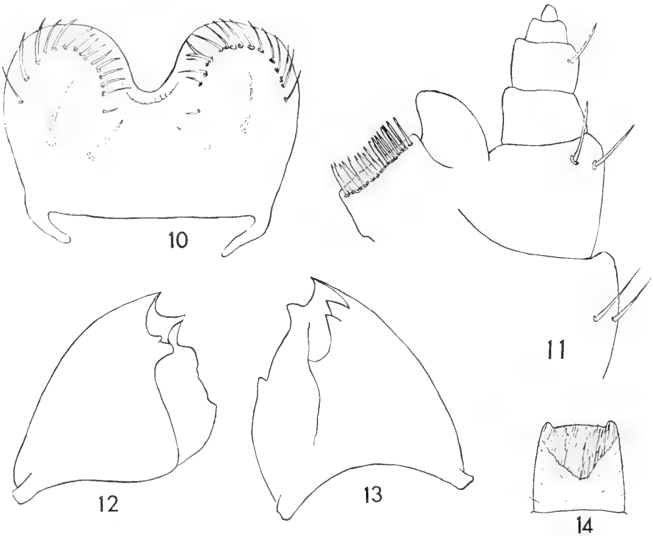
1. An unbroken black stripe on each side of each body segment except for prothorax and tenth abdominal segment (fig. 15), stripe continuous on venter of each segment; tenth tergum without black spots; on *Castanea* ..... *castaneae* Rohwer
   Body segments each with 2 or 3 dark brown spots on each side (figs. 16, 17); tenth tergum partly dark brown[2] 2
2. Each body segment with one supraspiracular and one subspiracular dark brown spot, each equal in size (fig. 16); band on anterior margin of tenth tergum dark brown; on *Corylus* ..... *curvarius*, n. sp.
   Each body segment with one supraspiracular and two subspiracular dark brown spots, the supraspiracular spot larger than the others (fig. 17); apex of tenth tergum dark brown (fig. 14) 3
3. Head black; on *Betula* ..... *latitarsus* Norton
   Head reddish-brown or reddish-yellow; on *Alnus* ..... *varus* (Villaret)

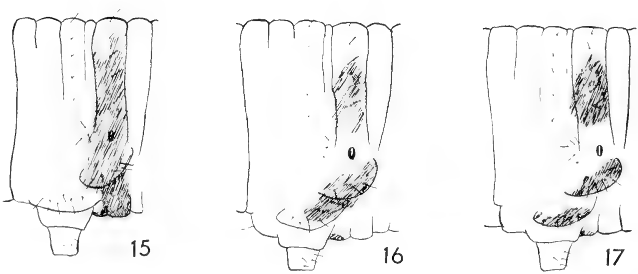
Croesus castaneae Rohwer

Croesus castaneae Rohwer, 1915, Proc. U.S. Nat. Mus. 49:213, ♂, ♀; Middleton, 1922, Proc. U.S. Nat. Mus. 61:14; Ross, 1951, U.S. Dept. Agr., Agr. Monog. 2, p. 42.

Female.—Average length, 9.5 mm. Black, apex of clypeus, apex of labrum, apex of hindcoxa, basal one-third of each tibia, and all of front and middle basitarsi whitish. Wings very lightly and uniformly infuscated.

Postocellar area one and one-half times broader than long. Mesopleuron shining, with fine, well-defined punctures, punctures separated from each other by smooth, shining interspaces; mesosternum smooth and shining, without punctures. Apex of hindbasitarsus straight (fig. 2). Sheath short, straight above, rounded below. Lancet with about 15 serrulae, each serrula deep, separated from each other by deep circular notch deeper than breadth of a serrula; 5 or 6 fine subbasal teeth on ventral margin of each serrula; lateral armature present on annuli 2 to 9, these annuli being nearly straight (fig. 3).





Figs. 10–14. *Croesus latitarsus* Norton, larval structures: 10, epipharynx; 11, maxilla; 12, right mandible; 13, left mandible; 14, tenth abdominal tergum, dorsal view. Figs. 15–17. Third abdominal segment of larvae, lateral view: 15. *C. castaneae* Roh.; 16, *C. curvarius*, n. sp.; 17, *C. latitarsus*.

Male.—Average length, 7.0 mm. Color similar to that of female, except for front and middle tibiae and tarsi which are entirely whitish. Structure similar to that of female. Lateral spine of penis valve with accompanying lobe (fig. 9); harpe and parapenis as in fig. 7.

Holotype.—*C. castaneae* Rohwer is U.S.N.M. type no. 18522, ♀, labeled "Falls Church, Va., reared, Sept. 16, 1912, *Castanea dentata*, Hopk. 10154."

Distribution.—Eastern North America. KENTUCKY: Baldrock, Sept. 23, 1959, on American chestnut (larvae). MARYLAND: Plummers Id., VIII–8–14. NEW YORK: "N.Y." PENNSYLVANIA: Inglenook, Dauphin Co., IX–12–09. VIRGINIA: Falls Church, reared, Sept. 16, 1912, *Castanea dentata*; Rocky Mount, July 10, 1961, on chestnut (larvae).

Host and Biology.—Adults were bred from larvae feeding on chestnut, *Castanea dentata* (Marsh.) Borkh. Larvae of the type series were collected August 7, 1912 and placed in rearing. They fed gregariously on the edge of the leaves. By August 17, all larvae had gone into the ground. Six adults emerged on September 16, 1912.

Larva.—Middleton (1922) described the larva of this species. It is easily distinguished from larvae of other species of *Croesus* by the continuous vertical, dark-brown stripe on each side of each segment of the body (fig. 15), and the lack of dark areas on the tenth tergum.

Discussion.—This shining mesopleuron of both sexes and black abdomen of the male will separate *castaneae* from *latitarsus*, and the black abdomen of the female will separate it from *varus*. *C. castaneae* most closely resembles *curvarius*, and the distinction between the two is discussed under that species.

Croesus curvarius, n. sp.

Female.—Average length, 8.2 mm. Antenna and head black; labrum brownish; white spot on each anterolateral margin of clypeus. Thorax black. Front and middle legs with each coxa, femur, and apical half of tibia black, trochanter and basal half of tibia white, tarsus whitish, infuscated toward apex; hindleg with basal half of coxa black, apical half white, trochanter white, femur black, basal half of tibia white and apical half black, tarsus black. Abdomen black. Wings uniformly, very lightly infuscated.

Postocellar area twice as broad as long. Mesopleuron shining, although roughened and without well-defined punctures; mesosternum shining, with widely spaced punctures. Hindleg as in fig. 2; basitarsus straight below, without small lobe as in *latitarsus* (fig. 1). Lancet with 13 segments, annuli beyond second sharply bent backward dorsally; lateral armature present on segments 2 to 7; serrulae deep, central and apical serrulae with no anterior and 3 to 6 coarse posterior subbasal teeth (fig. 5).

Male.—Unknown.

Holotype.—Female, labeled "Corylus," "Putnam, Conn., VII–31–42," "N.E. For. Ins. Lab. 364 205 41 12." U.S.N.M. type no. 71204.

Paratypes.—CONNECTICUT: same data as for holotype (4 ♀♀); data as for holotype except for dates, VII–42 (3 ♀♀), VIII–1–42 (1 ♀), VIII–7–42 (1 ♀), VIII–11–42 (2 ♀♀); Oneco, bred specimen, 7–18–21, hazelnut, Gip. Moth Lab. 12164F126 (2 ♀♀). Deposited in the U.S. National Museum and the Northeastern Forest Insect and Disease Laboratory, Hamden, Connecticut.

Larva.—The larva may be distinguished from those of other North American species of *Croesus* by the presence of two large subequal dark brown spots on each side of each body segment (fig. 16) and the dark brown band on the anterior margin of the tenth tergum. Also, there is a dark spot between the prolegs on each abdominal segment.

Host.—Adults were bred from larvae feeding on *Corylus* sp.

Discussion.—The lancet with annuli 2 to 9 markedly curved posteriorly toward the dorsal margin is distinctive for this species. The mesopleuron is roughened and without well-defined, separated punctures similar to the mesopleuron of *latitarsus*, but it is shining in *curvarius* and not dull as in *latitarsus*. The mesopleuron of *castaneae* is also shiny, but there are well-defined punctures separated by smooth, shining interspaces.

Croesus latitarsus Norton

Tenthredo septentrionalis Harris, *nec* Linnaeus, 1834, *In* Hitchcock, Rpt. on Geol., Mineral., Bot., and Zool. of Mass., p. 583

Craesus [!] *latitarsus* Norton, 1862, Proc. Ent. Soc. Phila. 1:199, ♀; Norton, 1867, Trans. Amer. Ent. Soc. 1:84; Provancher, 1883, Petite faune Entomologique de Canada, Vol. 2, Hyménoptères, p. 740; Jack, 1888, Psyche 5:41; Dyar, 1893, Can. Ent. 25:246; Dyar, 1895, Can. Ent. 27:342; Konow, 1905, Genera Insectorum, fasc. 29, p. 61 (*latitarsis*); MacGillivray, 1916, Conn. Geol. Nat. Hist. Surv. Bul. 22, p. 121; Yuasa, 1922, Ill. Biol. Monog. 7, p. 83; Brown, 1940, Canada Dept. Agr. Forest Insect Surv., 4th Ann. Rpt., p. 16; Ross, 1951, U.S. Dept. Agr., Agr. Monog. 2, p. 42; Wong, 1954, Can. Ent. 86:154; Maxwell, 1955, Can. Ent. 87, Sup. 1, p. 69; Raizenne, 1957, Canada Dept. Agr. Pub. 1009, p. 33.

Nematus latitarsus: Dalla Torre, 1894, Catalogus Hymenoptorum, Vol. 1, p. 223 (*latitarsis*).

Female.—Average length, 9.3 mm. Black; labrum brownish; apex of hindcoxa, hindtrochanter entirely, basal one-third of hindtibia, basal one-half of front and middle tibiae, and basal one-half of front and middle basitarsi whitish. Wings hyaline with very faint infuscated band below stigma.

Postocellar area nearly twice as broad as long. Mesopleuron dull, roughened, without well-defined punctures; mesosternum shining with scattered punctures. Apex of hindbasitarsus with slight lobe (fig. 1). Sheath short, straight above, rounded below. Lancet with about 13 serrulae, each serrula deep, circular notch separating each serrula about as deep as breadth of a serrula; 5 or 6 fine subbasal teeth on apical slanted margin of each serrula; lateral armature present on annuli 2 to 8, these annuli nearly straight (fig. 4).

Male.—Average length, 7.0 mm. Antenna black, occasionally dark orange; head black, sometimes supraclypeal area, clypeus, and labrum whitish. Each coxa black with apex of hindcoxa whitish; each femur orange; front and middle tibiae orange, hindtibia with basal half orange, apical half black; front and middle tarsi orange, hindtarsus black. Abdomen orange with first two segments black; hypandrium sometimes infuscated. Structure similar to that of female. Lateral spine of penis valve without accompanying lobe (fig. 8). Harpe and parapenis as in fig. 7.

Type.—There are two specimens, one of each sex, in the Museum of Comparative Zoology, Harvard University labeled "179 ♂" and "179 ♀," "MCZ Type 26326." There is also a specimen in the Academy of Natural Sciences of Philadelphia, a female labeled "Pa." and "Type 10304." Norton (1862) described only the female and stated "Pennsylvania (Coll. Ent. Soc. Phil.), Mass. (Harris Coll.)." All three specimens at Harvard and Philadelphia are the same species; however, I am designating the specimen at Philadelphia as the lectotype.

Distribution.—Eastern North America, Quebec to Florida west to Utah, British Columbia and Alaska. ALASKA: Matanuska, VI-44. BRITISH COLUMBIA: Carbonate, Columbia R., July 7–12, 1908, 2600′. CONNECTICUT: East River, reared, many dates from April to October of various years from *Betula populifolia*, *Betula populifolia-nigra*, *Betula lenta*; Lyme, VI–18–18. FLORIDA: Alachua Co., VI–1954. ILLINOIS: Antioch, Aug. 1, 1960; Herod, June 6, 1946; Urbana, May 9, 1935. MAINE: Augusta, emergence dates in June and August, ex gray birch; Bar Harbor, bred, June 1, 4, 1934, on gray birch; Mt. Desert I., bred, VIII–17, 18–1932, gray birch; Greenville, VI–1–32; Auburn, July 29, 1968; Orono, June 12, 1907. MANITOBA: recorded by Wong (1954). MASSACHUSETTS: Chelmsford, 20–8–29, *Betula populifolia*; Lynnfield, V–11–18, *Betula populifolia*; Newton, 1938; Southbridge. MICHIGAN: Cheboygan Co., 8–2–1934. MINNESOTA: St. Anthony Park, 7–24–91; Eaglesnest, Aug. 8, 1957. MISSOURI: Columbia, August 10, 1904. NEW HAMPSHIRE: Durham. NEW YORK: Cranberry Lake, 8–8–25; Big Indian Valley, Catskill Mts., V–23–06; Orient Pt., Sept. 8, 1917; Ringwood, May 23, 1937. NORTH CAROLINA: Davidson Co., May 22, 1958, on birch (larvae). NOVA SCOTIA: recorded by Brown (1940) from Cape Breton I. ONTARIO: recorded by Raizenne, (1957). PENNSYLVANIA: Marysville, VII–14–12. QUEBEC: Cascapedia R., VII–10–1935, white birch. SASKATCHEWAN: recorded by Wong (1954). UTAH: Logan, August 16, 1950. VERMONT: W. Topsham, Waits River, June 21, 1941. VIRGINIA: Strong Man Mt., July 31, 1900 (H. G. Dyar "11C"). WISCONSIN: Cranmoor, VI–9–10.

Larva.—The larva was described by Dyar (1893) and Yuasa (1922). Typically, each segment of the body has a large supraspiracular dark brown spot and two smaller subspiracular dark brown spots (fig. 17) as well as a dark spot between the prolegs on each abdominal segment. The head is black, and the apex of the tenth tergum is dark brown.

The supraspiracular spots are variable in size and may coalesce in some specimens to form a nearly solid, broad dorsal stripe.

Host and Biology.—Larvae feed on various species of birch including *Betula papyrifera* Marsh. (Wong, 1954; Raizenne, 1957), *B. lutea* Michx. (Raizenne, 1957), and *Betula lenta* L., *B. nigra* L., and *B. populifolia* Marsh. according to the host labels on specimens.

Wong (1954) studied this species in Manitoba and Saskatchewan. He noted that the larvae are gregarious and feed on the edge of the leaf and are found in early June and in September. There is one generation a year or a "second or partial generation." In Ontario, larvae were observed in late June and early September by Raizenne (1957). Cocoons were spun in early July and adults were found in early August.

Many specimens associated with Hopkins' numbers were reared from various species of birch in Connecticut. All were laboratory rearings. In most cases larvae were collected in late July through the middle of August and brought into the laboratory where adults emerged during September of the same year. In one rearing, larvae were collected in July and adults emerged the first part of August of the same year, and, in another rearing, larvae were collected the first of October and adults emerged during May of the following year. From those larvae collected in August, most of the adults appeared during the same year, but some did not appear unitl May of the following year. According to these data, there are either two generations a year or part of the second brood may remain in a cocoon in the soil, not emerging until the following year. A change of host plants was attempted in one experiment; larvae collected from white birch were transferred to black birch in the laboratory. The larvae apparently fed, but, within 10 days, all the larvae died.

Discussion.—This is the most commonly encountered species in this genus and is distinguished from the other species of *Croesus* by the dull and roughened mesopleuron and by the slight lobe at the apex of the hindbasitarsus. The black abdomen of the female will separate *latitarsus* from *varus*, and the red-banded abdomen of the male will separate it from *castaneae*. Annuli 2 to 9 of the lancet of *latitarsus* are nearly straight, as opposed the distinctly curved annuli of the lancet of *curvarius* and *varus*.

Croesus varus (Villaret)

Nematus varus Villaret, 1832, Soc. Ent. France Ann. 1:306; Dalla Torre, 1894, Catalogus Hymenoptorum, Vol. I., p. 268, lists numerous references to this species in European literature prior to 1894.

Croesus varus: Kirby, 1882, List Hym. Brit. Mus., p. 102; Konow, 1905, Genera Insectorum, fasc. 29, p. 61; van Rossum, 1906, Ent. Bericht. 32:141; Buckle, 1930, Can. Ent. 62:21; Ross, 1951, U.S. Dept. Agr., Agr. Monog. 2, p. 42; Lorenz and Kraus, 1957, Die Larvalsystematik der Blattwespen, p. 219; Benson, 1958, Handbooks for Identification of British Insects, Vol. 6, pt. 2(c), p. 211; Benson, 1963, Ent. Tidskr. 84:26.

Female.—Length, 9.0 mm. Antenna and head black; clypeus, labrum, and mouthparts whitish. Thorax black with posterior margin of pronotum and tegula light orange. Front and middle legs with each coxa black, trochanter, tibia, and tarsus whitish, and femur orange; hindlegs with basal third of coxa black, apical two-thirds whitish, trochanter whitish, femur orange, with black at extreme tip, basal half of tibia white, apical half black, tarsus black. Abdomen black with segments 3 to 6 orange. Wings uniformly, very lightly infuscated.

Postocellar area slightly less than two times broader than long. Mesopleuron shiny, with well-spaced punctures; mesosternum shiny with fewer punctures than mesopleuron. Hindleg similar to that of *curvarius* (fig. 2). Lancet with 13 segments, annuli 2 to 8 with lateral armature and each curved backward ventrally; central and apical serrulae moderately deep, each with no anterior and 4 or 5 coarse posterior subbasal teeth (fig. 6).

Male.—Unknown in North America, and I have not seen specimens. According to Benson (1958) very rare but similar in color and structure to the female. The penis valve is illustrated by Benson (1958, fig. 653).

Type.—Not examined and location unknown. The application of this name is based on Benson (1958) and European specimens in the U.S. National Museum identified by Benson.

Distribution.—Palaearctic, from Europe to Siberia; eastern Canada. QUEBEC: Montreal, 8–VIII–26, J. W. Buckle (1 ♀, in the Lyman Entomological Museum, McDonald College, Quebec). NOVA SCOTIA: specimen not seen, recorded by Kirby, (1882).

Host.—In Europe, the larva feeds on *Alnus* (Benson, 1958).

Larva.—Not examined, but described by Lorenz and Kraus (1957). The larvae apparently has one large supraspiracular spot and two small subspiracular black spots on each segment of the body, similar to the larva of *latitarsus*; however, the head is reddish-brown or reddish-yellow rather than black.

Discussion.—Kirby (1882) first recorded this species from a specimen that he had from North America, and Buckle (1930) later reported it from a specimen he collected in Montreal. The female Buckle collected is the only North American specimen I have seen.

The female is readily separated from other North American species of *Croesus* by the red-banded abdomen and orange femora. The lancet is also distinctive in that annuli 2 to 7 are markedly curved backward at their bases.

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THE LAST INSTAR CATERPILLAR OF THIOPTERA NIGROFIMBRIA (GUENÉE)

(Lepidoptera: Noctuidae)

George L. Godfrey, *Illinois Agricultural Experiment Station, University of Illinois and Illinois Natural History Survey, Urbana, Illinois 61801*

ABSTRACT—The last instar caterpillar of *Thioptera* (*olim Xanthoptera*) *nigrofimbria* (Guenée) is redescribed. The characters of the head capsule, mouthparts, and body are illustrated.

There is only one brief description of the caterpillar of *Thioptera* (*olim Xanthoptera*) *nigrofimbria* (Guenée) in the literature. That account is by Forbes (1954): ". . . with first two pairs of prolegs minute; cylindrical with strong annulations, green with faint white lines (Franclemont)." In his description of the larva of *Lithacodia muscosula* (Guenée), Forbes (1954) indicated that the larval head of *Thioptera nigrofimbria* bears dark adfrontal stripes. I question this, since of the 12 preserved caterpillars of *T. nigrofimbria* that I examined, none had the slightest trace of any stripes on the head. It has been my experience that dark head capsule markings are retained even in preserved specimens (Godfrey, 1970). Such characters also are retained on cast-off head capsules of certain geometrids (McGuffin, 1969). The following description emphasizes characters that I believe are the most useful for the purposes of identifying and classifying noctuid caterpillars.

Description

General. Head 1.5–1.6 mm wide. Total length 17–21 mm. Abdominal prolegs minute on third and fourth abdominal segments, normal on segments five and six. Crochets uniordinal. Head and body smooth. Dorsal abdominal setae simple, 3.8–4.0 times height of seventh abdominal spiracle; dorsal abdominal setal insertions flat.

Head. Postgenal sutures straight, parallel to each other or slightly curved. Epicranial suture 1.3 times longer than height of frons (fig. 2). Distance from frontal setae (F-1) to fronto-clypeal suture 0.28 times the distance between F-1's. Second adfrontal seta (AF-2) definitely posterior of apex of frons. Anterior setae (A 1–3) nearly forming right angle. Lateral seta (L) posterior of line formed by AF-2's. First posterior seta (P-1) caudad of juncture of adfrontal sutures. Interspaces between ocelli (Oc) 1–2 and 2–3 subequal; same interspaces slightly greater than width of Oc-1; distance between Oc 3–4 about twice that of Oc 2–3 (fig. 5).

Mouthparts. Oral surface of labrum unspined. Hypopharyngeal complex (fig. 1): spinneret long, tapering distad, surpassing tip of Lp-2; stipular seta subequal to Lps-1 and Lp-2; Lp-1 distinctly longer than Lps-2, about ½ length of Lp-2; distal region unspined except for scattered, short spines near proximo-lateral region; proximo-lateral region with single row of long, stout spines. Mandible (fig. 4):

Figs. 1–7. *Thioptera nigrofimbria* (Guenée): 1, hypopharyngeal complex; 2, head capsule; 3, lateral view of anal segment; 4, oral view of left mandible; 5, ocelli; 6, lateral view of prothoracic segment; 7, venter of first abdominal segment.

inner surface with one distinct inner ridge and one poorly defined region suggesting an inner tooth; outer teeth 1 and 2 distinct, triangular; outer teeth 3–6 fused, form a thin, curved cutting edge.

Thorax. Segment T-1 (fig. 6): seta D-2 caudad of line formed by D-1 and XD-2; major axis of prothoracic spiracle passing posterior of both SD-1 and -2, between SV-1 and -2; SD 1–2 located anterior of transverse line passing through D-2. Segments T 2–3: seta L-1 located above and slightly behind L-2; base of tarsal claw angulated to slightly rounded; distal tarsal setae slightly broadened basally.

Abdomen. Segment Ab-1: Three subventral setae present, SV-1 located posterolaterad of line formed by ventral seta (V) and SV-3 (fig. 7). Segments Ab 2–6 also with three subventral setae. Segment Ab-8: only one seta in each subventral group. Segment Ab-9: seta SD-1 hairlike, thinner than setae D 1–2. Subanal setae stout, noticeably thicker than lateral setae of anal proleg (fig. 3).

Host. Reared on *Digitaria* (= *Syntherisma*) sp. by J. G. Franclemont. Forbes (1954) stated, "Also reported from Ipomoea, in a fruit capsule, but doubtless a straggler."

Material examined. Twelve specimens: Arlington, Virginia. June–July, 1950. From ova laid by female collected by J. G. Franclemont.

Discussion

In comparison with other noctuid caterpillars of which I have knowledge either through direct examination or the literature, there are two species similar to *Thioptera nigrofimbria.* These are *Lithacodia muscosula* (Guenée) of the New World and an Old World species called *Jaspidia pygarga* (Hufnagel) by Beck (1960). Similar shaped hypopharynges, mandibles and feeding habits support this view. Additionally, they all have three subventral setae on the first abdominal segment. Beck (1960) discussed these points for *pygarga*, and Godfrey (1971) for *Lithacodia muscosula.* The last instar caterpillars of *Thioptera nigrofimbria* and *Jaspidia pygarga* both have enlarged subanal setae which *Lithacodia muscosula* does not. *Thioptera nigrofimbria* differs from the other two species by the presence of vestigial prolegs on the third abdominal segment. These structures are absent on the third abdominal segments of *Lithacodia muscosula* and *Jaspidia pygara.*

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NOTES ON SOME CTENOCEPHALIDES FROM MICRONESIA

(Siphonaptera: Pulicidae)

The following additional geographical records and comments supplement those given for the genus in Micronesia by Hopkins (1961, Ins. Micronesia 14(4):91–107). Material is deposited in the B. P. Bishop Museum, Honolulu, Hawaii.

Ctenocephalides felis felis (Bouché). YAP. Map: 1 ♀, on man, 5.XII.1963, F. A. Bianchi. S. MARIANA IS. Guam: 4 ♂♂, 3 ♀♀, Navy housing area, II–III.1959.

Ctenocephalides orientis (Jordan). Hopkins (*op. cit.*) listed three females of *Ctenocephalides canis* (Curtis) from Guam. These specimens are excessively cleared and in very poor condition. An additional male and female of this lot were not listed, apparently because he considered them undeterminable (written on slide). With careful examination using a phase contrast microscope, two to four minute spiniforms can be seen above the antennal fossa on two of the three females. These spiniforms are not obvious on the third female, probably due to its poor condition. All three females have only one short, stout bristle in the interval between the postmedian and apical long bristles of the dorsal region of the hind tibia. In my opinion, these specimens are *C. orientis* rather than *C. canis*. There are no other valid records of *C. canis* from Micronesia and the species should be deleted from the list of Siphonaptera for the area.

Nixon Wilson, *Department of Biology, University of Northern Iowa, Cedar Falls, Iowa 50613.*

A NEW GENUS AND SPECIES OF ANOBIIDAE FROM BRAZIL
(COLEOPTERA)

RICHARD E. WHITE, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—The new genus and species **Neoptilinus granulatus** White is described from Lambary, Brazil. The new genus belongs to the Ptilininae and is related to *Ptilinus*.

Seven specimens from the recently purchased Halik collection constitute a new genus and species nearest the almost world-wide genus *Ptilinus*. The following descriptions are from these specimens.

Neoptilinus, n. gen.

Type-species: *Neoptilinus granulatus*, n. sp.

General: Body elongate-cylindrical, nearly parallel-sided from dorsal view; pubescence sparse and short; all body surfaces densely, finely granulate; body black.

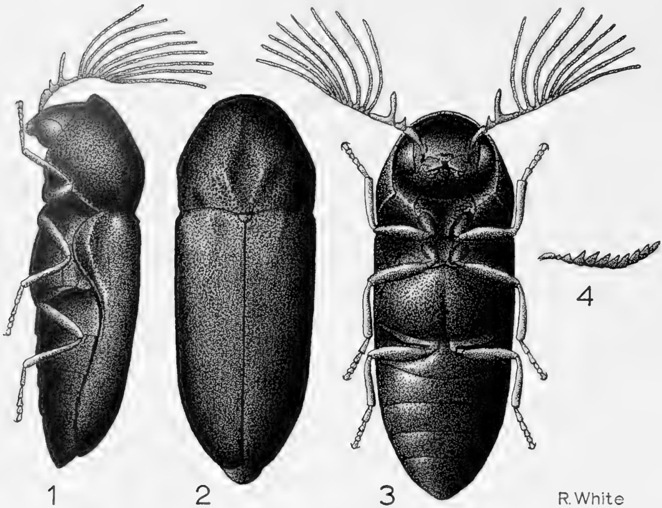
Head: Eyes of both sexes rather small, bulging; front nearly evenly convex side to side; clypeus weakly marked posteriorly, labrum densely pubescent; antenna 11-segmented, that of male strongly pectinate from 4th to 10th segments, that of female serrate from 3rd to 10th segments; last segment of maxillary and labial palpi elongate and pointed; mentum transversely trapezoidal, narrowed anteriorly.

Dorsal surface: Pronotum elongate, slightly wider than long, with 2 longitudinal carinae basally, lateral margin fine, distinct, complete; scutellum small, transverse; elytra not striate, humerus distinct, lateral margin markedly sinuate, epipleuron wide.

Ventral surface: Prosternum length before front coxae equal to width of a coxa, depressed, extending between coxae, nearly attaining coxal apex; front coxae separated by nearly ½ width of a coxa; middle coxae separated by nearly ½ width of a coxa; metepisternum wide, narrowed near base by elytron; metipimeron large, visible; metasternum grooved posteriorly at center; hind coxae narrow, elongate, not attaining elytra; 1st abdominal segment slightly depressed, not carinate for hind legs; in male 5th abdominal segment longest, rather cone-shaped, 1st segment second longest, 2nd segment moderate in length, 3rd and 4th segments subequal, shortest; in female 1st segment longest, 5th second longest, 2nd segment moderate, 3rd and 4th subequal, shortest, 5th segment more distinctly cone-shaped than in male; 1st abdominal suture weaker than others but evident throughout, bisinuate, others nearly straight and weakly double at center; pygidium of both sexes exposed beyond elytral apex.

This genus belongs to the subfamily Ptilininae and is most nearly related to *Ptilinus* Müller. The primary differences are as follows: the side of each elytron is faintly sinuate in *Ptilinus*, but in *Neoptilinus* it

[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.



Figs. 1–4. *Neoptilinus granulatus*, n. gen., n. sp.: 1, holotype male, lateral; 2, same, dorsal, appendages omitted; 3, same, ventral; 4, female antenna.

is distinctly sinuate; in *Ptilinus* the anterior tibia is toothed and in *Neoptilinus* it is not toothed; and the pronotum of *Ptilinus* is asperate anteriorly while that of *Neoptilinus* is not at all asperate.

Neoptilinus granulatus, n. sp.
(Figs. 1–4)

General: Body elongate cylindrical, 2.7 to 2.85 times as long as wide, pronotum slightly wider than elytra; pubescence grayish, sparse, so short as to be difficult to detect; body granulations smallest on metasternum and abdomen, largest at sides and near base of pronotum; body black, femora black with reddish evident, tibiae, tarsi and antennae dull dusky red; dorsal surface nearly lusterless, ventral surface more shining.

Head: Eyes separated by 2.5 to 2.8 times vertical diameter of an eye; front finely granulate, genae densely, rather coarsely punctate and finely granulate, punctures on genae so dense as to obscure granulation; male antenna with 1st segment long, arcuate, broadest apically, 2nd segment less than ½ as long as 1st, with a broad basal process, width of segment about equal to length, 3rd segment a little shorter than 1st, with a long basal process, width of segment ¼ greater than length, segments 4 through 10 short, subequal in length, each about ½ length of 2nd segment, each with a process about 18 or 19 times as long as segment, segment 11 much elongated, processes of segments 4 through 10, and segment 11, flattened, 2 to 3 times wider than deep; antenna of female with 1st segment long, arcuate, widest apically, 2nd segment less than ½ length of 1st, triangular, a little longer than wide, 3rd segment shorter than 1st, triangular, longer than wide, segments 4 through 10 similar in length, each about ½ as long as 1st, each produced laterally and wider than long, process of 4th segment lateral, processes of following segments becoming more inclined, 11th segment spindle shaped, over 2 times as long as wide; last segment of maxillary palpus roughly 3 times as long as wide, last segment of labial palpus roughly 4 times as long as wide (palpi of specimens obscured).

Dorsal surface: Pronotum longitudinally, shallowly depressed at center, depression bordered basally with 2 distinct carinae, surface somewhat depressed lateral to each basal carina, and depressed before humerus, disk somewhat produced each side of longitudinal depression, granulation fine and dense, granulations largest at sides and in depressions near base; each elytron with a weak longitudinal carina at base midway between suture and humerus, latter fairly prominent, granulations largest at side and base.

Ventral surface: Prosternum granulate; metasternum granulate-punctate, punctures irregular in size; abdomen granulate-punctate, punctures irregular in size.

Length: 4.1 to 5.0 mm.

The male holotype (USNM no. 71444), the allotype, and the 5 paratypes (2 males, 3 females) are in the U.S. National Museum of Natural History and bear the data, Lambary, M. Geraes, XI, 1924, J. Halik, Brazil, Halik 1966, Collection. The holotype bears the Halik collection number 10523, the allotype bears 2259, the 2 male paratypes bear 2261 and 2361, and the 3 female paratypes bear 2260, 2362, and 2360. Lambary is located just northwest of Rio de Janeiro, Brazil.

If aptness is an attribute of the words published by M. Pic (see references) to validate his 7 Brazilian *Ptilinus* species names, then *N. granulatus* has not already been named, for all of Pic's descriptions have at least a word or two which do not fit this species. The descriptions (consisting of as few as 15 words) are vague and superficial, but each mentions one or more characters not possessed by this species, such as reddish color, elytral striae, or dense pubescence.

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TABANIDAE OF PATUXENT WILDLIFE RESEARCH CENTER, LAUREL, MARYLAND. THE SECOND YEAR.
(DIPTERA)

PATRICK H. THOMPSON, *Veterinary Toxicology and Entomology Research Laboratory, U.S. Department of Agriculture, Agricultural Research Service, College Station, Texas 77840*

ABSTRACT—A second successive year of intensive study at Patuxent Wildlife Research Center produced 4,807 specimens representing 37 species of Tabanidae: 17 in *Chrysops*, 14 in *Tabanus*, and 6 in *Hybomitra*. Forty-three species in 3 genera were collected in the 2-year study. The 1968 and 1969 faunas were very similar, only 9 species being collected in only 1 year (6 of these represented by 1 specimen). *Hybomitra lasiophthalma* (Macquart) and 5 *Chrysops* species (*C. pudicus* Osten Sacken, *C. montanus* Osten Sacken, *C. vittatus* Wiedemann, *C. flavidus* Wiedemann, and *C. callidus* Osten Sacken) were the most abundant species in both years; all but *C. callidus* comprised 57–58% of the material collected. Most species appeared within 2 sample-days of those species preceding them, and the order of seasonal succession of each species was similar in both years. However, in 1969 the 12 dominant species were 5–30 days earlier than in 1968; with populations of those dominants having sharp and regular rates of increase and decline (*C. callidus*, *C. vittatus*, and *H. lasiophthalma*), peaks of abundance were also earlier in 1969 (10–25 days). The most abundant 1969 dominants decreased negligibly (*C. montanus*, 5.1%; and *C. vittatus*, 6.4%) or increased 20–40% (*C. flavidus*, *Tabanus lineola* F., *T. petiolatus* Hine, and *H. lasiophthalma*).

Initial intensive collections of Tabanidae at Patuxent Wildlife Research Center in 1965 (Thompson, 1967b) were followed in 1968 (Thompson, 1970) with more collections made periodically to describe the fauna in detail. The present paper describes annual differences in population numbers and in seasonal distribution of these species.

METHODS

The physiography of Patuxent Wildlife Research Center (PWRC), descriptions of trap sites, and use of collection methods, were previously described (Thompson, 1970). To enable comparison of results from the 2 years of study, Manitoba traps and overhead collections were used in the same sites, except the Manitoba trap at the river site and the associated overhead collections, was not operated because of poor catches in 1968. Data taken from this trap in 1968 were excluded from comparisons made in this paper. Routine collections by both methods were made on Mondays, Wednesdays, and Fridays at the 2 remaining sites, (the opening and pit) from May 9 through Sept. 13, 1969. (Collection dates for the 2 years of study differed by only 1 day; therefore, the 1968 dates will be used here.)

Results and Discussion

The Fauna.—This study produced 4,807 females (and 2 males) representing 37 species in 3 genera: 17 in *Chrysops*, 14 in *Tabanus*, and 6 in *Hybomitra* (Table 1). The 1968 and 1969 faunas were very similar (see Thompson, 1970, fig. 3). The 3 genera collected included similar numbers of species in 1968 and 1969: *Chrysops*, 18 and 17; *Tabanus*, 17 and 14; and *Hybomitra*, 5 and 6. *C. delicatulus*, *C. dimmocki*, *C. flavidus* var. *reicherti*, *T. calens*, *T. fairchildi*, and *T. sparus* var. *milleri* were collected in 1968, but not in 1969. *C. beameri*, *C. separatus*, and *H. illota* were collected in 1969, but not in 1968. Six of the above 9 species were represented by 1 specimen; 3 species, by 3 specimens.

Comparison of Collecting Methods.—The Manitoba trap was again collective; only 5 *Chrysops* spp. (*C. aberrans*, *C. beameri*, *C. cursim*, *C. geminatus*, and *C. univittatus*) were not taken in Manitoba traps (Table 1). The first 3 of these were represented by only 1–2 specimens. Additional conclusions made here would corroborate those made for the 1968 study regarding the collectivity of the Manitoba trap, its efficiency for collection of *C. callidus*, and the effectiveness of overhead collections for 7 of the 8 dominant *Chrysops* spp. (especially for *C. macquarti*, *C. univittatus*, and *C. vittatus*).

Site Specificity and Fly Habitat Selection.—Again the gravel pit site was a more productive collection site than the opening. Only 1 species (*T. superjumentarius*) was taken at the opening and not at the gravel pit. But catches of the same 4 species (*T. lineola*, *T. pallidescens*, *T. subsimilis*, and *T. sulcifrons*) were again greater at the opening.

Relative Abundance.—Fig. 1 (Thompson, 1970) showed the relative abundance of 24 species represented by 10 or more specimens. The group of abundant species or dominants (i.e., those with > 50 specimens) included the same 13 species in both years with 1 exception; *T. sulcifrons* decreased from 64 specimens in 1968 to 15 in 1969. In both years, the 6 most abundant dominants were the same, and 57–58% of all specimens collected included the same 4 *Chrysops* spp. (*C. pudicus*, *C. montanus*, *C. vittatus*, and *C. flavidus*) and *H. lasiophthalma*.

Seasonal Distribution.—Fig. 1 compares the population distributions of species represented by 50 or more specimens each year (*T. sulcifrons* had less than 50 specimens in 1969). Populations of all dominants were earlier (5–30 days) in 1969 than in 1968; with those dominants having sharp and regular rates of increase and decline in both years (*C. callidus*, *C. vittatus*, and *H. lasiophthalma*), peaks of abundance were also earlier in 1969 (10–25 days). In 1969, populations of the most abundant dominants (those represented by 300 specimens) either decreased negligibly (*C. montanus*, by 5.1% and *C. vittatus*, by 6.4%) or increased appreciably (20–40%) (*C. flavidus*, *T. lineola*, *T. petiolatus*,

Table 1.—Collection methods and catches (females) of Tabanidae taken at Patuxent Wildlife Research Center, 1969.

Species	Manitoba Trap Totals	Overhead Totals	Grand Totals
Chrysops aberrans Philip		2	2
beameri Brennan		1	1
callidus Osten Sacken	403	21	424
calvus Pechuman & Teskey	11		11
carbonarius Walker	1		1
celatus Pechuman	53	164	217
cincticornis Walker	18		18
cursim Whitney		1	1
flavidus Wiedemann	179	347	526
geminatus Wiedemann		14	14
macquarti Philip	4	163	167
montanus Osten Sacken	217	371	588
niger Macquart	15	1	16
pudicus Osten Sacken	240	397	637
separatus Hine	1		1
univittatus Macquart		60	60
vittatus Wiedemann	1	564	565
Tabanus lineola Fabricius	399		399
marginalis Fabricius	12		12
melanocerus Wiedemann	33		33
molestus Say	1		1
nigripes Wiedemann	26		26
pallidescens Philip	7		7
petiolatus Hine	244	2	246
pumilis Macquart	11		11
quinquevittatus Wied.	3		3
similis Macquart	6		6
subsimilis Bellardi	31		31
sulcifrons Macquart	14	1	15
superjumentarius Whitney	1		1
trimaculatus P. de B.	260		260
Hybomitra hinei hinei (Johnson)	4	1	5
illota (Osten Sacken)[a]	1		1
lasiophthalma (Macq.)	469	2	471
sodalis (Williston)	13		13
trispila (Williston)	4		4
typhus (Whitney)	13		13

[a] Maryland State record and southward extension of U.S. distribution (1 female, June 2).

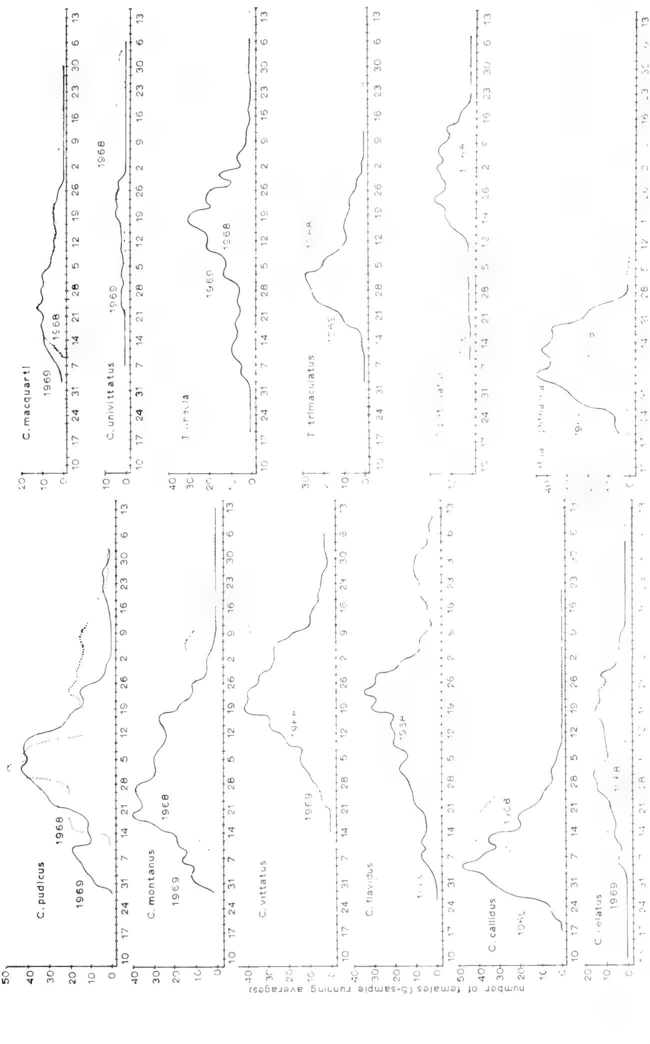

FIG. 1.—Seasonal distribution of the 12 most abundant species of Tabanidae, Patuxent Wildlife Research Center, 1968 and 1969.

and *H. lasiophthalma*). The large percentage decreases in 1969 populations of *C. univittatus* (49.1%) and *T. sulcifrons* (73.5%) are less significant because these species were represented by only small populations.

Although the *Chrysops* dominants appeared earlier in 1969, most species continued as late into the season as they had the preceding year. As in 1967 at Great Swamp (Thompson, 1967a, 1969), the distribution of *C. callidus* was discontinuous, with a 34-day interim between collection dates of the last 2 specimens (16 July–20 Aug.). This species increased and declined more rapidly at PWRC than the other *Chrysops* dominants (*C. pudicus*, *C. montanus*, *C. vittatus*, or *C. flavidus*). Except for beginning dates, no major differences occurred between the annual distributions of *Chrysops* dominants. As in 1968, populations of the dominants of *Tabanus* and *Hybomitra* increased and declined gradually. Again the distribution of *H. lasiophthalma* was similar to that of *C. callidus*.

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DISTRIBUTIONAL RECORDS OF SOME GELASTOCORIDAE IN THE COLLECTION OF THE AMERICAN MUSEUM OF NATURAL HISTORY (HEMIPTERA)

E. L. TODD, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—Distributional records are given for 28 species and subspecies in 2 genera of Gelastocoridae.

A small assemblage of unidentified Gelastocoridae from the collection of the American Museum of Natural History, New York, has been examined. A total of 212 specimens representing 28 species or subspecies were included. The species identified and localities at which they were collected are listed as follows.

Gelastocoris oculatus oculatus (F.) 1798, Suppl. Ent. Syst. p. 525.

Alabama: Gallant, 1♂. Arizona: 5 mi. W. Portal, Cochise Co., 11 ♂, 13 ♀; S.W.R.S., Chiricahua Mts., Cochise Co., 1 ♂, 2 ♀; Littlefield, 1 ♂; Grand Canyon, 1 ♂, 1 ♀. Arkansas: Wedington Lake, Ozark Forest, Franklin Co., 1 ♀. California: N. San Juan, Nevada Co., 2 ♂, 2 ♀; Leggett St. Pk., Mendocino Co., 1 ♀; Dodge Ridge Ski Area, Tuolumne Co., 7 ♂, 5 ♀; Big Sur, Monterey Co., 1 ♀; Cloverdale, Sonoma Co., 1 ♂; Pine Valley, San Diego Co., 1 ♀; Mt. Shasta, 1 ♀; San Gabriel, Los Angeles Co., 3 ♂, 1 ♀. Florida: Valparaiso, 1 ♂, 1 ♀. Indiana: New Harmony, 1 ♂, 1 ♀. New Jersey: Jackson Mills, 1 ♂. Tennessee: Memphis, 1 ♀. Texas: 2 mi. S. Nacogdoches, 1 ♀. México: San Ignacio, Baja California, 2 ♀. The females from Baja California are the first I have examined from that part of México.

Gelastocoris oculatus variegatus (Guérin-Méneville), 1844, Icon. Reg. Animal B. Cuvier, pt. 7, p. 352.

México: Oaxaca, Oaxaca, 10 ♂, 9 ♀; Paderon, Rio Tehuantepec, Oaxaca, 1 ♂.

Gelastocoris bufo (H.-S.), 1840, Wanz. Insecten 5:88, pl. 174, fig. 536.

México: Mitla, Oaxaca, 1 ♀.

Gelastocoris rotundatus Champion, 1901, Biol. Centr.-Amer., Rhynch., Heter. 2: 347, pl. 20, fig. 18.

México: Tequixistlan, Oaxaca, 1 ♀.

Gelastocoris hungerfordi Melin, 1929, Zool. Bidrag fran Uppsala 12: 168, figs. 5, 27–31.

México: 5 mi. E. Villa Union, Sinaloa, 4 ♂, 5 ♀; 40 mi. N. Mazatlan, Sinaloa, 2 ♀; 10 mi. N.E. Xilitla, San Luis Potosi, 1 ♂. Costa Rica: Turrialba, 1 ♂, 1 ♀.

Gelastocoris peruensis Melin, 1929, Zool. Bidrag fran Uppsala 12:160, figs. 4, 15.

Perú: Rio Ucayali, 2 ♂; Upper Rio Huallaga, 1 ♀.

Gelastocoris nebulosus (Guérin-Méneville), 1844, Icon. Reg. Animal B. Cuvier, pt. 7, p. 351.

Perú: Middle Rio Ucayali, 2 ♂, 1 ♀. Brazil: Corupá, Santa Catarina, 1 ♀.

Gelastocoris fuscus Martin, 1929, Univ. Kansas Sci. Bull. 18(4):364, pl. 58, fig. 15, pl. 59, figs. 17, 19a, 19b.

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[1] Mail address: U.S. National Museum, Washington, D.C. 20560.

Perú: Middle Rio Ucayali, 1 ♂, 1 ♀; Achinamiya, 1 ♀; Rio Santiago, 1 ♀; Manis, 1 ♂. Brazil: Rio Javary, Benjamin Constant, Amazonas, 2 ♀.

Gelastocoris vicinus Champion, 1901, Biol. Centr.-Amer., Rhynch., Heter. 2:349.

México: Tolosa, Oaxaca, 1 ♂, 2 ♀.

Nerthra martini Todd, 1954, Pan-Pacific Ent. 30(2):113, figs. 1, 5.

California: Cleveland Nat. For., San Diego Co., 1 ♂, 1 ♀; Palm Canyon, 5 mi. S. Palm Springs, Riverside Co., 1 ♂. México: 41 mi. E. El Rosario, Norte, Baja California, 2 ♂, 3 ♀; 23 mi. S. El Marmol, Norte, Baja California, 5 ♂, 2 ♀; Arroyo San Javier, 28 mi. S.W. Loreto, Sur, Baja California, 5 ♂, 2 ♀; San Ignacio Mission, Sur, Baja California, 1 ♂; 37 mi. W. El Rosario, Norte, Baja California, 1 ♀.

Nerthra hungerfordi Todd, 1955, Univ. Kansas Sci. Bull. 37, pt. 1(11):398, figs. 51, 60, 78.

México: Huixtla Riv., Chiapas, 1 ♂. Guatemala: Variedades, Such., 1 ♂. The male from México is the first I have examined from that country.

Nerthra fuscipes (Guérin-Méneville), 1843, Rev. Zool. Travaux Ined. 6:114.

México: 20 mi. W. Acayucan, Veracruz, 1 ♂; Uxmal, Yucatan, 1 ♂, 1 ♀; Campeche, Campeche, 5 ♀; Colonia, Yucatan, 1 ♀; Carrillo Puerto, Quintana Roo, 1 ♀; Lago Catemaco, Veracruz, 2 ♀. Costa Rica: Turrialba, 1 ♂, 1 ♀. Colombia: Jocorpa Mission, Sierra de Perija, Magdalena, 1 ♀.

Nerthra manni Todd, 1955, Univ. Kansas Sci. Bull. 37, pt. 1(11):396, figs. 54, 66, 80.

México: Xalitla, Guerrero, 1 ♂; Piaxtla Riv., Sinaloa, 1 ♂; Rio Casala, 2 mi. S.E. Aguanueva, Sinaloa, 1 ♂; 5 mi. E. Villa Union, Sinaloa, 2 ♀; Tolosa, Oaxaca, 2 ♀.

Nerthra montandoni (Melin), 1929, Zool. Bidrag fran Uppsala 12:195, fig. 95.

Trinidad: Arima Valley, 1 ♂.

Nerthra peruviana (Montandon), 1905, Ann. Mus. Nat. Hung. 3:403.

Perú: Tingo Maria, Huanuco, 3 ♂, 1 ♀; Airport, Tingo Maria, Huanuco, 1 ♀; Middle Rio Ucayali, 1 ♂, 1 ♀.

Nerthra nepaeformis (F.), 1775, Syst. Ent. 2:693.

Brazil: Corupa, Santa Catarina, 3 ♀; Jacareacanga, Para, 1 ♀.

Nerthra terrestris (Kevan), 1948, Ann. Mag. Nat. Hist. (Ser. 11) 14:813.

Trinidad: Arima Valley, 1 ♀. Venezuela: Road La Victoria-El Vigia, Merida, 2 ♂, 1 ♀. Perú: Rio Ucayali, 1 ♂, 1 ♀; Rio Abujao, 1 ♂, 1 ♀; Middle Rio Ucayali, 1 ♂, 2 ♀. Brazil: Boraceia, Salesopolis, São Paulo, 2 ♀.

Nerthra bracchialis Todd, 1955, Univ. Kansas Sci. Bull. 37, pt. 1(11):400, figs. 45, 71, 79.

México: 42 mi. E. Villa Union, Sinaloa, 1 ♀.

Nerthra unicornis (Melin), 1929, Zool. Bidrag fran Uppsala 12:179, figs. 50–53.

Paraguay: Paso-Yobai, Caaguazu, 1 ♂. This is the first specimen I have seen from Paraguay.

Nerthra quinquedentata (Melin), 1929, Zool. Bidrag fran Uppsala 12:188, figs. 84–87.

Argentina: Mutquín, Catamarca, 1 ♂.

Nerthra ranina (Herrich-Schäffer), 1853, Wanz. Insecten 9:28, fig. 896.

Argentina: Mutquín, Catamarca, 1 ♀.

Nerthra ampliata (Montandon), 1899, Bull. Soc. Sci. Bucarest, Roumanie 8(4/5): 404.

New Guinea: No. 4, Kaindi on Meari Creek, 9.5 mi. from Wau, 1 ♀.

Nerthra robusta Todd, 1955, Univ. Kansas Sci. Bull. 37, pt. 1(11):429, figs. 102, 140.

New Guinea: Iamelele No. 1, Fergusson Isld. about 15 mi. No. 3, Papua, 2 ♂, 2 ♀; Reria Creek, Kwagira River, 50 mi. No. 7, 1 ♀.

Nerthra conabilis Todd, 1959, Nova Guinea, n. ser., 10, pt. 1:88, figs. 11, 22, 41.

New Guinea: Ulur Camp, Cromwell Mts., Morobe Dist., 2 ♂; Tempanpan, Salaweket Range, Morobe Dist., 1 ♀; No. 7, Kotuni, south slope Mt. Otto, Eastern Highlands Dist., 1 ♂.

Nerthra mixtella Todd, 1959, Nova Guinea, n. ser., 10, pt. 1:85, figs. 9, 38.

New Guinea: Biniguni, Gwariu River, 150 mi. No. 3, Papua, 1 ♀.

Nerthra cheesmanae Todd, 1959, Nova Guinea, n. ser., 10, pt. 1:82, fig. 24.

New Guinea: N. Slope No. 4, Mt. Dayman, Maneau Range, Papua, 1 ♂. This species was described from an unique female, but I now have a fair series of males from the collection of the Bishop Museum. The male sex of this species is, therefore, being described in a separate paper treating a large lot of material received from that institution.

Nerthra probolostyla Todd, 1960, Pacific Insects 2(2):193, figs. 23, 34.

Australia: Brown's Creek, Pascoe River, Queensland, 1 ♂, 1 ♀.

Nerthra alaticollis (Stål), 1854, Öfv. Svenska Vet.-Akad. Forhandl. 11:239.

Australia: Blackheath, New South Wales, 1 ♂; Katoomba, New South Wales, 1 ♀.

THE CORRECT HOST PLANT FOR GILPINIA PINDROWI BENSON

(Hymenoptera: Diprionidae)

In my paper on Pakistan sawflies (1971, Proc. Ent. Soc. Wash. 73:401–408, I recorded the hosts *Abies pindrow* Spach and *Picea excelsa* Link for the sawfly *Gilpinia pindrowi* Benson. Benson (1961, Ann. Mag. Nat. Hist., Ser. 13, 3:309–310) described *G. pindrowi* and gave the host as *Abies pindrow*, and host labels on all the specimens I have seen read "*P. excelsa.*"

Dr. M. A. Ghani, Commonwealth Institute of Biological Control, Rawalpindi, Pakistan (personal communication) informed me that the hosts recorded by Benson and me are wrong and that the larvae of *G. pindrowi* feed only on the needles of *Pinus wallichiana* Jackson. My interpretation of the host label "*P. excelsa*" was in error; it actually refers to *Pinus excelsa* Wallich. Further investigation of the correct host plant name, with the assistance of Dr. Dan H. Nicolson, Department of Botany, Smithsonian Institution, revealed that the host plant is *Pinus griffithii* McClelland. Satake (1971, *In* Hara, Flora East. Himalayas 2:12) treated this species as follows: *Pinus griffithii* McClelland (1854) (= *Pinus excelsa* Wall. ex D. Don (1824) not Lamarck, 1778; = *Pinus wallichiana* Jackson (1938)).

According to Dr. Ghani, *G. pindrowi* is distributed over all the northern areas of West Pakistan, not only in the Murree area as I stated.

David R. Smith, *Systematic Entomology Laboratory, U.S. Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560.*

SYNOPSIS OF THE NEOTROPICAL COCKROACHES OF THE GENUS NESOMYLACRIS

(DICTYOPTERA: BLATTARIA: BLATTELLIDAE)

FRANK W. FISK, *Department of Entomology, Ohio State University, Columbus, Ohio 43210*

and

ASHLEY B. GURNEY, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—*Nesomylacris* is a genus of small, short-winged, flightless cockroaches, now including the following 6 species: *cubensis* Rehn & Hebard and *fratercula* Rehn (Cuba); *relica* R. & H. and **derelicta**, n. sp. (Jamaica); **asteria**, n. sp. (Costa Rica); and **reddelli**, n. sp. (Tamaulipas, Mexico). So far as known, they inhabit ground litter primarily; some specimens of *reddelli* have been taken in a cave. Distinctive areas presumed to be of a glandular nature on the dorsum of the male abdomen occur in several species. The phallomeres of the male genitalia and exposed external characters of male genital segments distinguish the species, in addition to more general characters which serve in most cases.

As previously described, the genus *Nesomylacris* Rehn & Hebard consists of three species, two from Cuba and one from Jamaica (Rehn & Hebard, 1927; Rehn, 1930; Princis, 1969). We now describe three additional species, one each from Jamaica, Costa Rica and Mexico, thus broadening the distribution of the genus, also modifying the characters which define it. The generic description given by Rehn & Hebard (1927) must be changed as follows: 1. The apical male terga are sometimes specialized; we describe specialization in three species, including the type species, and closer study may eventually disclose it in other species, though it is unknown for them now. 2. The group of apical spines on the ventro-anterior margin of the front femur includes three spines, the basal one of which sometimes is only a little longer than the adjacent spine of the main series. Rehn and Hebard keyed out *Nesomylacris* as having three spines in the apical group, but in the generic description said ". . . two larger spines." 3. Pulvilli are small and apical, usually on tarsal segments 1–4, rarely (*reddelli*, n. sp. from Mexico, only) on penultimate segment only.

Other characters in the original 1927 description remain unchanged. The abbreviated overlapping or attingent tegmina in both sexes give adults of *Nesomylacris* a superficial resemblance to adults of the Neotropical genera *Lobodromia* and *Nelipophygus*, but the latter two genera both have the ventro-anterior margin of the front femur with

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[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

Type B spination (long spines in basal half, succeeded in apical half by abruptly shorter, closely set, more delicate spines); *Nesomylacris* has Type A (spines on that margin of one series, of gradually decreasing length).

Type-species of genus—*Nesomylacris relica* R. & H., by original designation.

Following the key to species, four of the species are treated in detail, but the two Cuban species are not discussed because we have no new information regarding them.

Acknowledgments.—We are indebted to Dr. Irving J. Cantrall, University of Michigan, for loans; to Dr. Thomas H. Farr, Institute of Jamaica, Kingston, for assistance when one of us (A.B.G.) collected in Jamaica; to Dr. James R. Reddell, Texas Tech University, Lubbock, Tex., for contributing specimens resulting from his speleological explorations; to Dr. David C. Rentz, Academy of Natural Sciences, Philadelphia, Pa., for the privilege of studying that collection; and to Dr. Thomas J. Walker, University of Florida, for contributing specimens.

KEY TO THE SPECIES OF **Nesomylacris**

1. Tegmina trigonal in shape, attingent only at the base, with their apices lateral, reaching only to the metanotum and exposing portions of the mesonotum and the lobiform sliplike wings (Rehn & Hebard, 1927, pl. 11, fig. 1); general color of pronotum, tegmina, mesonotum, metanotum and first abdominal tergum dark orange, contrasting with deep grey-brown of other terga; lateral margins of terga often pale spotted, the latter sometimes coalesced to form longitudinal band. (CUBA) .... *cubensis* Rehn & Hebard

   Tegmina quadrate or subquadrate, with their entire mesal margins attingent or slightly overlapping, reaching to the abdomen and covering mesonotum and wings in both sexes; general color of pronotum and, usually, the tegmina similar to central portions of abdominal terga; lateral margins of terga variable in color 2

2. Size small, male 7–8 mm, female unknown; highly contrasting color pattern, disc of pronotum and central areas of terga deep greyish brown, contrasting with head, wide lateral and anterior margins of pronotum, entire tegmina, and wide margins of abdominal terga and sterna of yellowish buff. (Rehn, 1930: Pl. 1, fig. 4; pl. 5, fig. 1). (CUBA) .... *fratercula* Rehn

   Size larger, 9 mm or more for males, females larger; color pattern not highly contrasting, tegmina, pronotum and terga with same base color, though patterns of paler markings may occur, without broad conspicuous pale abdominal margins 3

3. Male supra-anal plate transverse, without visible specialization in pinned specimens, but when cleared a median emargination evident at base (fig. 16, *em*), in female broadly trigonal with sides convex, apex weakly or not at all emarginate; right male stylus very long and acuminate, often hidden by margin of subgenital plate (fig. 15). (COST RICA) .... *asteria*, n. sp.

Male supra-anal plate broadly trigonal with convex sides, specialized or not, in female sharply trigonal with sides straight or convex, and apex notched; male styli subequal in size, or left one much larger than right one 4

4. Male supra-anal plate highly specialized with raised central area and deep pits (fig. 23); male styli subequal (fig. 22); pulvillus only on penultimate (normally 4th) tarsal segment; eyes somewhat reduced, interocular distance clearly exceeding interantennal distance (between scrobes); female with ocellar spots not visible; unicolorous buff or brownish red species. (Tamaulipas, MEXICO) .... *reddelli*, n. sp.

Male supra-anal plate specialized or not; male styli very unequal; pulvillus on tarsal segments 1–4; interocular distance subequal to interantennal distance; ocellar spots evident; deep reddish brown species, often with pattern of conspicuous paler color. (JAMAICA) 5

5. Male supra-anal plate with basal depression, bearing tuft of specialized setae, combined with similar setae on posterior margin of tergum 9 (latter usually hidden by overlapping terga 7 and 8 (figs. 1, 3); right stylus minute, left stylus with pronounced basally directed spicules (fig. 4); entire face deep mahogany, making it appear broader than in *derelicta*; abdomen often with pale dorsal spots near lateral margins, costal and posterior margins of tegmina usually conspicuously pale .... *relica* Rehn & Hebard

Male supra-anal plate unspecialized; right stylus small, but larger than in *relica*; face usually not uniformly mahogany, so that it appears narrower than above; abdomen without pale spots, and tegmina usually of more uniform color. .... *derelicta*, n. sp.

Nesomylacris relica Rehn and Hebard 1927
(Figs. 1–6)

The specialization of the male supra-anal plate is relatively inconspicuous in general view (fig. 1) and was not mentioned by Rehn & Hebard (1927). When examined in detail (fig. 3), the specialized slender apically curved setae on terga 9 and 10, those on the latter associated with a shallow circular depression, are obviously related to a glandular function. The holotype is so specialized. The male from near Corn Puss Gap has few specialized hairs, and some may have been rubbed off; the depression is distinctly formed. Between the styli of the subgenital plate is a small flap borne by the dorsal surface of the posterior margin (fig. 4). The left paraproct is long, blunt, clublike; the right one also is elongate, but is more slender, and, when seen from some directions, sharply acute (fig. 5). The phallomeres include a membrane which bears elongate spines on a somewhat triangular sclerotized plate (fig. 6, *sp.*), another sclerite (*sc*) occurs near the L2d.

Tegminal and pronotal measurements of our series from Hardwar Gap and Catherine's Peak compare well with those given by Rehn & Hebard (1927: 143), but our specimens are longer (males, 11.2–12.1 mm; females, 13.7–14.3 mm); our specimens were degreased following preservation in alcohol, and probably had less shrinkage than those reported in 1927.

Specimens collected by Gurney in 1966 (see records below) were all taken in leaf litter on the ground, in mountain forest, many in jars sunk flush with the ground level in such areas and baited overnight with molasses.

The following material has not been recorded previously: JAMAICA. Along path to Corn Puss Gap (ca. 1.7 mi. n. May Hall, or 3.8 mi. n. Bath), from south, St. Thomas Parish, May 20, 1969 (T. J. Walker) 1 male, 4 nymphs; near Hardwar Gap, St. Andrew Parish, along path opposite driveway to Holleywell Cabin #1, from funnel of leaf litter, June 16, 1970 (T. J. Walker) 1 male; Hardwar Gap, St. Andrew Parish, Ducks Pond Trail, July 25, 1962 (Farr, O. & R. Flint) 1 male, 4 females; Hardwar Gap, Portland Parish, 13–XI–1966 (Gurney) 2 males, 3 females; Green Hills, Portland Parish, 13–XI–1966 (Gurney) 2 males, 4 females; Catherine's Peak, near Newcastle, St. Andrew Parish, 4600–5000 ft., 16–XI–1966 (Gurney) 9 females.

Nesomylacris derelicta, n. sp.
(Figs. 7–11)

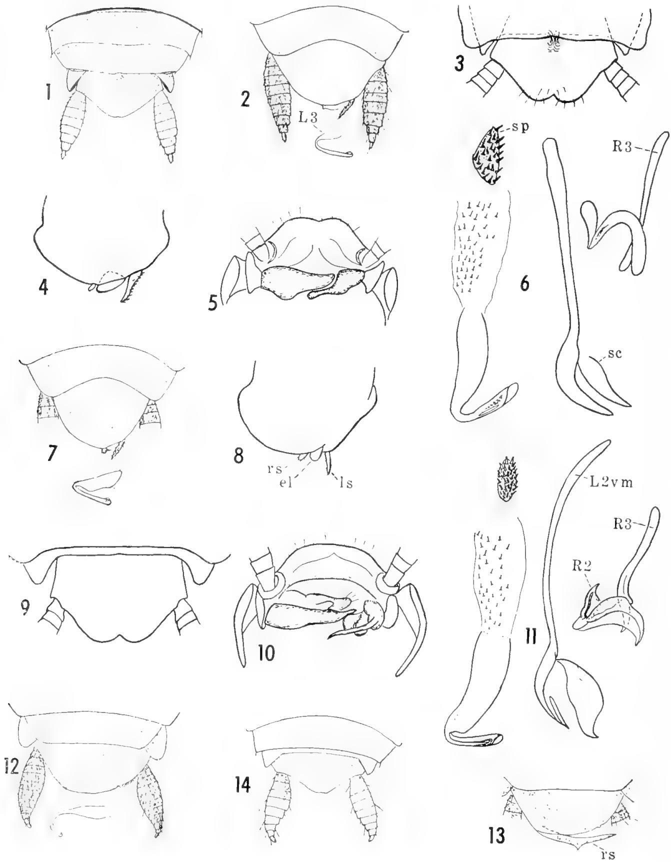
Male (holotype).—Size, 12.0 mm; form flattened, elliptical, widest across tegmina; wing slips covered by tegmina; body surface smooth; base color a deep reddish brown with no conspicuous color markings; legs and thoracic sterna tan.

Head barely visible from above, pyriform; maximum width subequal to depth; eyes widely separated and deeply emarginate, interocular distance equal to distance between antennal scrobes; ocellar spots conspicuous, dorsomedial to antennal scrobes but touching them; maxillary palp with basal segments moderately slender ultimate (5th) segment stout, spatulate with medial margin concave; 3rd and 5th segments of latter of subequal length, 4th segment ¾th length of either; antennae exceed body length.

Pronotum semi-circular in outline, with posterior margin slightly convex, lateroposterior angles and anterior portion broadly rounded; in transverse section pronotum broadly arched, more convex anteriorly where head fits beneath it; tegmina quadrate with lateral and medial margins slightly convex, posterior margins truncate, reaching 2nd abdominal tergum, latero- and medio-posterior angles rounded, venation obsolete; wings reduced to lobiform, articulate pads.

Abdomen broad, flattened dorsally, unspecialized; tergum 1 narrow, convex behind, nearly hidden by tegmina, with blunt median longitudinal carina; terga 8 and 9 covered by tergum 7 except for lateroposterior angles; posterior margin of tergum 7 somewhat concave; supra-anal plate (fig. 9) trigonal, with sides nearly straight and apex bilobate, lobes broad and shallow, but distinct. Cerci stout, fusiform spindle-shaped, relatively flat, smooth dorsally, rounded and setigerous ventrally.

Subgenital plate in transverse section strongly arched, ventral view as in fig. 8; conspicuous left stylus bearing only few spicules such as described for *N. relica*; margin between styli extended into an unpigmented elliptical lip; interstylar distance short, less than length of left stylus. Left paraproct not as broadly clublike



Figs. 1–6, *Nesomylacris relica* R. & H., based on males from Hardwar Gap: 1, terminal abdominal segments, dorsal view; 2, same, ventral view; 3, supra-anal plate and terga 8 and 9, dorsal view; 4, subgenital plate, ventral view; 5, paraprocts and associated structures, ventroposterior view; 6, phallomeres, dorsal view. Figs. 7–11, *N. derelicta*, n. sp., based on male paratypes from Catherine's Peak: 7, terminal abdominal segments, ventral view; 8, subgenital plate, ventral view; 9, supra-anal plate, dorsal view; 10, paraprocts and associated structures, ventroposterior view; 11, phallomeres, dorsal view. Figs. 12–14, *N. asteria*, n. sp., based on male holotype: 12, terminal abdominal segments, ventral view; 13, subgenital plate, ventral view, right stylus partially extended; 14, terminal abdominal segments, dorsal view. (Figs. 3–6, 8–11, KOH preparations.) Abbreviations: el, elliptical

in apical third as in *relica*, right paraproct with apical half much narrower at base than in *relica*; phallomeres as in fig. 11, membranous section bearing minute spines adjacent to sclerotized elongate-elliptical plate bearing strong spines of shorter length than in *relica*.

Coloration: Base coloration reddish brown on head, pronotum, tegmina and abdomen, shading to lighter brown on posterior and lateral margins of pronotum and tegmina; disc of pronotum has poorly defined median longitudinal pale mark that matches margins in color; 1st tergum of abdomen has narrow posterior margin of same color, also median spot near apex of supra-anal plate and dorsal surfaces of cerci. Head appears narrower than in *relica*, primarily because lateral and ventral margins of frons are suffused with buff; only narrow central portion is dark reddish brown. Legs and thoracic sterna tan with much darker mahogany patches on proximal anterior portions of coxae, largest on meso- and metacoxae.

Female (allotype).—Size, 12.5 mm; form broader than holotype, otherwise same. Detailed morphology also agrees with type male except as follows: Supra-anal plate more triangular in apical half, narrowly bilobed at apex; subgenital plate broad, symmetrical. Coloration likewise nearly identical to male; supra-anal plate has median longitudinal pale line, also weakly indicated on tergum 8.

Measurements.—4 males and 4 females (in mm): body length, ♂ 11.0–12.0, ♀ 11.8–13.5; pronotal length, ♂ 3.1–3.5, ♀ 3.4–4.1; pronotal width, ♂ 3.6–4.4, ♀ 4.8–5.0; tegmen length, ♂ 2.8–3.0, ♀ 3.3–3.7; tegmen width, ♂ 2.9–3.1, ♀ 3.3–3.5; width across both tegmina, ♂ 4.9–5.4, ♀ 6.0–6.3; hind tibial length, ♂ 4.1–4.6, ♀ 4.7–4.9.

Specimens of *Nesomylacris derelicta* examined: (8: 4 males, 4 females). JAMAICA. Catherine's Peak, St. Andrew Parish, 4600–5000 ft., 16–XI–1966 (Gurney), 2 males, 4 females (Holotype, Allotype, Paratypes) (Holotype, U.S.N.M. No. 71499); Hardwar Gap, St. Andrew Parish, 13–XI–1966 (Gurney), 2 males (Paratypes).

The name *derelicta* is a Latin word meaning neglected or disregarded. The species was found in the same habitat as *relica* and apparently both species occur together, but in the field it was not realized that two species were present, and possibly additional observations would show that there are somewhat different ecological preferences.

Nesomylacris asteria, n. sp.
(Figs. 12–18)

Male (holotype). Size, 13.0 mm, general form moderately broad, brachypterous, shining dark reddish brown.

Head narrowly triangular, glossy smooth; interocular space wide, subequal to interocellar space; eyes comma-shaped, broad dorsad, greatly narrowed ventrad to accommodate antennal scrobes; ocellar spots conspicuous, pale; maxillary palpi slender, ultimate (fifth) segment subequal to third or one and one-third times fourth.

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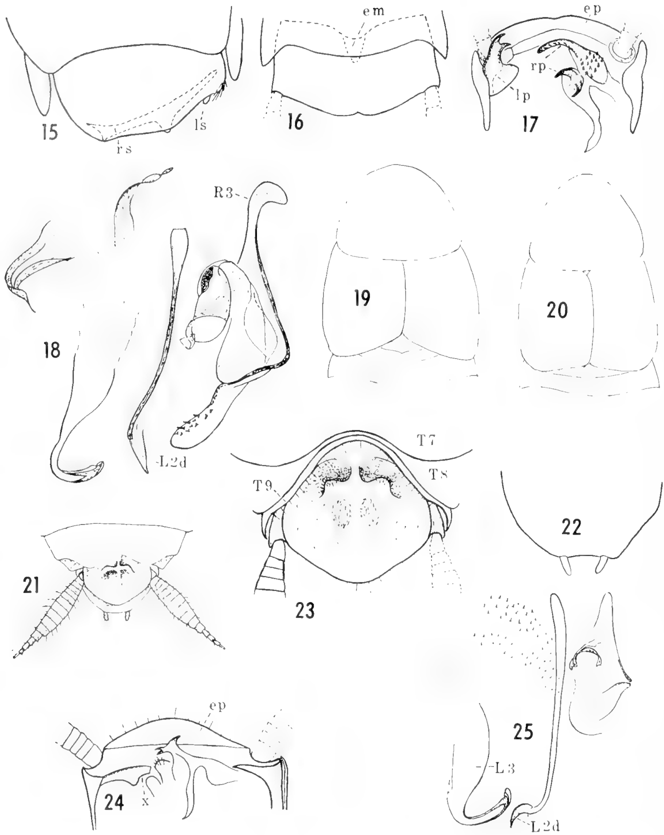
lip; L2vm, elongate sclerite of median phallomere; L3, third sclerite of left phallomere; rs, right stylus; R2, second sclerite of right phallomere; R3, third sclerite of right phallomere; sc, sclerite associated with terminal sclerite of median phallomere (L2d); sp, sclerotized plate near L3.



Figs. 15–18, *Nesomylacris asteria*, n. sp., based on male holotype: 15, subgenital plate and associated structures, ventral view; 16, supra-anal plate and associated structures, dorsal view; 17, paraprocts and associated structures, ventroposterior view; 18, phallomeres, dorsal view. Figs. 19–25, *N. reddelli*, n. sp., based on female paratype (19) and male holotype (20–25): 19, pronotum, tegmina, abdominal terga 1–2, dorsal view, female; 20, same, male; 21, terminal abdominal segments, dorsal view; 22, subgenital plate, ventral view; 23, supra-anal plate and associated structures, dorsal view; 24, paraprocts and associated structures, ventroposterior view; 25, phallomeres, dorsal view. (Figs. 15–18, 22–25, KOH preparations). Abbreviations: em, median basal emargination; ep, epiproct (supra-anal plate); lp, left paraproct; ls, left stylus; L2d, terminal sclerite of median phallomere; L3,

Pronotum arched in transverse section, ventrally curved laterad, posterior margin nearly straight, latero-posterior angles broadly rounded, head barely visible from above; tegmina subquadrate, posterior margins reach to base of tergum 1, marginal fields distinct in position and color, flared out horizontally, not curved like remainder of tegmina; wing slips clearly defined, articulate, failing to reach posterior margin of metanotum; latter margin transverse, entire except for minute median posterior projection.

Abdomen broad, flattened dorsad, no specialization evident in general view (see below); posterior margin of tergum 1 decidedly convex, the following terga less so; 7th and 8th terga very slightly convex, nearly straight transverse; tergum 8 nearly concealed by tergum 7; caudo-lateral angles of terga 7 and 8 blunt. Supra-anal plate (fig. 16) transverse, caudally directed apex very shallowly but distinctly emarginate; KOH preparation reveals specialized emargination at base of supra-anal plate. Cerci broad, somewhat compressed dorso-ventrally. Subgenital plate (figs. 12, 13, 15) asymmetrical, sides of plate both broadly curved; right side more evenly rounded. Right stylus long, slender, hidden; left stylus reduced to obscure, minute peg; acuminate right stylus has acute, caudally directed projection about midpoint in its length, usually hidden from behind and below by recurved posterior margin of subgenital plate; along latter margin, laterad of base of left stylus, is dense row of slender, medio-posteriorly projecting spinelike setae collectively resembling a fringe. Right paraproct with platelike base, marginally spined mesally, with a spined knob laterally, mesoventrally a separate sclerite bearing 2 short hooks; left paraproct with short base, 2 hooks (fig. 17); phallomeres as in fig. 18; L2d pale, triangular, weakly sclerotized; right phallomere with laterally curved anterior end (R3), a posterior section of membrane bearing 11 short spinelike spicules.

Front femur with 5 spaced spines on ventro-posterior margin; front tibia slightly shorter than tarsus; mid- and hind tibiae increasingly slender, hind tibia much longer than tarsus; tarsi each with arolium and 4 small pulvilli; tarsal claws symmetrical, unspecialized.

Coloration: Head dark reddish brown, like disc of pronotum, tegmina and abdomen; compound eyes nearly black; ocellar spots and antennal scrobes very pale, nearly white; pale brownish orange bar above labrum; spots surrounding anterior tentorial pits very dark, nearly black; palpi mostly pale grey, surfaces of ultimate and penultimate segments light brown. Pronotum dark reddish brown except for lateral margins which shade into brownish orange; tegmina dark like pronotum except for brownish orange, broad marginal fields; dark apical spot on each wing slip hidden by tegmen. Abdominal terga dark reddish brown except for caudo-lateral angles of terga 5 to 8, which are brownish yellow; supra-anal plate with same base color, but apical triangular area much lighter, nearly transparent. Cerci with same base color, distal segments pale. All abdominal sterna and subgenital plate also dark reddish brown, except for nearly transparent broad transverse recurved distal band on latter. Legs and tarsi brownish yellow; coxae yellowish white with poorly defined dark brown spots covering basal fourth of each.

←

third sclerite of left phallomere; rp, right paraproct; rs, right stylus; R3, third sclerite of right phallomere; T7, T8, T9, terga 7, 8, 9, respectively; x, left paraproct with apex apparently lost by breakage.

Female (allotype). Morphology and coloration as in male type, except as follows: Tegmina slightly longer, extend beyond tergum 1; supra-anal plate trigonal, not transverse, apex broadly rounded, not emarginate, plate has median raised area, entire plate dark reddish brown; subgenital plate deeply pouched, nearly hemispherical in shape, its dorsal margin semicircular.

Measurements, 3 males and 1 female (in mm): body length, ♂ 13.0–13.5, ♀ 13.5; pronotal length, ♂ 3.5–3.6, ♀ 3.7; pronotal width, ♂ 4.6–4.8, ♀ 5.2; tegmen length, ♂ 3.0–3.3, ♀ 3.5; width across both tegmina, ♂ 5.7, ♀ 6.2; hind tibial length, ♂ 4.2–4.5, ♀ 4.5.

Specimens of *Nesomylacris asteria* examined: (4: 3 males, 1 female) COSTA RICA. 13 km. n.w. Turrialba, 0.7 km. n.w. Santa Cruz, Cartago Prov., Oct. 1, 1961 (Hubbell, Cantrall & Cohn), 1 female (Allotype) (University of Michigan Mus. of Zoology); Turrialba, Cartago Prov., Sept. 30, 1961 (Hubbell, Cantrall & Cohn), 1 male (University of Michigan Mus. of Zoology); Barba, Heredia Prov., July 17, 1966 (F. W. Fisk) 1 male (Holotype) (U.S.N.M. No. 71500); Zarcero, Alajuela Prov., July 30, 1966 (F. W. Fisk) 1 male (Paratype) (Ohio State University).

The name *asteria* is a Latin word meaning "precious stone"; because it is a noun, it would not require a change if ever transferred to a masculine genus.

Nesomylacris reddelli, n. sp.
(Figs. 19–25)

Male (holotype).—Size, 13.0 mm; form flattened, elliptical, brachypetrous; body surface smooth, pale buff color; antennae and legs relatively long and slender.

Head not visible from above, completely hidden by pronotum in resting position, pyriform in shape, maximum width about ⅘th depth; eyes small for genus, widely separate, deeply emarginate, interocular distance exceeds interantennal distance by ratio of 11:9; ocellar spots small but evident; maxillary palpi slender, ultimate (5th) segment very little expanded, slightly longer than either 3rd or 4th segments, which are subequal; antennae greatly exceed body length.

Pronotum (fig. 20) semi-circular in outline, posterior margin nearly straight, other margins broadly rounded; in transverse section pronotum broadly arched; anteriorly, where head fits, it is convex, hoodlike; tegmina quadrate, reaching tergum 2, with lateral and medial margins slightly convex, posterior margins truncate, latero and medioposterior angles rounded, venation obsolete; wings reduced to lobiform pads, completely covered by tegmina.

Abdomen broad, flattened dorsally, specialized; tergum 1 narrow, convex behind, largely hidden by tegmina; terga 2 and 3 less convex posteriorly, those that follow with straight transverse margins; except for lateroposterior angles, terga 8 and 9 hidden by tergum 7; posterior margin of tergum 7 bilobed, rounded apices of lobes each at midpoint between median line and lateral margin, lobes thickened, appear softer than surrounding cuticle.

Supra-anal plate (figs. 21, 23) roughly diamond shaped with lateral angles (near cercal bases) rather sharply rounded and anterior and posterior angles broadly rounded; beginning near anterior margin is a median longitudinal ridge (flanked by pair of large shallow pits) which extends posteriorly about ¼th distance to posterior apex where it bifurcates sharply into pair of short transverse ridges which then curve posteriorly in lateroposterior direction and merge with surface of the plate. These paired ridges heavily pigmented and sclerotized on their sharp edges appear like inverted basal portion of a shield, anterior edges overhang large pits referred to earlier; between paired ridges median ridge continues posteriorly, flanked by pair of small shallow pits; median ridge, both anterior and posterior to bifurcation, blunt and without special pigmentation; whole specialization occupies proximal half of supra-anal plate.

Cerci slender, approximately ⅞th length of tegmina; contrasting with other members of genus, where cerci are about half tegminal length. Subgenital plate simple, symmetrical, briefly truncate apically between styli (fig. 21); styli simple, subequal in size and shape; interstylar distance twice length of stylus.

Right paraproct complex, with 3 sharp apical hooks, a fleshy lobe bearing slender marginal spines dorsad of hooks; left paraproct simpler, somewhat swollen at mid-length (may be broken basad of apex in preparation, fig. 24, x). Phallomeres as in fig. 25; hook (L3) of left phallomere with cleft near apex; L2d strongly sclerotized, crescent-shaped, sharply acute; membrane bearing both tiny and medium-sized spiniform spicules, no plate bearing large spines.

Coloration: Pale buff throughout except for white ocellar spots, nearly black bifurcate ridge on supra-anal plate, and some poorly defined suffusions of darker tan on tegmina and abdominal terga. Pale coloration may reflect an adaptation for cave life.

Female (allotype).—Size, 15.0 mm; larger than holotype, reddish tan, otherwise very similar.

Eyes widely separated, small, interocular distance exceeds interantennal distance by 3:2, median margins of eyes centered just above antennal scrobes; total eye length little greater than apical segment of maxillary palpus; ocellar spots not evident. Tegmina (fig. 19 from paratype female) subtrigonal, rounded lateroposterior angles reach tergum 2, posterior margins oblique so that medio-posterior (sutural) angles expose tergum 1 and part of metanotum; sutural margins nearly straight, lateral margins broadly curved; metanotum convex behind, with median posterior projection. Wings articulate, completely covered by tegmina.

Tergum 1 narrow, convex behind; terga 2 to 7 wide, transverse; terga 8 and 9 hidden; supra-anal plate broadly trigonal, sides straight with slight notch at apex marking distal end of weakly elevated median carina; cerci slender as in male; subgenital plate broadly curved, symmetrical. Legs as in holotype, a single pulvillus on penultimate segment of each tarsus.

Basic coloration reddish tan, uniform on nearly entire insect; darker than holotype; clypeus, palpi and tip of labrum somewhat paler; median carina of supra-anal plate marked by pale buff line.

Measurements, 1 male and 3 females (in mm): body length, ♂ 13.0, ♀ 15.3–16.0; pronotal length, ♂ 4.1, ♀ 4.8–5.3; pronotal width, ♂ 5.5, ♀ 6.4–7.0; tegmen length, ♂ 3.4, ♀ 4.3–4.8; width across both tegmina, ♂ 6.4, ♀ 7.8–8.5; hind tibial length, ♂ 5.8, ♀ 6.2–7.0. In addition there are 4 nymphs measuring 11.5, 11.5, 16.5 and 17.0 mm in length respectively.

Specimens of *Nesomylacris reddelli* examined: (8: 1 male, 3 females, 4 nymphs). MEXICO, Tamaulipas: 4 mi. S.W. Cd. Victoria, 1200 ft., Aug. 5, 1963, (Duckworth & Davis), 3 females (1 preserved as allotype, 2 others accidentally destroyed following study, except for tegmina); Cueva de El Pachon, 12 mi. s.w. Mante, among rocks near cave entrance, June 8, 1967, (James R. Reddell) 1 male, holotype (broken after study, only apical part of abdomen and tegmina preserved, U.S.N.M. Type 71501; 1 nymph); Cueva de El Pachon, June 22, 1971 (F. W. Fisk) 3 nymphs.

The above two localities are in southern Tamaulipas, separated by about 60 miles. Drs. W. D. Duckworth and D. R. Davis did not collect in caves, and their specimens were apparently associated with ground litter. The 1971 collections from Cueva de El Pachon were definitely from within the cave in the guano-covered, dimly lighted zone under flat rocks, presumably the same habitat noted earlier by Reddell. They were very scarce in this cave and could not be found in 7 other caves within a 40 mile range from El Pachon.

This distinctive species is named in honor of Dr. James R. Reddell in recognition of his diligent and productive efforts to enhance our knowledge of the United States and Mexican cave fauna.

Although *Nesomylacris reddelli* is not restricted entirely to cave habitats, based on the Victoria collection, it shows some indications of adaptation to cave living in the elongate legs and antennae, small eyes, and uniform pale coloration. Because of the presence of a pulvillus only on the 4th tarsal segment and the strikingly specialized male supra-anal plate, it is possible that future studies will show *reddelli* to warrant a different generic placement, but it agrees with most characters of typical *Nesomylacris* and we place it there provisionally.

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SUMMER TABANIDAE OF THE POCOMOKE RIVER SWAMPS, WORCESTER COUNTY, MARYLAND[1]
(DIPTERA)

PATRICK H. THOMPSON, *Veterinary Toxicology and Entomology Research Laboratory, U.S. Department of Agriculture, Agricultural Research Service, College Station, Texas 77840*

and

W. BRINTON SAGLE, III *and* JEANNE R. SAGLE, *Department of Entomology, University of Maryland, College Park, Maryland 20742*

ABSTRACT—Collections in Pocomoke river swamps in Worcester County, Maryland in 1968 and 1969 produced 13,084 specimens representing 40 species of summer Tabanidae in 4 genera—18 in *Chrysops*, 19 in *Tabanus*, 2 in *Hybomitra*, and 1 in *Diachlorus*. Catches from 1 modified Manitoba trap, an overhead collection, and a vehicle collection were made routinely at 3 sites (2 at Pocomoke Cypress Swamp (PCS) and 1 at Shad Landing State Park (SLSP)) every 2–4 days, July 2 through Aug. 23 (1968) or Aug. 25 (1969). *Chrysops vittatus* Wiedemann, *Tabanus lineola* Fabricius, *T. petiolatus* Hine, and *C. flavidus* Wiedemann, were among the 7 most abundant summer dominants at both study areas; 19 species were common to both study areas. *Chrysops obsoletus* Wiedemann dominated the PCS fauna with 60.2% and 77.4% of the material collected in 1968 and 1969, respectively. Summer dominants at SLSP in the 2 years of study were *C. vittatus* (58% and 69%) and *T. lineola* (13.5% and 7%). Populations of most species declined greatly in 1969 over 1968, especially at SLSP.

The Pocomoke Cypress Swamp was considered in a 1965 faunal study of Maryland Tabanidae (Thompson, 1967). Collections here, in Shad Landing State Park, and in other Pocomoke River swamps, were made in July and August, 1968 and 1969 to describe the Tabanidae of the lower Eastern Shore of Maryland.

The Pocomoke River and the River Swamps.—The Pocomoke River runs 60 miles from extreme south-central Delaware to Chesapeake Bay at the Maryland-Virginia State line. The gentle 3-foot fall of the river bed in Worcester County and the ebb and flow of the tide cause the sluggish flow of the river and the consequent formation of swamps along its margins. The *river swamps* of Shreve, et al. (1910) or *swamp forests* of Beaven and Oosting (1939) extend from just north of Rehobeth to the Delaware line and occupy a zone on each side of the river from 0.5–2 miles wide. The characteristic trees of the river swamp are the bald cypress, *Taxodium distichum* (L.)[2] Rich., and the tupelo, *Nyssa sylvatica* var. *biflora* (Walt.) Sarg. Shade from the dense canopy of the swamp forest restricts the diversity and abundance of shrubs and

[1] Mention of a proprietary product in this paper does not constitute an endorsement of this product by the USDA.

[2] Latin and common names taken from Gray's Manual of Botany, 8th ed., 1950.

Table 1.—Tabanidae taken by Manitoba trap (MT) and overhead collection (Ov), Pocomoke Cypress Swamp and Shad Landing State Park, 1968 and 1969.

	Pocomoke Cypress Swamp						Shad Landing State Park					
	1968			1969			1968			1969		
	MT	Ov	Tot	MT	Ov	Tot	MT	Ov	Tot	MT	Ov	Tot
Chrysops												
atlanticus Pech.		7	7									
brunneus Hine[a, b]	1	5	6									
callidus O. S.	13	19	32				3		3			
celatus Pech.	1	1	2		5	5	9	21	30	1	11	12
dacne Philip								1	1			
dimmocki Hine								1	1			
flavidus Wied.[b]	2	51	53	2	49	51	17	37	54	3	6	9
var. *reicherti* Fair.[b]							4	7	11	1		1
geminatus Wied.								1	1			
hinei Daecke[a, b]	1		1				5	126	131	2	19	21
macquarti Philip[a, c]								1	1			
montanus O. S.[a]					1	1						
nigribimbo Whitney							4	101	105	2	33	35
obsoletus Wied.	39	1239	1278	74	940	1014	2	8	10		1	1
pudicus O. S.[a]				1	1	2						
univittatus Macq.[a, b]					1	1		1	1			
upsilon Philip[b]					1	1						
vittatus Wied.[b]	3	162	165	5	276	281	86	1842	1928	28	415	443
Diachlorus ferrugatus (F.[b])	6	17	23				3	14	17			
Tabanus												
americanus Forster[b]	1	4	5				7	7	14			
atratus F.		1	1					1	1			

TABLE 1. (*Continued*)

	Pocomoke Cypress Swamp						Shad Landing State Park					
	1968			1969			1968			1969		
	MT	Ov	Tot	MT	Ov	Tot	MT	Ov	Tot	MT	Ov	Tot
fulvulus Wied.[a]	1	1	2				4	5	9			
gladiator Stone[a]		1	1									
lineola F.	150	25	175	164	12	176	417	33	450	42	3	45
maculipennis imitans Wlkr.							1	2	3			
melanocerus Wied.	10	3	13	15	1	16	186	15	201	8	2	10
molestus Say	1		1				1		1			
nigrescens P. de B.	2	2	4	1		1						
nigripes Wied.							5	3	8	1		1
nigrovittatus Macq.		1	1				1	1	2			
petiolatus Hine	138	121	259	336	28	364	231	55	286	40	7	47
pumilus Macq.							8	7	15			
quinquevittatus Wied.		1	1									
sparus var. *milleri* Whitn.	1	6	7	1	10	11	12	3	15			
stygius Say	18	4	22	12	2	14						
sulcifrons Macq.	5	8	13	2	1	3	1	1	2			
trimaculatus P. de B.	34	4	38	29		29					1	1
zythicolor Philip[a, d]												
Hybomitra												
daeckei (Hine)	8	2	10				2		2			
hinei hinei (Johnson)	1		1				7	7	14	1		1

[a] Worcester County record.
[b] Somerset County record.
[c] Wicomico County record.
[d] Taken in miscellaneous collections only.

herbs. The upland border, an area of transition between the swamp forest and the upland vegetation, is characterized by white cedar, *Chamaecyparis thyoides* (L.) BSP, several spp. of evergreen shrubs (mountain laurel, *Kalmia latifolia* L.; inkberry, *Ilex glabra* (L.) A. Gray; wax-myrtle, *Myrica cerifera* L.), and many spp. of herbs. Forests of loblolly pine, *Pinus taeda* L., and less commonly, scrub pine, *P. virginiana* Mill., characterize the uplands surrounding the swamp. Isolated from the south and the west by Chesapeake Bay and from the north by Delaware Bay, the river swamps are a northern extension of the southern cypress swamps that characterize the Atlantic Coastal Plain. Although they contain sphagnum and associated plants of the glaciated regions of northern bogs, the dominant trees and their associates are identical with those of the Dismal Swamp.

Description of Trap Sites.—The area called Pocomoke Cypress Swamp (PCS) is a 3.4 acre section of river swamp east of the Pocomoke River between Pocomoke City and Rehobeth. Trap sites used here were described in more detail in Thompson (1967). The first collection site was an upland opening in a stand of young loblolly pines ("opening"). The second collection site was a clearing about 27 m^2 in the upland border ("road"). The third collection site on the Pocomoke River was at Shad Landing State Park (SLSP), located 4 miles SW of Snow Hill on U.S. Highway 113. The Manitoba trap was placed on a road in a loblolly pine-sweetgum forest 1 mile W of the Park and 12 miles NE of the PCS sites.

Methods

Flies were taken routinely at each site by the Manitoba trap, by collections above our heads ("overhead" collections), and by collections from vehicles. Details of trap construction and the relative effectiveness of the collecting methods as indicated in previous studies were described in Thompson (1969). Routine collections were made at 3 sites, 2 at PCS and 1 at SLSP, every 2–4 days from July 2 through Aug. 23 (1968) or Aug. 25 (1969). Overhead and vehicle collections (pooled under "Ov" in Table 1) were made at each Manitoba trap site. The "daily catch" is the total number of specimens taken by all methods at a given locality on a given date, except that Manitoba trap catches actually included specimens taken during the 1–3 days preceding.

Miscellaneous Collections.—In addition to routine collections at the 3 sites previously described, overhead and vehicle collections were made on 1–4 different days at each of 11 other localities along the Pocomoke River from Shelltown to Whiton (1968) or on 1–5 different days at each of 21 other localities from Shelltown to Careytown and north to southern Delaware (1969).

Results

The 2-year study produced 13,084 specimens representing 40 species in 4 genera (Table 1). Of the total for 1968 (7,488), 44.3% (3,318 specimens) were from SLSP and 28.3% (2,121) were from PCS. Of the remaining 27.3% (2,049) taken in miscellaneous collections, the great majority, 93.5% (1,916), were taken at PCS or SLSP within about 1 mile of the routine collection site. Fig. 1 shows the seasonal distributions, expressed as population indices, for 12 summer species represented by 50 or more specimens at the 2 sites in both years.

Fauna of Pocomoke Cypress Swamp.—Four of the 5 most abundant summer dominants at PCS, *C. flavidus*, *C. vittatus*, *T. lineola*, and *T. petiolatus*, were also among the 7 most abundant species at SLSP. The 5th and most abundant species, *C. obsoletus*, dominated the PCS fauna with 60.2% and 77.4% of the material collected in 1968 and 1969, respectively; this species was represented by only 11 specimens at SLSP in the 2 years.

Fig. 1 suggests most of the summer species had emerged by July 2. In 1969 *C. obsoletus* declined at a rate greater than that of any other species taken in the 2-year study (July 28, 1969; fig. 1). The 8.4 inches of rain recorded for July 21–23 at nearby Pocomoke City (U.S. Dept. Commerce, 1969) could have accumulated throughout the nontidal swamp forest, drowning large numbers of pupae.

Populations of the 2 other *Chrysops* dominants, *C. vittatus* and *C. flavidus*, occurred throughout most of the season. *Tabanus petiolatus* reached peak numbers about July 24 in 1968 and about 1 week earlier in 1969. *Tabanus lineola* declined gradually from maximum numbers in early July; seasonal catches showed small differences for the 2 years (175 in 1968 vs. 176 in 1969).

Nine spring species taken in 1965 (Thompson, 1967) were not collected in 1968 and 1969 because collections were not begun until July 2. Catches at PCS from May 25–27, 1965 (also from 1 Manitoba trap, a vehicle, and an overhead collection) included: *C. niger* Macquart, 841; *C. brimleyi* Hine, 251; *T. marginalis* Fabricius, 83; *Hybomitra lasiophthalma* (Macquart), 57; *C. cincticornis* Walker, 8; *C. fuliginosus* Wiedemann, 6; *C. carbonarius* Walker, *C. calvus* Pechuman and Teskey, and *T. subsimilis* Bellardi, 1.

Fauna of Shad Landing State Park.—Thirty-three of the 39 species collected in the study were found at SLSP; among the 6 not found here, *Tabanus stygius* and *T. trimaculatus* were common at PCS. Summer dominants at SLSP in 1968 were *C. vittatus* (58%) and *T. lineola* (13.5%). *Tabanus petiolatus* and *T. melanocerus*, and 3 deer flies, *C. hinei*, *C. nigribimbo*, and *C. flavidus*, completed the list of most common forms. No data for description of spring species were available.

Chrysops vittatus was the most abundant summer deer fly at Shad

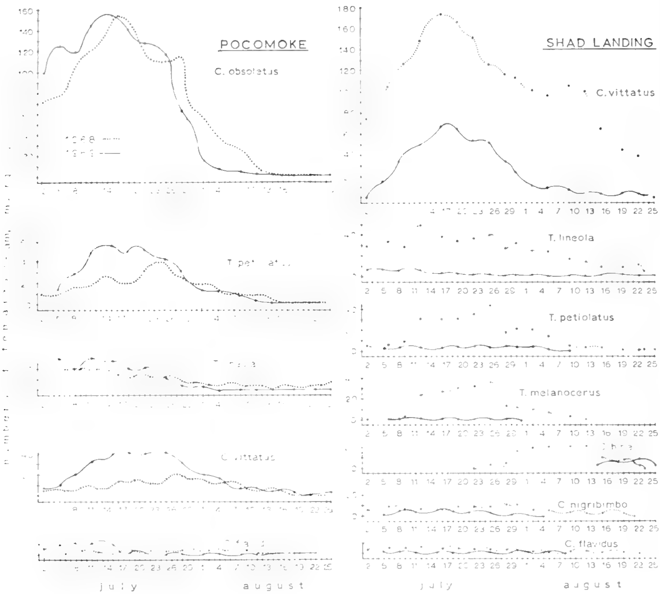

Fig. 1. Seasonal distribution, expressed as population indices of females, of species represented by 50 or more specimens at Pocomoke Cypress Swamp and Shad Landing State Park, 1968 and 1969.

Landing, as it had been at the Great Swamp and Patuxent Study areas. Although abundant at Pocomoke, it was greatly outnumbered there by *C. obsoletus.* The 1968 and 1969 populations of *C. vittatus* differed greatly (73% decline in 1969) but increased and declined in similar fashion and peaked at the same time in mid-July. As with *C. vittatus*, populations of the other *Chrysops* dominants, *C. hinei*, *C. nigribimbo*, and *C. flavidus*, declined greatly in 1969 (67–85%). *Chrysops hinei* was the latest common species collected, reaching maximum numbers in early August. Populations of *T. lineola*, the most abundant horse fly at SLSP in 1968, decreased by 90% in 1969.

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A NOTE ON THE IDENTITY AND STATUS OF GONODONTA MIRANDA RAYMUNDO

(LEPIDOPTERA: NOCTUIDAE)

E. L. TODD, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—The South American species *Gonodonta miranda* Raymundo is reduced to a subspecies of *G. bidens* Geyer; *G. bidens meridionalis* Todd is listed as a synonym of *miranda.*

The description of *Gonodonta miranda* Raymundo (1908, O Entomotogista Brasileiro 1(5):79–80) has been overlooked until recently. Notification of publication of the name did not appear in Zoological Record or in any systematic paper treating species of the genus published since 1908. Therefore, the name was not included in the revision of the genus (Todd, 1959, U.S. Dept. Agric. Tech. Bull. 1201). My awareness of the existence of the name resulted with publication of Part 2, Volume 1 of "Quarto Catálogo do Insetos que vivem nas plantas do Brasil" by d'Araújo *et al.* in 1968. That work cites three references to *Gonodonta miranda* Raymundo on page 235. Two of the references may be incorrectly associated with *miranda* as presently treated, but that possibility will be discussed at another point in this paper.

The original description of the adult does not agree with any *Gonodonta* species known to me. Furthermore, Raymundo did not indicate a type specimen nor did he state how many specimens were examined. He cited "Rio de Janeiro (Quinta da Bôa Vista)" as source of his material. Accordingly, entomologists in Brazil were contacted in

[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

an attempt to locate the specimen or specimens from which the species was described. Dr. José Cândido de Mello Carvalho, Museu Nacional (Rio de Janeiro) informed Dr. O. Mielke, Universidade Federal do Parana (Curtiba), of my interest. Dr. Mielke located two specimens in Raymundo's collection in the Instituto de Educação (Rio de Janeiro) labeled "*Gonodonta miranda* mihi, ♂, Rio de Janeiro" and carried them to his colleague, Vitor Osmar Becker, who, in turn, sent them to me for examination.

The two specimens, both females, not males as indicated on the labels, represent two species. The original description is a composite, with maculation and coloration characteristics of both species being included. Both specimens have suffered some damage from museum pests. One specimen has the legs missing, part of the right hindwing eaten and it has had the hindwings and abdomen broken from the specimen. Those parts are now glued to the thorax. That specimen is an example of *Gonodonta clotilda* (Stoll). The other specimen is an example of *Gonodonta bidens meridionalis* Todd. This specimen is in better condition than the *clotilda* specimen. Therefore, I have selected, labeled and now designate it as lectotype of *Gonodonta miranda* Raymundo. By this action the name proposed by Raymundo will apply to the South American subspecies of *Gonodonta bidens* Geyer with a bibliography as follows.

Gonodonta bidens miranda Raymundo, n. status

Gonodonta miranda Raymundo, 1908, Ent. Br. 1(5):79–80.—d'Araújo, et al, 1968, Quarto Catálogo dos insetos que vivem nas plantas do Brasil, Pt. II, 1:235.

Gonodonta soror (Cramer) auct. nec Cramer.—Guenée, 1852, Histoire Naturelle de Insectes, Species Général des Lépidoptères, v. 6 (Noctuélites II), p. 368 [partim].—Walker, 1857, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, pt. 12, p. 948 [partim].—Felder and Rogenhofer, 1872, Reise der Öster-reichischen Fregatte Novara um die Erde, Zoologischer Theil, v. 2, Abt. 2, Atlas, Inhalts-Verzeichniss Heterocera, p. 10, pl. 111, fig. 13.

Gonodonta bidens meridionalis Todd, 1959, U.S. Dept. Agric. Tech. Bull., No. 1201, p. 39. NEW SYNONYMY.

In the original description Raymundo described a larva and cited "'Carapeta' ou 'Itó' (Guaria trichilioides)" as the foodplant. This plant has more recently been referred to as *Guarea trichiliodes* with the Brazilian common name, carrapeteira. Two other plants have been cited as larval food plants of *Gonodonta miranda* Raymundo. They are *Cupania* (or *Blighia*) *vernalis* or camboatá and *Diospyros kaki* or caquizeiro. Because two species of moths were confused by Raymundo, it is uncertain whether the larva described and the foodplants cited are referable to *bidens*, to *clotilda*, or to both species. Entomologists working in the area of occurrence of the two species will have to resolve the questions through rearing experiments and comparative studies of the authentic larvae obtained from the experiments. For this reason I have omitted two references from the synonymical bibliography of *miranda*. The references are Monte, 1934, Publ. no. 21, Secr. Agric. Est. Minas Gerais, 220 pp. (I have been unable to obtain this work and cannot cite a page reference for *Gonodonta miranda* Raymundo) and Biezanko, Bertholdi and Baucke, 1949, Agros 2(3):163, 173 and 176.

The lectotype will be returned to Mr. Becker in Curitiba. He has indicated that the Raymundo collection may be moved from the Instituto de Educação in Rio de Janeiro to the Departmento de Zoologia, Universidade Federal do Parana, Curtiba, Brasil.

THREE SPECIES REASSIGNMENTS, ONE IN CHRYSOMELIDAE, TWO IN ANOBIIDAE
(COLEOPTERA)

RICHARD E. WHITE, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—The species *Calymmaderus aeneus* Pic (Anobiidae) is reassigned to *Oyarzuna* of Chrysomelidae and redescribed. *Byrrhocerus newmani* Brèthes (Byrrhidae) is placed in *Calymmaderus*, thus making *Byrrhocerus* a synonym of *Calymmaderus*. *Dorcatoma bibliophaga* Magalhães (Anobiidae) is transferred to *Falsogastrallus* of Anobiidae. Possible synonymy involving *C. newmani* and *F. bibliophagus* is discussed.

Examination of type specimens from the Maurice Pic collection in the Museum National d'Histoire Naturelle in Paris disclosed that the species *Calymmaderus aeneus* Pic, from Chile, though described in Anobiidae, is a member of Chrysomelidae. I below assign *C. aeneus* to the chrysomelid genus *Oyarzuna* Bechyné and offer a description and illustrations so the species can be recognized.

During my attempts to assign *C. aeneus*, I found that the monotypic genus *Byrrhocerus* Brèthes (1919), from Chile and assigned to the Byrrhidae, is not distinguishable from *Calymmaderus* Solier (1849), and below I synonymize the two.

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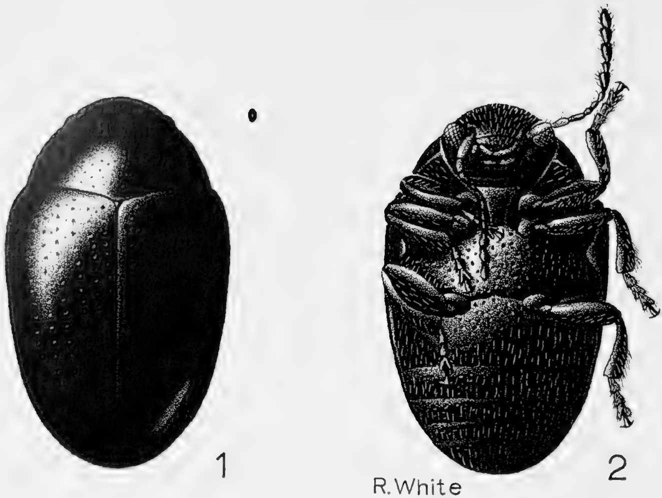
[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.



Figs. 1–2. *Oyarzuna aenea* (Pic), holotype. Small figure equals actual size.

The descriptions and illustrations of the anobiid *Dorcatoma bibliophaga* Magalhães (1907, and 1926) from Brazil show that this species does not belong in *Dorcatoma*, but is a member of *Falsogastrallus* Pic (1914).

Thanks are due to Madame A. Bons of the Museum d'Histoire Naturelle in Paris for loan of specimens.

Chrysomelidae

Oyarzuna aenea (Pic), n. comb.

(Figs. 1, 2)

Calymmaderus aeneus Pic, 1915, p. 10.

General: Body oval, widest at humeri, elytra tapering from humeri, body over 1.6 times as long as wide; body black, dorsal and ventral surfaces moderately shining, dorsal surface with a pinkish reflection; appendages black, apices of 1st and 2nd antennal segments orange-brown, segments 3 to 5 brown, remaining segments black; head moderately shining and with a vague pinkish reflection; pubescence sparse and recumbent on front half of head, longer and bristling on labrum, each mandible with a long bristle; pubescence on dorsal surface of body short, sparse, difficult to detect, appressed, hairs separated on an average by more than their lengths, easily abraded, on ventral surface rather sparse, moderate in length, subrecumbent, grayish, hairs separated on an average by about their lengths.

Head: Eyes bulging somewhat, separated by over 2.1 times vertical diameter of an eye; a fine groove extending diagonally from above eye to over base of antenna; antenna 11 segmented, 1st segment long, broad, 2nd shorter, less broad, 3rd about as long as 2nd, much narrower, 4th, 5th, 6th and 8th short, subequal, 7th, 9th, 10th, and 11th larger, similar in size, 7th, 9th, and 10th triangular, produced, a little longer than wide, 11th elongate oval, about 2 times as long as wide; head nearly evenly convex, surface finely alutaceous, front with fairly distinct, shallow punctures, separated on an average by about 2 times their diameter, punctures smaller, less distinct posteriorly; clypeal lines fairly distinct at sides, absent at middle; a very fine, impressed, longitudinal line extends from vertex to near clypeus.

Dorsal surface: Pronotum in profile evenly, moderately arching, disk evenly convex side to side, at extreme side more distinctly rounded, lateral margin sharp, complete, distinct, diagonal; surface smooth, not alutaceous, punctures elongate, fine, rather sparse, evenly distributed, separated on an average by 2 to 3 times their length; scutellum minute, triangular; each elytron with 9 fine striae composed of rows of punctures plus a scutellar stria; punctures of striae smaller toward apex but traceable; strial punctures on disk separated on an average by 1.5 to 2.0 times their length; between striae with smaller, irregular to linearly arranged punctures, surface otherwise smooth; margin at side of elytra distinct, recurved, less distinct, not recurved at apex.

Ventral surface: Prosternum produced, sides and anterior margins vertical, widest anteriorly, anterior width nearly 2 times posterior width, attaining anterior limit of middle coxae, closely joining anterior margin of mesosternum, sides arcuate, narrowest at level of middle coxae, proepisternum explanate anteriorly, a deep channel between prosternum and proepisternum, receiving antennae in retraction, channel continuing between coxae and prosternum; anterior margin of prosternum narrowly produced, surface anteriorly convex, posteriorly slightly depressed; anterior coxae transverse, separated by about their transverse diameter; side of body depressed for anterior legs, surface of depression finely rugose; mesosternum much reduced and withdrawn, narrowly visible between middle coxae; middle coxae separated by about their transverse diameter; body at side distinctly depressed for middle legs, depression including mesosternum, metasternum, and side of elytra; metasternum transverse, punctate at center, punctures separated on an average by about 1.5 times their diameter, at side depressed anteriorly and posteriorly, hind coxae widely separated by interposed 1st abdominal segment; side of body depressed for hind legs, depression including metasternum, elytra, and 1st abdominal segment, surface of depression finely rugose; 1st abdominal segment longest, 2nd and 5th shorter, subequal, 3rd short, 4th shortest, sutures fine, distinct throughout, punctation on 1st segment much as that at center of metasternum, finer to abdominal apex, much finer on 5th segment, abdomen from center of 2nd segment to 5th segment nearly flat; femora channeled for tibiae, and more or less flattened; middle and hind tibiae flattened; tarsi 4–4 (no hind tarsi clearly visible), widened, densely pubescent beneath, 3rd segment v-shaped, claws divaricate, a distinct, acute tooth at base.

Length: 1.9 to 2.1 mm.

Oyarzuna aenea (Pic) is possibly a synonym (junior) of *O. splendida* (Philippi), also from Chile. Unfortunately, the description offered by Philippi (1864, p. 390) is too brief and superficial to adequately characterize the species. Also, the original description of the genus *Oyarzuna* (Bechyné, 1950) is quite brief and offers little of value for comparison. However, *O. aenea* is in good agreement with the description and illustrations of *Oyarzuna*, as based on *splendida*, that are given by Monros (1956), and this is the basis for my assigning *aenea* to *Oyarzuna* and for the above comment on possible synonymy with *splendida*. I have not seen specimens of *splendida*.

The first specimen in the Pic series of three bears the species identification and a yellow label with the word "type" handwritten, and a red label with "type" printed.

Anobiidae

Calymmaderus Solier

Calymmaderus Solier, 1849, p. 472.
Byrrhocerus Brèthes, 1919, p. 26. NEW SYNONYM.

Byrrhocerus was described with the single species *newmani* (the type-species by monotypy) which I below reassign to *Calymmaderus*, thus making *Byrrhocerus* a junior synonym of *Calymmaderus*.

Calymmaderus newmani (Brèthes), n. comb.

Byrrhocerus newmani Brèthes, 1919, p. 27.

The detailed French description of *Byrrhocerus newmani* and the illustrations of its antenna and palpi leave no doubt that it is properly assigned to *Calymmaderus*. The description is in such close agreement with my description of the holotype of *Calymmaderus sericeus* Pic (1923) that the latter must be regarded as possibly a junior synonym of *C. newmani*. The only notable difference that I find is that the metasternum of *C. newmani* is described as bearing a weak, median, longitudinal impression; the metasternum of *C. sericeus* is not impressed. I have not seen specimens of *C. newmani*.

Falsogastrallus bibliophagus (Magalhães), n. comb.

Dorcatoma bibliophaga Magalhães, 1907, p. 97.

Examination of the French descriptions of *D. bibliophaga* and illustrations of the adult and its antenna (Magalhães, 1907 and 1926) clearly shows that this species belongs to *Falsogastrallus*. *F. bibliophagus* is possibly a senior synonym of *F. librinocens* (Fisher), 1938. Although the illustrations of *F. bibliophagus* (see Magalhães, 1926) disagree with specimens of *F. librinocens* in a number of points (i.e., proportions of the pronotum, shape of the 1st abdominal segment and form of the prosternal region), the haste with which the drawings were made could account for the differences. Unfortunately, I have seen no specimens of *F. bibliophagus*, so am unable to say with certainty that the two names refer to a single species.

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SYNOPSIS OF THE GENUS STATOR BRIDWELL IN THE WEST INDIES, WITH DESCRIPTIONS OF NEW SPECIES
(COLEOPTERA: BRUCHIDAE)

JOHN M. KINGSOLVER, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—The genus *Stator* Bridwell is recorded from the West Indies for the first time. Characteristics, distribution and host plants are given for the 5 known species: **rugulosus** n. sp., **chalcodermus** n. sp., **bottimeri** n. sp., *cearanus* (Pic), n. comb., and *dufaui* (Pic), n. comb. Relationships with mainland species are discussed.

Bridwell (1946) described the genus *Stator* based on *Bruchus pruininus* Horn, but not assigning any other species to the new genus. Johnson (1963) revised the genus for the United States, treating six species, including one new species. Johnson (1967) and Bottimer (1969) have published on host plant associations for various species in the U.S. fauna, but did not add to the number of species.

[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

I have been unable to locate any reference to species of Bruchidae from the West Indies being assigned to *Stator*. This paper records five species, three of which are new, and two are reassigned, one of which is part of a circumcaribbean complex needing further study.

Stator occurs throughout the Western Hemisphere from the United States to Argentina, although many species which should be transferred to *Stator* are presently assigned to *Acanthoscelides* in Blackwelder's catalog (1946). A complete revision of the genus is planned, but names are needed for certain biological and faunal studies now underway.

A list of generic characteristics was given by Johnson (1963).

I am grateful to Mme. A. Bons, Museum National d'Histoire Naturelle, Paris, for her assistance in loaning the types of *Bruchus dufaui* Pic and *B. cearanus* Pic.

Stator dufaui (Pic), n. comb.

Bruchus dufaui Pic, 1927, p. 11.
Acanthoscelides dufaui: Blackwelder, 1946, p. 759.

Body black. Antenna with four basal segments, tarsal pads, or occasionally entire tarsus reddish or reddish yellow. Vestiture of thinly scattered gray setae. Pygidium with three diffuse patches of gray setae on basal margin.

Head ovate with eyes strongly protruding laterally; depth of ocular sinus one-third length of eye; vertex and frons finely, densely fossulate, thinly setose; frontal carina prominent, microgranulate; antenna with seven distal segments forming a slightly eccentric, compact club. Pronotum subhexagonal, lateral margins in dorsal aspect angulate anteriorly, continuous in outline with margins of elytra; dorsal punctation fine, dense, discrete, thinly setose. Scutellum broader than long, depressed, densely setose. Elytra with strial rows normal, slightly impressed, with individual strial punctures discrete; intervals reticulate-strigate. Pygidium finely, densely punctate, each puncture bearing a short, appressed seta. Procoxae narrowly separated by prosternum. Mesosternum and metasternum shallowly foveolate with interspaces strigate-setigerous; metacoxal face finely foveolate, the foveolae discrete mesally but more densely placed and intricate laterally; metafemur with lateral ventral carina sinuately emarginate apically but without blunt angulation; metatibia with mucro length one-half of tibial width at its apex; lateral denticle one-half length of mucro; lateral carina sinuate, complete; intermediate carina obliterated; ventral carina prominent, sharp; dorsal coronal margin with three denticles. Male genitalia with ventral valve of median lobe triangular (fig. 2); internal sac finely spiculate, with large, triangular sclerite near middle of sac, hemispherical, denticulate sclerite near apex of sac; ejaculatory duct closed by circular valve flanked by thin, denticulate plates; lateral lobes (fig. 1) deeply cleft, bowed, expanded toward meson at apices.

Body length—2.75–3.0 mm. Maximum width—1.9–2.0 mm.

Holotype ♀ bearing label "Guadeloupe" and paratype ♀ with same data in the Pic Collection, Museum National d'Histoire Naturelle, Paris.

Type locality—Guadeloupe Island, West Indies.

New Records—PUERTO RICO: Aibonito, Aug. 3, 1923, June 9, 1934; Guyanilla, Feb. 21, 1933; Adjuntes, Mar. 23, 1933, in flower of *Inga laurina* (Sw.) Willd.; USDA Plant Quarantine interception, Puerto Rico, no specific locality, Feb. 24, 1941, in *Acacia riparia* H. B. K. ST. VINCENT: Kingstown, Oct., 1967. ST. THOMAS: Louisenhoj Estate, Mar. 26, 1941, in fruit of "*Ichthomenthia bicipula*" (sic) (now *Piscidia piscipula* (L.)). TORTOLA: Sage Mt., 1000′, Apr. 17, 1956. ANTIGUA: June 18. ST. JOHN'S, VIRGIN IS.: Feb. 20, 1971, in seeds of *Acacia riparia*. All material in the USNM collection.

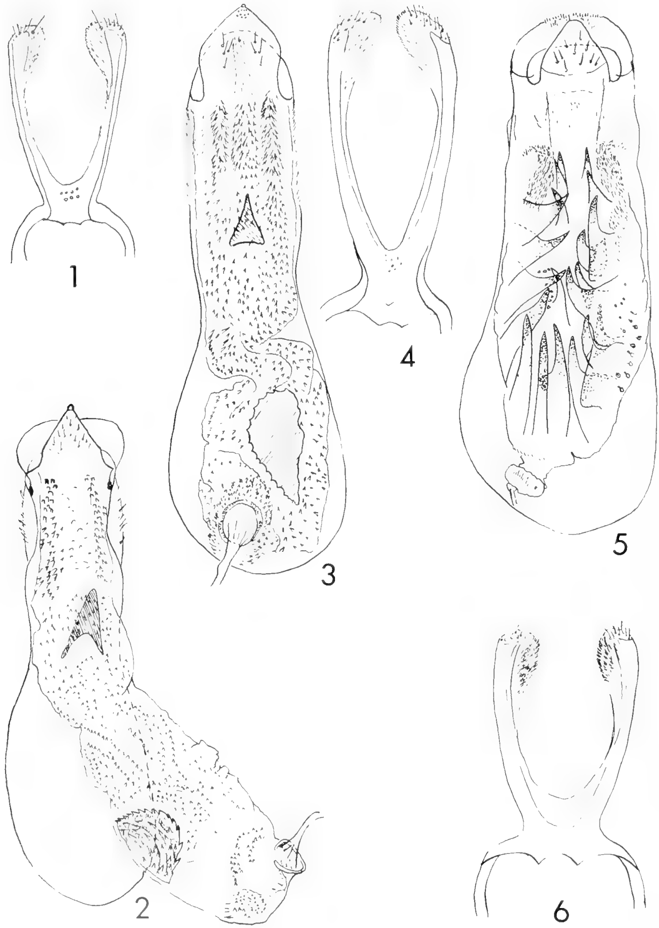
The habitus of *dufaui* is similar to that of S. *pruininus* (Horn) from the United States and Mexico, but the male genitalia indicate that the two species are only distantly related within the genus. The following characters differentiate *pruninus*: punctures of frons and vertex rounded, not fossulate; ocular sinus deeper than ½ length of eye; pygidium densely, uniformly clothed with slender, gray setae which conceal the fine punctation; vestiture not condensed into spots on basal margin of pygidium; front and middle legs entirely red with base of femur fuscous in some specimens; metacoxal face finely, evenly foveolate; armature of internal sac in male genitalia with many fine teeth and spicules (Johnson, 1963, fig. 1). On the strength of characters in the ♂ genitalia, *dufaui* will fall into or near the limbatus species group.

I have not seen specimens of *dufaui* from the mainland.

Stator rugulosus, n. sp.

Body reddish yellow to piceous; anterior ½ of basal abdominal sternum piceous; disk of pronotum, disk of pygidium, indistinct sutural stripe and apical ½ of elytra fuscous; legs reddish yellow; antennae yellow. Vestiture of long, narrow, yellow setae, densely, evenly placed on body except in mottled pattern on elytra.

Head with eyes moderately protruded; ocular sinus about ½ length of eye; vertex and frons finely punctate-reticulate; frontal carina prominent, finely granulate; apical ½ of clypeus finely granulate; postocular lobe reduced to fringe of coarse setae. Pronotum subconical, lateral margins nearly straight in dorsal aspect; lateral carina nearly hidden by vestiture, dorsal surface densely set with setigerous foveolae. Scutellum about as wide as long, setose. Elytra together slightly wider than long, finely but rugosely punctate on intervals, each puncture appearing to be the center of radiating strigulae; striae normal, marked by evanescent rows of setigerous foveolae in basal half, more distinct in apical half; pygidium finely, irregularly punctate, nearly concealed by vestiture. Procoxae not contiguous, separated by apex of prosternum. Mesosternum and metasternum punctate as on pygidium. Metafemur with lateral ventral carina gently sinuate subapically; metatibia with lateral carina partly obliterate, sinuate; intermediate carina lacking; mucro length ⅓ of tibial width at apex; lateral denticle ½ length of mucro; dorsal coronal margin with three denticles; metacoxal face densely punctate, punctation nearly concealed by vestiture. Terminal abdominal sternum strongly emarginate in ♂ for reception of apices of 8th tergite and pygidium, not emarginate in ♀. Male genitalia with ventral valve of median lobe ovate (fig. 3) with base broad, internal sac denticulate, denticles appearing to be in rows near apical orifice, macro-arma-



Figs. 1–2. *Stator dufaui* (Pic), ♂ genitalia: 1, lateral lobes, ventral; 2, median lobe, ventral. Figs. 3–4. *S. rugulosus*, n. sp., ♂ genitalia: 3, median lobe, ventral; 4, lateral lobes, ventral. Figs. 5–6. *S. bottimeri*, n. sp., ♂ genitalia: 5, median lobe, ventral; 6, lateral lobes, ventral.

ture consisting of triangular sclerite near apical orifice and irregular, denticulate, bivalve sclerite near apex of sac; ejaculatory duct closed by circular valve at apex of sac flanked by curved, denticulate, thin sclerites; lateral lobes as in fig. 4.

Body length—2.75 mm. Maximum width—1.8 mm.

Holotype ♂—CUBA: Baraguá, Mar. 20, 1945, L. C. Scaramuzza, E. E. A. Cuba Entom. No. 11222, in seeds of *Pithecellobium discolor* Britton. USNM Type No. 70398.

Allotype ♀, paratypes 2 ♂, 2 ♀, same data as holotype. 3 ♂, 1 ♀ paratypes, Cuba: Baraguá, Mar. 11, 1942, L. C. Scaramuzza, E. E. A. Cuba Entom. No. 11220.

This new species is not closely related to any other species of *Stator* I have seen. Most species of *Stator* have a smooth or a minutely sculptured integument, but in *rugulosus*, the surface of the body is rugulose, with the rugulosities nearly effacing the puncture series of the elytra. The lateral carina of the pronotal margin is nearly hidden in the dense vestiture, but the hind femur and the form and armature of the ♂ genitalia are typical for the genus.

Stator rugulosus is known only from Cuba.

Stator chalcodermus, n. sp.

Body black with bronzy highlights, front and middle legs red, hind legs black; antennae usually red but sometimes darker in middle segments of club. Vestiture of white or gray, coppery brown and golden setae intermixed and forming mottled pattern on elytra and pronotum with two irregular transverse rows of white spots on elytra; mixed coppery and gray beneath with lateral gray spots on abdominal terga; ♂ pygidium with mottled pattern similar to that on pronotum, and with vaguely condensed patches at anterior angles, disk with inverted, dark, U-shaped mark; ♀ pygidium with coppery sheen except each anterior corner with an elongate condensed patch of yellowish white setae, middle of basal margin with similarly colored small patch, apex with scattered small yellowish white setae.

Head with eyes moderately protruded; ocular sinus about one-half vertical length of eye; frons and vertex with dense, discrete, setigerous punctures; frontal carina with prominent, rounded boss between upper limits of eyes and extending as an impunctate line to fronto-clypeal suture, but sometimes faintly marked; clypeus densely punctate in dorsal one-half, granulate in ventral one-half; postocular lobe represented by narrow fringe of gray setae; segments of antennal club moderately eccentric. Pronotum campaniform; lateral margins slightly arcuate in dorsal aspect; dorsal punctures disciform, individual punctures ovate to circular, discrete, setigerous; interspaces flat, impunctate; basal lobe with short, median, impunctate sulcus. Scutellum rounded, densely setose. Elytra together as long as wide; strial rows normal faintly impressed longitudinally between setigerous, foveolate strial punctures; intervals densely microstrigate, setigerous. Pygidium of ♂ densely, finely punctate, nearly concealed by vestiture; of ♀ with dense, setigerous, disciform punctures in reticulate pattern but not concealed by vestiture. Procoxae nearly contiguous apically. Mesosternum and metasternum with punctation scattered, disciform, setigerous, interspersed with punctulation; metacoxal face with densely placed punctures in irregularly reticulate pattern covering entire coxal face; metafemur with lateral ventral carina shallowly, sinuately emarginate subapically; metatibia with ventral and lateral carinae complete, the latter slightly sinuate, intermediate carina obsolete; mucro 3 times as long as lateral tooth but one-third as long as width of tibia at apex. Terminal sternum of abdomen emarginate in ♂ for reception of apices of eighth sternum and pygidium; not emarginate in ♀. Male genitalia with ventral valve of median lobe lancet-shaped (fig. 7), dorsal membranous hood rounded; internal sac with 10 to 12 flat, falcate, rather slender spines grouped in a circle near middle of sac, not linearly arranged as in *S. bottimeri*, valve of ejaculatory duct circular, ringlike; lateral lobes (fig. 6) flat, bowed, expanded medially at apex.

Body length—2.5–2.75 mm. Maximum width—1.5–1.75 mm.

Holotype ♂—JAMAICA: Kingston, June 14, 1958, M. W. Sanderson, (J-58-2), NE slope Long Mountain, beating vegetation. USNM Type No. 70397.

Allotype ♀ and paratypes 1 ♂, 3 ♀, same data. Other paratypes—JAMAICA: Port Royal, Aug. 5, 1967, 1 ♂, 1 ♀, C. W. O.Brien; St. Andrew Ferry July 12, 1959, R. P. Bengry, 1 ♀; Kingston, Palisades, Aug. 25, 1966, Howden and Becker, 2 ♂. HAITI: Hinche, Aug. 30, 1930, H. L. Dozier, 3 ♂, 4 ♀; Port-au-Prince, R. J. Crew, 1 ♂; Poste Terre Rouge, Oct. 5, 1934, P. J. Darlington, 1 ♀. DOMINICAN REPUBLIC: San Jose de las Matas, June, 1938, P. J. Darlington, 3 ♂; Puerto Plata Prov., Aug. 23, 1967, L. H. Rolston, 2 ♀; Barahona, Sept., 1938, P. J. Darlington, 1 ♂; Colonia la Altagracia, Pedernales, Mar. 22, 1967, 2 ♂; Tamboril, Aug. 6, 1965, 1 ♀. PUERTO RICO: San Juan, Sept. 10, 1969, light trap, 4 ♂; Isla Verde, July 3, 1969, 30 ♂, 20 ♀.

Paratypes are deposited in the U.S. National Museum of Natural History, Washington, D.C.; Canadian National Collections, Ottawa; Museum of Comparative Zoology, Cambridge, Mass.; Northern Arizona University, Flagstaff; Institute of Jamaica, Kingston; Texas A. and M. University, College Station, Tex.

Stator chalcodermus, n. sp., is most closely related to S. *subaeneus* (Schaeffer) from Texas and Mexico, but with the following differences: in *subaeneus*, the eye is flattened and nearly contiguous with the lateral margin of the head, the posterior margin expanded and merging with the lateral part of the vertex, while in *chalcodermus*, the posterior margin of the eye protrudes laterally and is well separated from the vertex; in *subaeneus*, the lateral ventral carina of the metafemur is strongly emarginate subapically, while in *chalcodermus* the carina is merely sinuate; in ♀ *subaeneus*, the antero-lateral white spots of the pygidium are set in a diffuse, lunate band of golden setae while those of ♀ *chalcodermus* are yellowish white sharply delimited against a darker background; in *subaeneus*, the armature of the internal sac of the ♂ genitalia (Johnson, 1963, fig. 6) is a mixture of short and long spines with the shorter spines near the base of the sac, while in *chalcodermus* (fig. 7), most the spines are grouped in a circle near middle of sac but with a few spines at the apex of the sac long and slender; in *subaeneus*, the profile of the body in dorsal aspect is distinctly angulate at the juncture of the pronotum and the elytral humerus, while in *chalcodermus*, the profile is nearly contiguous.

Stator chalcodermus is known only from West Indian islands, while *subaeneus* is known only from the mainland.

Stator bottimeri, n. sp.

In size, color and general appearance similar to *Stator chalcodermus*, n. sp. but with the following exceptions: hind legs entirely red; antennae entirely red, seldom with darker suffusion near apex; in ♀, lateral patches on pygidium pure white; body less bronzy; ♂ genitalia (fig. 5–6) with 18 to 20 flat, broad spines, those near apex of sac more slender than those in middle (cf. Johnson, 1963, fig. 6), lateral lobes (fig. 6).

Holotype ♂—CUBA: near Santiago, Aug. 31, 1917, H. Morrison, USNM Type No. 70396.

Allotype ♀—Same data as holotype.

Paratypes: Same data as holotype, 3 ♂. CUBA: Cayamas, Jan. 1, June 6, Nov. 3, E. A. Schwarz, 1 ♂, 2 ♀; Camaguey, June 19, 1950, Berg & Link, 1 ♀, June 3, 1942, 2 ♂; Soledad near Cienfuegos, May–June, 1939, Parsons, 1 ♂, 1 ♀; Santiago, Oct. 2–10, 1913, 3 ♂, 1 ♀. BAHAMAS: Abaco Cays, Elbow Cay, Hopetown, Hayden & Giovannoli, 1 ♂; Eleuthera, July 9–15, Wickham, 2 ♂, 1 ♀; South Bimini Is., May–Aug., 1951, 16 ♂, 4 ♀. FLORIDA: Stock Is., Apr. 10, 1944, in *Acacia pinetorum* Hermann (reported as *Vachellia insularis* A. Rich.), 1 ♂; Cudjoe Key, Mar. 9, 1945, 4 ♂, 2 ♀, Apr. 11, 12, 20, 22, May 1, 2, 17, 20, 1960, L. J. Bottimer, in *Acacia farnesiana* (L.) Willd., 76 ♂, 48 ♀.

Paratypes in Canadian National Collections, Ottawa; U.S. National Museum of Natural History, Washington; American Museum of Natural History, New York; Museum of Comparative Zoology, Cambridge, Mass.

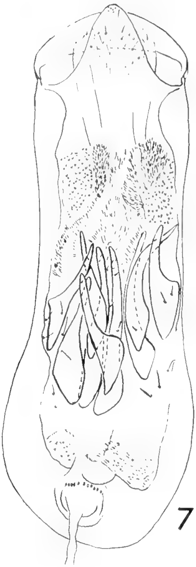
Although this species and *chalcodermus* are extremely closely related, the consistent color differences and distinctions in the male genitalia are entirely adequate to separate them.

I am grateful to Mr. Larry J. Bottimer for turning over to me the Cudjoe Key material which he collected. He has contributed much to the study of the Bruchidae with his painstakingly documented reared material, and I am pleased to name this species for him.

Stator cearanus (Pic), n. comb.

Bruchus cearanus Pic, 1930, p. 12; Bondar, 1936, p. 39.
Acanthoscelides cearanus: Blackwelder, 1946, p. 759.

Body black with the following exceptions: elytra red with intervals 1 and 2, humeri and marginal spot black; pygidium red, occasionally with basal margin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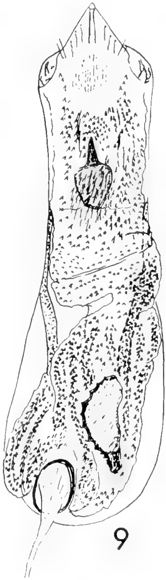
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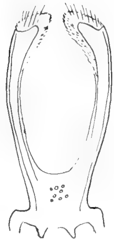
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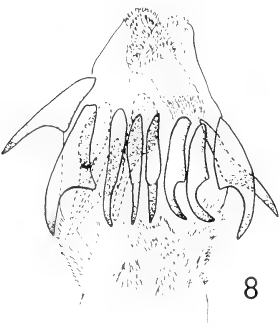
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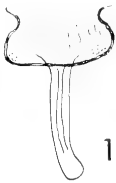
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Figs. 7–8. *Stator chalcodermus*, n. sp., ♂ genitalia: 7, median lobe, ventral, (lateral lobes identical to those of *S. bottimeri*); 8, everted internal sac showing armature. Figs. 9–11. *S. cearanus* (Pic), ♂ genitalia: 9, medan lobe, ventral; 10, lateral lobes, ventral; 11, spiculum gastrale. Figs. 12–13. *S. limbatus* (Horn), ♂ genitalia: 12, spiculum gastrale; 13, basal spine of internal sac.

piceous; abdominal sterna red except basal two-thirds of basal segment piceous; antennae red to yellow; labrum usually dark red. Vestiture of slender gray setae sparsely evenly distributed over dorsal and ventral surfaces except slightly more condensed on mesepimeron, along anterior margin of hind coxa, pleura of basal abdominal tergum, and in three vaguely defined, yellowish gray spots along basal margin of pygidium. Scutellum with dense, white pilosity.

Head short, subovate; eyes rounded, protruded laterally, well separated from lateral surface of head on posterior margin, postocular lobe narrow, setose, length of ocular sinus about one-half vertical length of eye; vertex and frons finely, densely punctate, punctures slightly coarser on basal two-thirds of clypeus, apical one-third of clypeus granulate; labrum finely, transversely striate, with transverse row of 6–8 silky, curved, golden setae; frontal carina vaguely defined as an impunctate line; antenna with segment 1 cucumiform, 2, 3 and 4 conical, 5 through 10 eccentric, trapezoidal, 11 elliptical, segments 5-11 forming a subserrate club. Pronotum broadly campaniform in dorsal aspect, apical margin evenly rounded, basal margin sinuate, ratio of width to length 11:7; dorsal surface evenly convex, slightly depressed on basal lobe, densely, evenly, finely punctate, the setigerous punctures separated by about their own diameters, an impunctate line on meson extending one-third length of pronotum from base toward apex; in lateral aspect, lateral margin inflexed, marked by a fine, polished, sinuate carina extending from postero-lateral angle to procoxal insertion; antero-lateral margin of pronotum posterior to eye with bisetigerous tubercle. Elytra with strial rows normal in course, not quite reaching basal margin; stria 1 extending submarginally around apex of elytron to end opposite hind coxa, striae 2, 3, 4, 8 and 9 extending nearly to apex, free apically, striae 5 and 6 short, joined apically, 10 submarginal, extending to a point opposite middle of apical abdominal sternum; strial rows shallow, punctures shallow, setigerous, causing scalloped margins on intervals; intervals microstrigate, setigerous, strigae interspersed with fine punctures. Scutellum quadrate, emarginate on posterior margin. Pygidium subtriangular, basal and lateral margins arcuate, marginal carina complete; surface densely set with very shallow, lunulate, or subhexagonal depressions, each with seta on its anterior border. Prosternum short, triangular, apex carinate, separating procoxae at their apices; postcoxal sulci of middle coxae meeting on meson; metasternal disk coarsely punctate; abdominal sterna densely, finely punctate, the punctures intermixed with microstrigae, punctures setigerous; apical margin of terminal sternum gently excised in ♂ to receive apex of pygidium; margin evenly arcuate in ♀. Front and middle legs normal, not modified; hind coxa densely, evenly punctate; hind femur clavate, lateroventral carina without subapical angulation, evenly sinuate, mesoventral carina with short, acute tooth; hind tibia with lateral, intermediate, ventral and mesal carinae complete, partial dorsal carina present; mucro short, about one-third as long as width of tibia at apex; lateral denticle prominent, acute; 3 or 4 dorsal coronal denticles present.

Male genitalia with ventral valve triangular (fig. 9), apex acute, incised laterally at base; armature of internal sac consisting of broad-based spine near apical orifice and an irregular, reniform sclerite serrate on one margin near apex of sac; gonopore closure valve ring-like, flanked by densely clustered pockets of fine denticles; interior of sac lined with many fine, acute denticles; lateral lobes (fig. 10) bowed in ventral aspect, rather short, with many sensitive setae at apices. Spiculum gastrale as in fig. 11.

Holotype ♀ bearing label "Ceara, 8–84," 8 ♂, 4 ♀, paratypes with same data, all in the collection of Museum National d'Histoire Naturelle, Paris.

Type locality—Ceará State, Brazil, S. A.

New records—ST. VINCENT: Botanical Gardens, in *Pithecellobium berterianum* Bentham (now *P. fragrans* Bentham). CARRIACOU IS.: (no locality), Mar. 3, 1932, in *Pithecellobium berterianum*. CURACAO: Schottgatwee, July 1–5, 1962, J. Maldonado C. JAMAICA: Kingston, Mar. 1, 1962. TRINIDAD: Port of Spain, May 8, 1925, S. A. Rohwer. VENEZUELA: La Vela de Coro, Mar. 20, 1918, in *Acacia* sp. COLOMBIA: Sta. Marta, P. J. Darlington; Rio Frio, P. J. Darlington. All material in the USNM except the latter in Museum of Comparative Zoology, Cambridge.

Stator cearanus is most closely related to *S. limbatus* (Horn) described from Baja California and Sonora, Mexico, but which ranges from California, Arizona and Texas to Panama (also introduced into Hawaii), and at least one other species, *Stator bisbimaculatus* (Pic) NEW COMBINATION (described in *Bruchus*) from Argentina and Uruguay. I have failed to find any external morphological characters other than color to separate these three species. The black abdomen, piceous antennal club and entirely black hind leg distinguish *limbatus* and *bisbimaculatus* from *cearanus* in which these parts are red; *limbatus* is distinguished from the other two by possession of a slender spine (fig. 13) near the apical orifice in the ♂ genitalia rather than a broad-based spine, and by the lyre-shaped, convex spiculum gastrale (fig. 12) rather than a simple, flat, Y-shaped type. Further collections are needed in Mexico and Central America and in northern South America to further elucidate the limits of these three species. For the present, the differences just outlined, however slight, will serve to distinguish them.

Relationships of West Indian Species of Stator

Of the 5 known species of West Indian *Stator*, *rugulosus* is known only from Cuba with no known relatives on the mainland, *chalcodermus* and *bottimeri* are closely related to species in Mexico and the United States, but not with any species yet known from Central or South America, and *cearanus* is part of a complex of 3 species reaching from western North America to Argentina. The relationships of *dufaui* are yet obscure, but characters in the ♂ genitalia place it near the *limbatus* complex.

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INCORRECT USAGE OF THE TERM "NEW SYNONYMY"

The late Harold Grant explained to me, several years ago, why it is incorrect to label a newly established synonym as "new synonymy." He, as an editor, and I, as an author, have tried to establish in literature the correct usage as "new synonym" rather than "new synonymy." But bringing others to this usage has been slow. Perhaps a special notice would add some converts.

A dictionary (Webster's) definition of synonymy is: "The scientific names (incorrect and correct), collectively, which have been used in different books to designate a species or other group; also, a list of these names." The same dictionary defines synonym as: "One of two or more words of the same language having the same or nearly the same essential meaning in all or some of their senses." If one accepts these definitions as essentially correct, synonymy is the total list of synonyms and a new synonymy would be a new total list. An individual name newly added to the synonymy of a species or a genus would be a new synonym. Entomological authors commonly confuse synonymy (the total list) with the individual synonyms, and label each name newly added to the list a "new synonymy." The correct term for an addition to the synonymy is "new synonym."

HENRY TOWNES, *American Entomological Institute, 5950 Warren Road, Ann Arbor, Michigan 48105.*

EVALUATION OF SEVERAL CHARACTERS BY WHICH FIVE SPECIES OF CHEYLETUS ARE DISTINGUISHED

(ACARINA: CHEYLETIDAE)

FRANCIS SUMMERS, ROBERT WITT *and* SHMUEL REGEV, *Department of Entomology, University of California, Davis, California 95616*

ABSTRACT—Results of this investigation indicate that the distinguishing morphological characters or combinations of characters already attributed to five species of *Cheyletus* by their describers are trustworthy within satisfactory limits. In respect to measurement data, some of the items measured provided information useful for taxonomic judgments, others did not. A method was devised for tabulating the amount of overlap between the linear measurements obtained for each of several characters among five species when the species are compared two at a time. This procedure emphasizes the measurement data which give the clearest differentiation between species.

The observed frequencies with which various numbers of teeth occur on the claw and combs of the pedipalps show that these tooth counts are useful in species taxonomy. Attempts to distinguish species according to small differences in types of particular setae were virtually unprofitable—except that the general form of body and appendicular setae may be distinctive, as in *cacahuamilpensis*.

The character and distribution of dorsomedian setae provide satisfactory bases for species discrimination. The qualitative or quantitative variations observed among the dorsomedians of species which normally bear a complement of dorsomedian setae were not serious enough to impair the worth of judgments based on the features. Strangely, more variations in the pattern and dimensions of dorsomedian setae were encountered in the variants of *eruditus*, a species normally having no dorsomedian setae. In these cases, however, the kinds of dorsomedian setae found on the exceptional specimens were unique for the species; such variants were not confused with other species.

The rearing and examination of large numbers of individuals in clones and inbred cultures, have not produced atypical specimens which deviated seriously from the general range of fluctuating variations of their kind. No hybrids or off-type intermediates were observed. Instead of furnishing important new morphological criteria for separating species, the results of this investigation tend to affirm rather than to deprecate the worth of the features already in general use. Observations on mating, laying and nesting are reported briefly for one or another of the five species.

About ten years ago five species of *Cheyletus* were collected within a small area of the campus of the University of California at Davis. The specimens were taken from feed grain trash and vegetable matter in hay debris and manure scooped from the floors of various domestic animal barns and stock pens. The species of *Cheyletus* were: *C. eruditus* (Schrank), *C. malaccensis* Oudemans, *C. aversor* Rohdendorf, *C. cacahuamilpensis* Baker, and *C. trouessarti* Oudemans. Samples collected from each kind of situation often yielded two species of *Cheyletus* in addition to species of other cheyletid genera, such as *Cheletomorpha* and *Acaropsella.*

Females of the five species of *Cheyletus* seemed to classify discretely, without confusing intermediate forms. Their distinguishing features are given in two recent publications (Volgin, 1969; Summers and Price, 1970). The characters by which they have been differentiated, although apparently serviceable for taxonomic purposes, are nevertheless minute, delicate and somewhat variable features. For example, the very tiny and hard-to-see dorsomedian setae are disposed differently or are absent on the different species. Among some of the more ornate species in other cheyletid genera, the dorsomedian setae are noticeably unstable in respect to number, location and, sometimes, conformation. One who copes with the differentiating characters described for *Cheyletus* species has to wonder about their reliability—whether all of the immediate descendants of an individual or a pair will classify as one species and not be confused with another. Since there appears to be some degree of intermingling of species within general habitats, is it possible that interspecific F_1 hybrids may appear (Edwards, in A. M. Hughes, 1960)? Another element of possible confusion may be introduced by the occurrence of two forms of males, homeomorphic and heteromorphic, as described for the ubiquitous species, *C. eruditus* (Hughes, 1960). What is their genetic or developmental significance in taxonomy?

In an effort to test the constancy or trustworthiness of the taxonomic characters already ascribed to the above-named species, the writers initiated the task of capturing live specimens of each one of these predaceous mites and rearing selected individuals and pairs under fairly constant, contrived conditions. The standardization of methods and materials ultimately proved to be less troublesome than the effort to capture and recognize living specimens of the mites.

The immediate objective of this study was to examine the currently recognized taxonomic features on significant numbers of these mites, to seek other criteria which may be useful for identifying species, and to record the kind or magnitude of deviations from the central tendencies of the populations observed. To this end, judgments on 40 possibly useful characters were made for samples of 100 slide-mounted females of each species; and many additional specimens reared from isolated pairs were examined for general conformity with our criteria of species. Involvement in a rearing program of the scope to be described inevitably has revealed other avenues of fruitful investigation; some of the side issues are reported here, others may be reported elsewhere.

Materials and Methods

Considerable information has been published about the relations of cheyletids to their prey organisms (Rodionov and Furman, 1940; Krantz, 1961; Soloman, 1962) and about the conditions under which the acarid prey organisms grow (Soloman, 1962; Sinha, 1962, 1968; Woodring, 1963). Thus the task of finding and rearing a suitable prey species did not entail much exploratory work. A good source of food organisms was found without much ado; this was a large sack of wheat bran stored in a cold room at 41°C, 70% RH. This material was heavily infested with *Acarus siro* Linn., *Glycyphagus destructor* (Schr.) and *G. domesticus* (DeG.), with the first species predominating. Although the preferences of these acarids for several other kinds of food were tested, as done by Radinovsky and Krantz (1961), the stock of *Acarus siro* growing on wheat bran was selected as a standard food supply for the cultures of *Cheyletus*. The cultures of food organisms and predators were incubated at 25°C and held within a humidity range of 80–85% RH. The culture vessels were stored on glass shelves in glass or plastic moist chambers the bottoms of which were flooded with saturated aqueous KCl.

The *Glycyphagus* species ultimately disappeared from the stock cultures of *Acarus siro* and, much later during the course of the work, another acarid, *Aleuroglyphus ovatus* (Troupeau), appeared and flourished in all of the laboratory stocks. The same food source, *Acarus siro* only, or *A. siro* and *Aleuroglyphus ovatus*, and the same procedures and culture vessels proved to be adequate for rearing each one of the five species of *Cheyletus*. The intrusion of *A. ovatus* in the food supply seems not to have had any noticeable effect on the vitality of the cultures as far as present purposes were concerned. The growth of the acarids was found to be appreciably stimulated when quick-cooking oat flakes were added to the bran, only a few flakes per culture tube.

Small mass cultures of acarids were reared in either of two kinds of containers. Most used were 4-oz screwcap glass baby food jars. One and one-quarter inch holes were punched in the metal screw-caps and bleached muslin was cemented over the openings. In practice, the jars were filled to half-volume with fresh bran, capped and preconditioned for about 24 hours in a humidifier before a substantial inoculum from an older culture was sifted in. Other mass cultures of acarids were cultivated in 100 × 100 × 15 mm square plastic Petri dishes. The venting tabs were trimmed from the bottom sections and the tops sealed on with 18 mm masking tape applied as circumferential strips. Insofar as the seals were nearly airtight, a small piece of wetted filter paper (about 1 × 2 cm) was included to boost the humidity of the enclosed air. Cobalt thiocyanate paper was used to monitor per cent R.H. where a rough check of the closed culture vessels was desired.

The Petri dish cultures were stackable and the condition of the acarids could be checked quickly with a dissecting microscope. Thriving mass cultures of the acarids were easy to produce but exceedingly difficult to keep confined.

Four types of containers were used for rearing *Cheyletus* species.

1. The supply stocks of different species were kept in the sealed square Petri dishes as described above. Some of these *Cheyletus* cultures survived long periods of neglect (5 months or more), depletion or disappearance of prey, and with humidities considerably lower than the optimum for *Acarus siro* (Solomon, 1962). Such stocks were refurbished or subcultured before mites were taken therefrom for experimental use.

2. Small "holding" cells were constructed by cementing 5 mm sections of thick-walled glass tubing (13 mm I.D.) onto molded flats of plaster of paris-charcoal mixture (Lipovsky, 1953). The plaster-charcoal slurries were cast in glazed ceramic dishes used for embedding tissues in paraffin. The upper, open ends of the cells were covered with 18 mm circular coverglasses "soldered" in place with paraffin. A pencil type of soldering iron was equipped with a slender screwdriver tip and dipped into a beaker of just-melted paraffin. A powerstat was used to reduce the temperature of the soldering iron to slightly exceed the melting point of the wax. Several touches of the iron to the margin of the coverglass usually sufficed to make a tight seal without overheating the glass cell. The breaking of the seal with a sliver of razor blade was troublesome and the covers often cracked. Small squares of thin plastic film were also used to cap the cells. The film was sealed onto the end of the cell with a very small amount of vaseline. This closure proved to be quite satisfactory when the amount of vaseline was properly adjusted.

The principal use of these small cells was to confine isolated pairs with a few food organisms so that the survival of both mates could be confirmed after a short period of exposure to each other. This was especially helpful when males were confined with female deutonymphs for the duration of the final molting period of the latter. The plaster flats bearing the cells were preconditioned in a moist chamber for at least 12 hours prior to use.

3. "Rearing" tubes were made of 18 mm O.D. pyrex glass tubing sawed into lengths of 60 mm. One end was closed with cigarette paper affixed with warm, dilute gelatin; a plastic snap-cap was used to close the other end of each tube. These tubes were used for rearing the progeny of isolated females and, sometimes, for starting cultures with selected pairs. Each tube was normally filled to about one-quarter of its volume with bran and acarids. Prepared tubes were stored horizontally on racks in moist chambers or placed upright with paper ends

down and resting on a wire grid. Although the parent cheyletids were not easily found in the mass of bran within the tubes, the finding of immature forms later sufficed to indicate survival of the female parent. The acarids sometimes multiplied to form dense masses which soon depleted the vegetable food supply after which they declined quickly. The heavy buildup may have affected the propagation of the cheyletids. When humidification failed, the prey organisms diminished quickly and additional bran and acarids had to be added. Increasing the volume of the bran added appreciably to the labor of harvesting the progeny of the selected cheyletids.

4. "Harvesting" cages were made of 50 × 10 mm circular, plastic Petri dishes. The venting tabs were trimmed from the edges of the bottom sections and the lids fastened down with 4 radial strips of narrow masking tape. The contents of the rearing tubes were transferred to these cages so that the progeny of the individuals originally isolated could be recovered and classified. The transfer of mites and food substrate from tubes to dishes could be done effectively by first dumping the bran and mites and then sharply tapping the up-ended tube with a pencil-like wand. The reverse transfer, dish to tube, was rarely done because some of the tiny immature cheyletids were usually lost or overlooked. Additional amounts of bran and acarids plus wetted paper strips were added at this time or at any time thereafter when unfavorable conditions prevailed.

Living specimens were recovered from bulk field samples with a Tullgren-type funnel extractor, and the extracted specimens were trapped on the surface of water or in a dry tube taped to the stem of the collecting funnel. Live or floating *Cheyletus* species were difficult to identify even when water-mounted specimens were temporarily immobilized with a coverglass. Female specimens suspected of being desired species were isolated in rearing tubes until F_1 female progeny matured and some of them sacrificed for specific determinations.

A routine was established for assessing the reproduction habits of each species. As soon as the first mass cultures permitted, approximately 20 rearing tubes were set up with one nymph each. Another 20 tubes were set up with one mature female each. If males were noticed in the stocks, an additional 20 cultures were established from attempted matings. One male and an active or a moulting deutonymph were caged together in small holding cells or sometimes seeded directly into prepared rearing tubes. The size of the nuptial cage—whether tube or cell—appeared not to affect the outcome of the mating attempt, but the use of the small cells for a short confinement gave a better check on the outcome of the final molt of the selected nymph. Much labor was expended in the setting up of intended matings because many of the isolated nymphs transformed into males instead of females.

At a much later date, the authors attempted to separate species in mass cultures of *C. malaccensis* (arrhenotokous) accidentally contaminated with *C. eruditus* (thelytokous) through the food supply. We noticed that the males of the former identified for us the moulting deutonymphs of its own species and, at the same time, the preoccupation of the males with only certain of the moulting deutonymphs identified these as females. Thereafter only such "identified" moulting forms of *malaccensis* were selected for mating trials.

Mature F_1 progeny from isolated individuals or from attempted intraspecific crosses were harvested by hand at irregular intervals between the third and fifth weeks or were harvested once with a Tullgren apparatus at the end of the fifth week. We believed that a growing period of five weeks yielded most of the brood of first generation adults without appreciable intrusion of mature individuals of a second generation. The estimate of five weeks was based on a 19 to 30 day cycle reported for *C. eruditus* (Beer and Dailey, 1956).

The progeny of attempted intraspecific crosses were sexed and counted but not minutely examined for phenotypic variations. In the case of attempted interspecific crosses, all individuals reared from each isolated pair, to a maximum sample of 20, were preserved and mounted for microscope examinations.

The length of leg I (Table 1) was measured as the distance between the coxo-trochanteral articulation and the tip of the tarsal claws. Tarsus I was measured from its proximal end to the distal face of the rounded elevation which bears the paired addorsal setae tc' and tc''. The mesal (paraxial) addorsal seta on tarsus I is noted as Tc' in Table 1. The gnathosoma was measured in the dorsal midline, from the arched apodeme which supports the hind margin of the stylophore to the apex of the rostrum. Macro. IV refers to the unusually long dorsolateral seta of tibia IV. In *cacahuamilpensis* the seta in this location is a short blade, not longer than its opposite companion. Post. Coxa I and Ant. Coxa III refer to lengths of the posterior or anterior setae on the coxae indicated.

Analysis of Taxonomic Characters

Forty characters were selected as possible criteria for distinguishing between the five species of *Cheyletus* available for study. Twenty of these were continuous variates selected to yield reasonably precise measurement data. For example, the distance between the two setae on the same sclerite could be determined to the accuracy limit of the micrometer whereas dimensions subject to severe parallax or distortion due to mounting were avoided. The other twenty characters were qualitative, some requiring judgment of degree or condition (e.g., form of setae), others were meristic or discontinuous variates (e.g., number of setae on podomeres).

Table 1. Means and standard deviations obtained for measurements of 20 characters in 5 species. Each mean represents 100 specimens. Two lots of *Cheyletus eruditus* were processed.

Characters	*eruditus* (lab. clone)	*eruditus* (wild)	*trouessarti*	*cacahuamil-pensis*	*malaccensis*	*aversor*	Mean Coef. Var.	LSD 1%
* Leg I	411.0 ± 19.4	417.4 ± 31.4	285.2 ± 26.6	277.2 ± 25.9	443.0 ± 32.1	365.4 ± 16.9	7.1	9.41
* Gnathosoma	189.3 ± 7.9	186.1 ± 14.8	141.0 ± 11.1	153.9 ± 9.3	207.9 ± 13.4	174.6 ± 8.1	6.2	4.03
* Tarsus I	115.0 ± 5.9	119.0 ± 7.3	88.3 ± 7.2	94.7 ± 6.3	136.3 ± 8.6	103.5 ± 4.8	6.2	3.11
Tibia I	87.2 ± 5.2	89.7 ± 9.0	54.1 ± 6.2	41.8 ± 4.0	92.9 ± 8.8	66.1 ± 3.8	8.7	
Sol. *w* I	26.0 ± 2.3	27.2 ± 3.0	16.5 ± 1.5	12.7 ± 1.8	23.6 ± 2.0	26.7 ± 2.7	10.3	
* Guard Seta	—	—	35.9 ± 3.8	59.2 ± 3.8	—	50.3 ± 3.8	8.2	2.23
* Ve	70.6 ± 4.8	68.9 ± 6.7	49.7 ± 4.7	45.3 ± 3.2	73.6 ± 7.3	60.8 ± 4.9	8.5	2.28
* Ve-Ve	130.7 ± 7.5	130.2 ± 12.9	94.8 ± 9.4	111.0 ± 10.9	181.0 ± 16.7	129.7 ± 8.4	8.5	3.44
Dl4	67.6 ± 5.0	65.3 ± 6.6	41.7 ± 3.9	41.2 ± 3.8	74.1 ± 7.7	60.2 ± 4.8	9.0	
Dl6	66.0 ± 4.6	62.0 ± 5.9	41.2 ± 4.4	39.4 ± 3.6	82.2 ± 8.5	66.4 ± 5.5	9.2	
* *Dl6-Dl6*	158.3 ± 9.1	150.7 ± 16.3	123.6 ± 17.0	141.5 ± 17.0	172.0 ± 14.7	142.6 ± 10.8	9.8	5.25
Dl6-Dl7	92.3 ± 5.5	91.9 ± 7.2	64.1 ± 9.6	58.3 ± 8.8	103.1 ± 9.4	77.2 ± 7.9	10.5	
Subcap.—Subcap.	69.4 ± 3.4	71.7 ± 6.1	50.3 ± 5.8	49.1 ± 4.5	63.8 ± 4.5	65.5 ± 4.1	7.9	
D.Plp.Fem.Seta	136.8 ± 7.2	134.9 ± 12.4	90.8 ± 8.3	47.8 ± 3.4	156.8 ± 13.3	109.7 ± 7.6	7.7	
D.Plp.Gen.Seta	89.3 ± 5.0	92.6 ± 9.9	61.7 ± 6.4	41.6 ± 3.5	103.3 ± 7.9	82.8 ± 5.8	8.3	
Humeral Seta	140.9 ± 8.1	144.4 ± 13.2	68.5 ± 7.4	48.2 ± 3.9	147.1 ± 21.0	100.2 ± 7.8	9.3	
* Macro. IV	141.6 ± 8.3	157.3 ± 16.0	84.6 ± 9.7	—	176.1 ± 13.7	106.4 ± 8.4	8.6	4.18
Post. Coxa I	88.5 ± 6.1	87.9 ± 8.8	61.3 ± 7.2	65.5 ± 6.6	104.9 ± 8.9	83.4 ± 5.7	9.0	
Ant. Coxa III	57.8 ± 3.6	60.0 ± 5.1	40.7 ± 6.0	35.4 ± 3.4	62.4 ± 6.4	52.5 ± 4.7	9.7	
Tc′ I	126.0 ± 6.7	127.0 ± 8.8	86.5 ± 8.6	75.3 ± 6.8	128.0 ± 8.6	93.2 ± 6.2	7.4	
Mean for Coef. of Variation	6.0	9.1	10.7	8.8	8.8	8.6		

Table 2. Comparisons of different combinations of five species in per cent overlap for measurements of eight characters.

Characters	1	2	3	4	5	6	7	8
	Lengths						Distances	
Species	Macro-Seta IV	Leg I	Tarsus I	Guard Seta	Gnatho-soma	*ve*	*ve-ve*	*dl6-dl6*
malaccensis	0	0	1		0	12	0	12
trouessarti	† 0	† 0	† 1		† 0	25	† 0	28
cacahuamil.		0	0		0	1	3	61
malaccensis		† 0	† 0		† 0	† 3	6	65
trouessarti	1	3	14		39	51	37	55
eruditus	† 1	† 3	30		18	26	14	77
malaccensis	0	11	1		16	36	6	53
aversor	† 0	61	† 5		65	96	53	75
cacahuamil.		0	41		78	8	82	93
eruditus		† 0	4		27	3	61	98
cacahuamil.		97	93	0	99	99	62	72
trouessarti		97	97	† 0	92	94	90	87
aversor	34	28	47	14	26	77	7	99
trouessarti	51	5	27	10	13	51	2	57
cacahuamil.		1	69	82	54	8	38	93
aversor		6	72	58	33	21	69	100
malaccensis	97	93	57		72	95	8	94
eruditus	91	97	86		74	99	59	81
aversor	14	85	94		100	100	100	100
eruditus	6	30	29		57	61	98	95

† Used to mark couplets in which neither value exceeds 5%.

Each of the 40 characters were examined on 100 specimens of each species. Items occasionally missing on one specimen were supplied from spare specimens or from the opposite (spare) side of the next specimen processed.

The use of laboratory-reared specimens was inimical to the purpose of this phase of the study because interest was focused on variations within species rather than within clones or families. Unfortunately, series from samplings of numerous localities in California were available only for *eruditus* and *trouessarti;* otherwise the scarcity of "wild" individuals required that the sample of 100 species be reared from one or a few wild specimens, or that all of the wild individuals be recovered from bulk material obtained in one or two locations. All of our data, therefore have the limitation of representing somewhat related clones or inbred families of each species rather than representing species in their broadest sense.

A. Continuous Variates.

The means and standard deviations for measurements of lengths or distances between two parts are given for 6 lots of 100 specimens each (Table 1). Coefficients of variation were calculated for the pairs of parameters (Mean ± Std. Dev.) and averaged for columns (species) and rows (characters). The individual coefficients are omitted from the table.

Eight of the 20 characters were subsequently judged to be more useful for taxonomic purposes (marked *) than the others and these were further analyzed for least significant difference (L.S.D.) values. Two lots of *eruditus* were processed. One lot comprised a clone reared in our laboratory (lab. clone) and included only females of four consecutive generations. The other lot of 100 specimens (wild) included females taken from at least 20 localities scattered throughout Northern California.

Although only small differences between the means of comparable measurements for the several species are required for statistical significance, the data of Table 1 are difficult to assimilate for taxonomic judgments. The means and deviations are probably more useful for comparing samples of populations within species whereas estimates of degree of overlap may better indicate the worth of such data for discriminating species. In an effort to reveal more clearly the utility of these measurements in taxonomy, a different presentation of the same data was devised. In Table 2, the amount of overlap in measurements is shown in per cent for the ten dissimilar combinations of five species taken two at a time. The lab-reared clone of *eruditus* was omitted from these comparisons. Each separate value in the table represents the frequency with which the measurements of a structure on one species lie within the observed range of the corresponding structure on another species. For example (Table 2, upper right), 12 per cent of the measurements of distances between setae of the pair *dl*6 on *malaccensis* overlap 28 per cent of the corresponding measurements on *trouessarti.* These percentages of overlap were obtained from frequency distributions of each character plotted over a common base line for each of the five species, approximately as done in Tables 3 and 4. The numbers are percentages because the sample size was 100 in each case.

In respect to most structural features, *trouessarti* is the smallest species in this series and *cacahuamilpensis* is but slightly larger; the largest of the five is *malaccensis.* Table 2 shows that some of the quantitative characters observed do not overlap when large and small species are compared (e.g., *trouessarti* vs. *malaccensis*) whereas species similar in general body size tend to show great overlapping in linear dimensions of various parts (e.g., *trouessarti* vs. *cacahuamilpensis*, or *aversor* vs. *eruditus*). If some arbitrary value is fixed as a level of tolerance for overlap, then it is easier to identify some quantitative characters as more serviceable than others for species identification. If the tolerance for overlap is limited to 5% or less for either value of a couplet the possibilities for distinguishing between species in each couplet according to several characters (rows), or the usefulness of each character for distinguishing several couplets of species (columns) can be roughly quantified.

Table 2 is arranged to show these discriminating critera in approximate diminishing order of value reading down and left to right. It therefore appears that, according to the samples tested, characters 1–4 should be of greater service in specific descriptions than others included in the table. A character such as the distance between setae *dl*6 and *dl*6 (Fig. 1) can be measured with precision but the information would be of dubious assistance when comparisons are being made between a few specimens.

The coefficients of variation averaged for species and characters (Table 1) appear to demonstrate several other tendencies of the samples observed. The means of the coefficients for 20 items (Mean ± Std. Dev.) in each column differ little between species. There is. however a large difference in these means for the two lots of *eruditus*. The mean C.V. of 6.0% for the reared clone versus 9.1% for the lot of wild specimens, indicates greater uniformity among the 100 individuals of the reared clone. The coefficients computed for items in the column for the lab-reared clone were consistently smaller than the coefficients (not shown) for the corresponding items obtained for the lot of wild specimens.

The coefficients averaged for rows appear to show that deviations observed for measurements of length of certain setae—verticals (*ve*) and second dorsolateral hysterosomals (*dl*6)—are not appreciably smaller than the coefficients averaged for distances separating the setae of each of these pairs (*ve-ve* on the propodosomal and *dl*6-*dl*6 on the hysterosomal plate). In other words, the amount of stretch between pairs of alveoli on each of these plates attributable to pressures of mounting appears to introduce no unusual source of variation. The greatest average coefficient was obtained for measurements of distance between setae *dl*6-*dl*7 on one or the other sides of the hysterosomal plate. This variability is probably related to developmental anomaly because *dl*7 is frequently not set opposite its mate.

B. Qualitative Characters.

The frequencies of variation—any noteworthy deviation from normal—among 20 qualitative or meristic characters are summarized in Tables 3–5 inclusive.

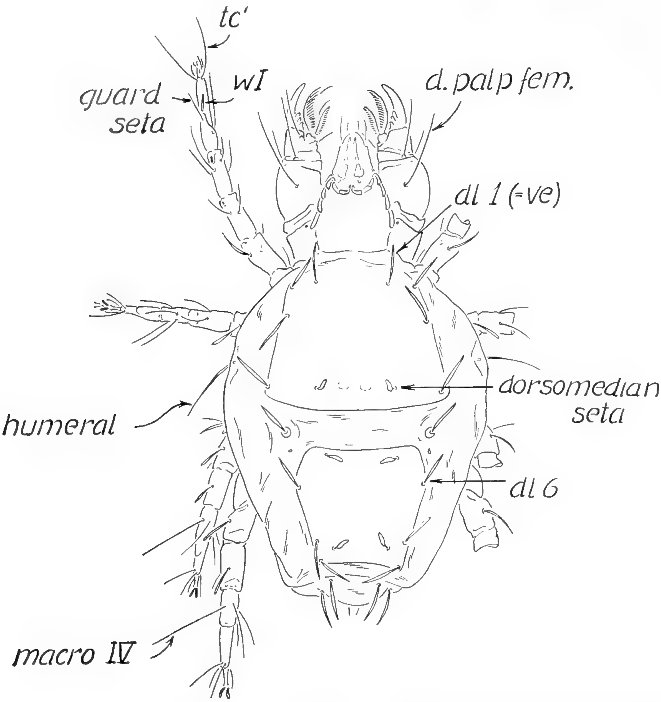

Fig. 1. Female of *Cheyletus trouessarti* Oud. Most of the dorsal setae mentioned in the text are labeled on the drawing.

The number of teeth on the base of the palp claw gives a tentative identification only of *trouessarti* (Table 3). The modal number of teeth on the claw of this species is 3. The teeth, or cusps, are very nearly equal (isodont). The other four species are not separable according to number of these teeth. The coalescence of the several basal teeth into one large apophysis occurs so rarely among these five species that the single apophysis on the palp claw of *fortis* Ouds. may be a reliable spot character on that species.

The form of the teeth on the palp claw (Fig. 2) gives an identifier important assistance in distinguishing *eruditus* from *malaccensis*, *cacahuamilpensis* and *aversor*. In the first species, the cusps are con-

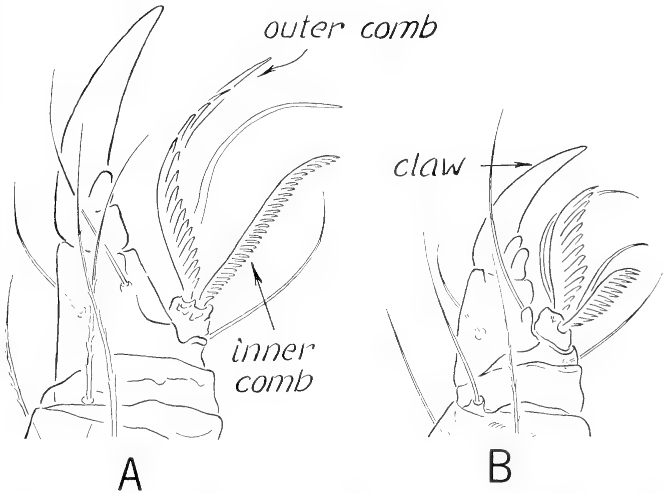

Fig. 2. Illustration of the terminal segments of the palps of *Cheyletus malaccensis* Oud. (A) and *C. eruditus* (Sch.) (B) to show shapes of the teeth on the tibial claws.

ical, very nearly alike in size and their long axes are almost parallel. In the others the two basal teeth are dissimilar, one is conical, the other flat-sided. A common deviation is incompletely separated teeth—*eruditus* (5%), *cacahuamilpensis* (5%), *malaccensis* (18%) and *aversor* (1%). In such instances the basal excrescence of the claw is a sort of dental ridge having a faint notch approximately in its midregion. In many specimens of *malaccensis*, *cacahuamilpensis* and *aversor*, the basalmost cusp appears to be flat-sided when viewed in one plane but it appears to be conical when viewed from another. It is appressed tightly against distal tooth so that the axes of the two lie in different planes. The appearance of the flattened tooth cannot be relied upon to differentiate *malaccensis* from *cacahuamilpensis* and *aversor*.

The numbers of teeth (or tines) on the inner and outer comb-like setae on 100 specimens of each of the 5 species are given in table 4. Of this group, only *eruditus* has both combs with relatively few, coarse teeth. The teeth on both sensilla may be counted with relative ease. In 5% of the *eruditus* individuals observed, the inner comb possessed 1 to 4 additional spurious teeth on its off side (bipectinate). The larger number of teeth on the combs of the other species created diffi-

Table 3. Frequencies with which various numbers of teeth occur on the right palp claw. Specific names are abbreviated.

Number of Teeth (Rt. side)	Species				
	erud.	*trou.*	*caca.*	*mala.*	*aver.*
0		1			
1	1			1	
2	98	6	98	98	95
3	1	82	2	1	5
4		11			
5					

culties for the observer to make reasonably accurate counts, especially when there were 30 or more fine teeth on the curved shaft of the inner comb. The use of an ocular having a hair pointer greatly assisted in the counting process and increased its accuracy.

The frequency distribution shown in table 4 suggests that number of teeth on the inner comb provides a clearer separation of several species than the number of teeth on the outer comb.

Judgments on 17 other structural features are shown in Table 5. Some of the features selected for observation seem to have no evident worth for distinguishing these particular species. Several of the characters proved to be stable or uniform within the range of species studied (Nos. 1, 7, 8). For example, the four pairs of dorsolateral setae on the propodosomal plate (No. 1) deviated from the common condition only three times in 500 observations. Another stable character, the disposition of dorsolateral setae on the hysterosomal plate, assuredly distinguishes *cacahuamilpensis* (No. 17). Setae of the fifth pair of dorsolaterals are set on the hysterosomal plate only in this species; this pair of setae is interscutal in the other four species. The numbers of dorsolaterals on the hysterosomal plate are shown to be highly variable because the hindmost one or two pairs—mostly the 8th pair—show many irregularities in location, and the posterior portion of this plate is frequently deficient on one side or both.

The numbers, kinds and disposition of dorsomedian setae have critical value in species recognition. Lack of dorsomedian setae heretofore has been thought to be characteristic of *eruditus* and *malaccensis*. No exceptions have been noticed in our samples of *malaccensis*. However, this character is now known to vary appreciably in *eruditus*; superfluous dorsomedians occur on both plates and even between the plates (interscutal). The superfluous dorsomedians do not really confound the matter of identification because, when they occur, their structure is peculiar to the species. They are acicular, smooth and small, sometimes so minute that they are classifiable as microsetae; they are also

Table 4. Frequencies with which various numbers of teeth occur on the inner and outer comb-like setae of the palp tarsus.

Number of Teeth	Inner comb					Outer comb				
	erud.	* *trou.*	*caca.*	*mala.*	*aver.*	*erud.*	*trou.*	*caca.*	*mala.*	*aver.*
10						1				
11										
12						6				
13	3					37				
14	5					42	1			
15	19					13	5	1		
16	33					1	18	1	1	
17	26						23		9	7
18	12	4					25	14	29	7
19		11					22	30	28	30
20	2	20					4	27	19	30
21		18					2	18	10	19
22		23						4	4	6
23		13						4		1
24		7						1		
25		2		2	2					
26				13	9					
27		1		21	21					
28			1	24	18					
29			3	16	21					
30			7	11	14					
31			9	7	7					
32			16	5	3					
33			29	1	3					
34			14		2					
35			8							
36			7							
37			5							
38			1							

*/ n = 99

unpredictable as to symmetry of position on the body. Records from some of the attempts to breed *eruditus* suggest that a certain complement of dorsomedian setae is inherent in the genetic organization of each species but the genic control over phenotype somehow varies during the final molt of females so that superfluous setae or deficient pairs occasionally appear.

Another noteworthy phenomenon was encountered in *aversor*. The female of this species normally has two pairs of very small, saccular dorsomedians, one pair on the propodosomal, another on the interscutal membrane in front of the hysterosomal plate. The deviations in num-

Table 5. Results recorded for judgments made on several kinds of characters selected for possible use in identifications. The quality norm for each character is indicated and the number of deviations per 100 specimens is shown in parentheses.

Characters			*erud.*		*trou.*		*caca.*		*mala.*		*avcr.*	
1	Number of dorsal setae (pairs)	Laterals on propodo. pl.	four	(0)	four	(0)	four	(0)	four	(2)	four	(1)
2		Laterals on hystero. pl.	three	(29)	three	(4)	four	(5)	three	(3)	three	(11)
3		Medians on propodo. pl.	zero	(11)	one	(1)	one	(1)	zero	(0)	one	(8)
4		Medians on hystero. pl.	zero	(2)	two	(6)	one	(1)	zero	(0)	zero	(2)
5		Medians interscutal	zero	(1)	zero	(2)	zero	(0)	zero	(0)	one	(3)
6	Number of leg setae	On femora I–IV	2222	(1)	2221	(2)	2221	(3)	2221	(1)	2221	(1)
7		On genua I–IV	3222	(2)	3222	(4)	3222	(1)	3222	(1)	3222	(2)
8		On tibiae I–IV	6444	(3)	6444	(2)	6444	(1)	6444	(0)	6444	(0)
9	Types of setae	Dorsolat. No. 1 (*ve*)	C	(0)	D	(20)	D	(0)	C	(0)	C	(0)
10		Dorsolat. No. 4	C	(0)	D	(17)	D	(0)	C	(0)	C	(0)
11		Dorsolat. No. 5	C	(0)	D	(16)	D	(0)	C	(0)	C	(1)
12		Humeral	B	(0)	C	(35)	D	(0)	B	(29)	D	(0)
13		Macroseta IV	B	(0)	B	(0)	—		B	(0)	B	(0)
14		Ant. s. of coxa III	B	(0)	B	(0)	C	(0)	B	(0)	B	(0)
15		Dors. s. of palp femur	B	(0)	B	(0)	C	(8)	B	(0)	B	(0)
16	Guard seta shorter (s) or longer (l) than *w* I		s	(0)	l	(0)	l	(0)	s	(0)	l	(0)
17	Location of dorsolat. No. 5—on/off hystero. plate		off	(0)	off	(0)	cn	(0)	off	(0)	off	(0)

ber of dorsomedian setae in *aversor*, as indicated in table 5 (Nos. 3, 5), represent unilateral deficiencies of one side or the other. The form of the dorsomedians in *aversor* presents an interesting aspect of its chaetotaxy. In numerous other cheyletid genera, the form of the dorsomedians is sex-linked. All of the dorsomedians of males and all juveniles are indistinguishable structurally from their neighboring dorsolaterals. The dorsomedians of females in these genera are transformed into aberrant or peculiar setae during the final molt. In females of *aversor* these setae may or may not become aberrant; those which change become small and saccular. The dorsomedians of *aversor* females may show aberrancy (27%) or orthodoxy (73%) for both pairs. In only one specimen (1%), the individual setae of the pair of interscutals were heteromorphic, one orthodox and one aberrant.

The numbers of setae on three segments of legs I–IV do not vary sufficiently to confuse species identification (Table 5, Nos. 6, 7, 8). On the other hand, among the five species examined, only femur IV of *eruditus* females provides a differentiating feature. An interesting point arises in this connection. Oudemans (1906) and Hughes (1961) described males of *eruditus* from European localities. But no males of this species have been reported in North America (Beer and Dailey, 1956; Summers and Price, 1970). We suppose that wherever males of *eruditus* occur, their femora IV should bear two setae. The present descriptions of *eruditus* males do not cover this point.

The types of setae located on various parts of the body (Table 5, Nos. 9–15 incl.) seem to provide no novel or useful criteria. Small deviations from the normal types are not discernible or they are too subjective to be reliable. Also, the amount of rotation or angle of view seriously affects judgments of fine differences between lanceolate and narrow spatulate classes. The attempted classification of unspecialized setae encountered within this group of species was as follows: A = acicular, smooth; B = acicular, barbed; C = lanceolate, narrow, fringed; D = spatulate, fringed, with 1–3 barbed ribs on blade.

Character No. 16, guard seta longer (l) or shorter (s) than solenidion *w* on tarsus I, is most helpful and definitive for the species in question because judgments are easily made; the guard seta either is much longer or much shorter. Other species intermediate in this respect could introduce complications in this judgment.

Observations on Reproduction

1. Parthenogenesis and Sex Ratios.

The intended program of experimentation with intraspecific and interspecific mating trials was considerably disrupted when the nature of reproduction by each species became clear. All five species are parthenogenetic. Two of them, *eruditus* and *aversor*, are thelytokous types and the strains dealt with developed no males. We have reared very large numbers of *eruditus* from juveniles and females under a wide range of conditions and have not encountered males. Beer and Dailey (1956) also reared clones of this species and found no males. We have not discovered males of *eruditus* or *aversor* among numerous cheyletid samples collected in Northern California.

Females of *aversor* were easy to transfer and their growth requirement presented no special problems. Since all individuals became females and produced only females, we merely seeded 45 isolation cultures with stock females and counted the number of mature daughters harvested on or close to the 35th day in isolation. The 45 females produced 1,633 daughters or 36.3 mature progeny per mother.

Cheyletus cacahuamilpensis also proved to be thelytokous but the strain propagated did produce males. It had a peculiarity in its sexuality, however. As far as known, the strain reared in our laboratory was propagated from a single wild female. The first stock cultures had males but these were notably few in number. It seems probable, therefore, that she had previously mated. Mature F_1 progeny were counted and sexed for 69 isolation cultures established to provide information about the sex ratios. Eleven of the cultures were seeded with nymphal stadia, 34 were seeded with females picked randomly from mass cultures and 24 were started with confirmed pairs. The latter averaged 21.9 matured, progeny per parent. Matured progeny harvested from the isolated pairs comprised females only, and the assumption is that there was no functional mating. Male progeny appeared in only two of the 69 cultures, both of which had been seeded with females picked from general stocks. The peculiarity is the fact that the male-producing females produced males only, 21 males by one parent, 31 males by the other.

The taking of males for mating attempts somewhat depleted the population of males in the stocks of *cacahuamilpensis*. Since we failed to breed males intentionally, the male line became depleted and was eventually lost. The stocks then became clones of thelytokous females.

It has been noted in phytoseiids that conspicuous absence of males may characterize highly inbred lines (Poe and Enns, 1970). The duration of the period of inbreeding of our strain of *cacahuamilpensis* was probably not more than six months, time enough for a few generations only. This cheyletid is thelytokous and it could be possible, though not established, that its males may not be haploid.

Routine rearings of isolated individuals and pairs of *trouessarti* and *malaccensis* clearly established that these are arrhenotokous species having plentiful males. The bisexual condition of their colonies was easily maintained in laboratory stocks.

Although numerous juveniles of *trouessarti* were isolated in culture vessels, only eight of these survived to maturity and became reproducing virgin mothers. These produced only males; 136 males were harvested from these isolates. Two cultures, each initially containing a proved pair yielded 23 progeny, 9 males, 14 females. The term "proved" pair is employed to indicate that an isolated deutonymph is known to have transformed into a female in the presence of an active male. Forty-four females picked at random from mass cultures and reared in isolation tubes produced offspring of both sexes. Males only were produced by 11 of these 44 females; these were presumed to have been virginal when isolated. The other 33 isolated females produced F_1 progeny of both sexes, 233 males, 402 females. At this stage of technical capability in the rearing operations, the conditions of the cultures were somewhat erratic and many of the offspring were victims of cannibalism. Possibly the real reproductive capability of *trouessarti* exceeds that which was demonstrated.

In the case of *malaccensis*, one group of 20 isolated deutonymphs became reproducing females and these gave rise to males only. This group of females produced 213 males. Twenty-one cultures started with mature females randomly selected from stocks produced 487 progeny harvested as adults, 130 males, 357 females. All of these 21 females reproduced. Twenty-two cultures seeded with proved pairs yielded 572 progeny, 200 males, 372 females. Six of the isolated pairs failed to reproduce. More progeny were harvested from this group of 16 cultures than were taken from cultures initially established with females picked randomly from stocks. The latter probably included older, partly expended individuals. The mated females of *malaccensis*, like those of *trouessarti*, tended to weight the sex ratio appreciably in favor of females. How the sex ratio may have been affected by cannibalism or by the restricted period of the harvesting is not known at present. In all of our culture vessels, the number of eggs observed has greatly exceeded the number of mature progeny harvested later.

2. The Mating Process.

Deutonymphs of presumptive opposite sexes are not easily distinguished by their gross features and apparently identifiable associations between them have not been noticed—except when one feeds upon the other. Males begin to attend molting deutonymphs destined to become females shortly after the onset of the final quiescent period. One male usually becomes the dominant suitor and, having established an enduring association, hovers about, mostly in contact with the transforming nymph. The portent of approaching ecdysis is an increased mobility of the male. He quickens his assiduous ministrations—the moving of her body or legs, palpations and even possibly the puncturing of her integument with his stylets, until her exuviae is shed.

Very soon thereafter he backs beneath the front part of her somewhat elevated body and copulation ensues, with female over male in a rear to rear posture. When the mates separate, the constancy of the association is broken and mates no longer can be identified as such. This account of copulation conforms closely with Robertson's (1952) description of the process in *eruditus* and with the description of mating given by Beer and Dailey (1956) for the species which they named *Cheletophyes knowltoni.*

3. Conditions for Mating.

It has been possible to investigate only a few of the factors involved in the breeding processes of *malaccensis.* One question concerned the size of the vessel within which potential mates were confined. It is our common experience that the probability of fruitful matings was not perceptibly affected by our choice of the kind of isolation culture vessels employed or, within reasonable limits, by the quantity of prey mites present at the critical time of mating. The confinement of a moulting nymph and the male within a small "holding" cell did not increase the number of successful matings as compared with pairs seeded into the larger vessels having greater numbers of acarids and more of their cereal food materials.

Twenty-two cultures with proved pairs were set up in vial-like rearing tubes and their mature progeny harvested 30 days later. Sixteen of these females mated successfully and produced F_1 progeny of two sexes—about 72% mating—and six produced only males. Another lot comprising 20 cultures was set up with one moulting nymph (potential female) and 10 males per vessel. Only 60% of these virgins mated and produced progeny of both sexes; the unsuccessful cultures contained only a few hold-over males but no females. Our attempts to mate couples or to mate virgin females by confining them with several males have demonstrated that mating is difficult to induce or control in captive populations.

Gravid or ovipositing females (virgin or mated) of *malaccensis*, *aversor*, *cacahuamilpensis* and *eruditus* exhibit a kind of nesting behavior, protecting their nests or broods of eggs against other encroaching mites, including males of their own kind. They may therefore repel all potential mates for the duration of the brooding periods or, possibly, for the entire period of oviposition.

Evidence from trials with *malaccensis* suggests that successful matings in this species occur very soon after the female deutonymph molts but less frequently thereafter. In one battery of tests, virgin females reared from isolated deutonymphs were exposed to males at various intervals after they attained adulthood. Two males were placed with virgin females 2, 4, 6, 8 and 14 days of age. In the trials with younger virgins, 2–8 days inclusive, the males were allowed to remain with the females for 2 days only after which they were removed from the nuptial cages. There were 10 replicates for each age to 8 days and 25 replicates for the 14-day isolates. In the final series, the isolated females were transferred at 7-day intervals to new cages with new food in order to cast off their own male progeny prior to the actual mating attempts. Two strange males were introduced when the females were transferred on the 14th day. In this series, the numbers of progeny produced before and after the introduction of males were recorded. Most of the progeny were produced from eggs laid before the 14th day (288 males harvested) and only a few were produced from eggs laid after males were introduced (46 males harvested). Female progeny appeared in only one of the 65 culture vessels; culture #3 among the 4-day isolates yielded 44 males and 2 females other than the mother mite. Otherwise there were no other indications of mating among virgins 2 days of age or older. The 64 other females produced male progeny exclusively.

The question of whether mating may occur much later than the teneral period was approached in a different way. Isolated virgin females were confined for long periods with their accumulated male progeny. Thirty-five such cultures were set up and inspected regularly for periods ranging to 81 days. Most of the cultures developed only males and then died out. However, 12 of the isolated females ultimately produced daughters; these cultures were discarded when at least four females were found. That approximately one-third of the females appeared to have mated with their sons late in the reproductive period may relate to the intermittency of brooding. Females may lose their broodiness and accept males in the brief intervals between oviposition cycles.

4. Oviposition.

As mentioned before, females of the species *eruditus*, *aversor*, *cacahuamilpensis* and *malaccensis* exhibit pronounced nesting habits. The progeny of *eruditus* are especially difficult to harvest from cultures containing bran flakes because the young brooding or laying females secrete themselves within the rolled or cupped flakes. They do not move about freely on the walls of the containers and they are quite difficult to dislodge from their nests. The nesting species accumulate sizeable clutches of eggs on which they perch. Invaders are attacked by the nesting mothers. A few strands of silk have been observed only in the nests of *eruditus*.

C. trouessarti does not seem to deposit eggs in obvious clusters. It was necessary to isolate and hatch some of the eggs of this species in order to demonstrate that its females are oviparous. In thriving cultures the eggs of the acarids complicate the matter of identifying those of the predator.

A special study of oviposition was made for *malaccensis.* In this study, 30 females were reared to maturity in isolation cultures and their production of unfertilized eggs recorded daily for the first 11 days of adulthood. The nests were removed daily from each culture vessel so that yields could be determined. It is probable that the taking of the nests each day affected to some extent the progress of oviposition. All of these females reproduced. First eggs were laid on the second to sixth days, with 23 individuals beginning to lay on the third or fourth days. This lot of virgin females averaged slightly more than 19 eggs on the initial laying day and 5 females actually laid 50 eggs on the first day of the laying period. They averaged 83.7 eggs during the first 11 days of adult life.

A second series of 22 isolates was established to estimate total egg production and to provide information about the duration and intermittency of laying. These females were virginal and their nests were taken daily for the first 15 days and thereafter only when sizeable lots of eggs appeared. One of these females was unproductive; she died on the 11th day. The remaining 21 females average 133.1 eggs during their laying periods.

Twenty of the females survived at least 38 days and 8 survived 48 days. Oviposition peaked on the fifth day and approximately 75% of the eggs were deposited during the first 15 days. Individual protocols showed that laying was intermittent, one large burst of ovipositional activity followed by 2 to 3 minor flurries at variably spaced intervals, the last of which ended on the 40th day. Insofar as the females were virgins and their nests were repeatedly taken, we do not know how the eggs would have been laid under undisturbed circumstances or in the presence of males.

5. Attempts to Cross Species.

Attempts to produce interspecific F_1 hybrids were begun when laboratory stocks included but three species: *eruditus*, *trouessarti* and *cacahuamilpensis.* The only males in good supply were those of *trouessarti.* At this stage of the operation, many attempted matings aborted because some of the molting deutonymphs isolated and placed with males transformed into males. Without relevant genetic or cytological information with which to anticipate outcome, we attempted to mate the males of an arrhenotokous species (*trouessarti*) with females of thelytokous species (*eruditus*, *cacahuamilpensis*).

Fifty-five culture tubes containing proved couples of *eruditus* females × *trouessarti* males produced 351 matured progeny, all parthenogenetically generated females of *eruditus.* These were mounted in Hoyer's fluid and individually examined. In similar fashion, 46 culture tubes containing proved couples of *cacahuamilpensis* females ×

trouessarti males were established. Many of these failed to reproduce; 21 females produced 241 matured progeny. All were mounted and judged to be parthenogenetically produced females of *cacahuamilpensis*.

Later on, attempts were made to obtain F_1 hybrids from the two arrhenotokous species, *malaccensis* females × *trouessarti* males and *trouessarti* females × *malaccensis* males. Only male progeny were harvested from 20 proved couples of the attempted crossing of the first combination. All of these females reproduced; 376 *malaccensis* males were harvested from the cultures. Thirty-seven attempts to test the reciprocal cross, *trouessarti* females × *malaccensis* males, aborted because moulting deutonymphs or young virgin females of *trouessarti* were attacked or devoured by the much larger males of *malaccensis*.

The 121 attempts to cross species produced no evidence of hybridization in respect to morphology or change in the sex ratios of the progeny examined. In virtue of the reluctance of *Cheyletus* females to accept mates, at least when reared in captivity, the issue of whether interspecific F_1 hybrids occur is not clearly resolved by these trials.

One noteworthy phenomenon was recorded for some of the progeny generated in attempted matings of *eruditus* females × *trouessarti* males. Systematists have described *eruditus* females as having no dorsomedian setae. Actually a small percentage of them do have one or more pairs of inconspicuous dorsomedians (Table 5). A few of the females used in the attempted interspecific matings gave progeny having one or more pairs of dorsomedian setae. In two cases out of 55 observations, the daughters from each of the two mothers varied in this respect, some daughters of each one showed dorsomedian setae in several patterns whereas other daughters had no dorsomedians. In a third case, an *eruditus* mother produced 15 daughters all having dorsomedian setae among which there were 15 variations in the numbers and symmetry of the scutal or interscutal setae. Otherwise, however, the daughters were indistinguishable from *eruditus* females generally. The dorsomedian setae, when present were also observed to vary in size, from mere dots in the center of alveoli to substantial acicular, smooth setae about 30 microns long.

This appears to present a situation in which a character—a complement or dorsomedian setae—is expressed variably. We suppose that the mother's genotype governs the development of dorsomedian setae as a group but that something in the nature of organizer control during later periods of differentiation becomes feeble or inhibited and regionally spotty.

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LECTOTYPE DESIGNATION FOR AEDES (STEGOMYIA) GALLOISI YAMADA WITH A NOTE ON ITS ASSIGNMENT TO THE SCUTELLARIS GROUP OF SPECIES

(DIPTERA: CULICIDAE)[1, 2]

YIAU-MIN HUANG, *Southeast Asia Mosquito Project, Department of Entomology, Smithsonian Institution, Washington, D.C. 20560*

ABSTRACT—Examination of syntypes of *Aedes galloisi* Yamada confirms its assignment to the *scutellaris* group of species. A full description of the lectotype male is given.

Aedes (Stegomyia) galloisi Yamada
(Fig. 1)

Aedes galloisi Yamada, 1921, Annot. Zool. Jap. 10:47 (♂*, ♀). Type locality: Sapporo, Honshu, Japan.

Lectotype hereby designated: lectotype male with associated terminalia slide (YMH–'69–81), Sapporo, Hokkaido, 18–8–1917. (S. Yamada). Deposited in the Medical Zoology Laboratory, Institute for Infectious Diseases, University of Tokyo, Tokyo, Japan.

Male. *Head.*—Proboscis dark scaled, without any pale scales on the ventral side; palpus dark, slightly shorter than proboscis, with a white basal band on each of segments 2–5; those on segments 4, 5 incomplete dorsally; segments 4, 5 subequal, slender, upturned, and with only a few short hairs; antenna plumose, shorter than proboscis; clypeus bare; torus covered with white scales except on dorsal side; decumbent scales of vertex all broad and flat; erect forked scales brownish dark, not numerous, restricted to occiput; vertex with a median stripe of broad white scales, with broad dark ones on each side interrupted by a lateral stripe of broad white scales followed by a patch of white broad ones ventrally. *Thorax.* Scutum with narrow dark scales and a prominent median longitudinal stripe of similar white ones, the median stripe narrows slightly posteriorly and forks at beginning of the prescutellar space; there is on each side a posterior dorsocentral white line, a few narrow white scales on the lateral prescutal area and on the scutal angle area forming a curved white line along the border of the lateral prescutal area and scutal angle area and connected to the posterior dorsocentral white line, a patch of broad flat white scales on the lateral margin just before the level of the wing root and a few narrow curved white scales over the wing root; acrostichal bristles absent; dorsocentral bristles present; scutellum with broad white scales on all lobes and with a few broad dark ones at the apex of mid lobe; anterior pronotum with broad white scales; posterior pronotum with a large patch of broad white scales and some white narrow ones dorsally; paratergite with broad white scales; postspiracular area with broad white scales; subspiracular area with

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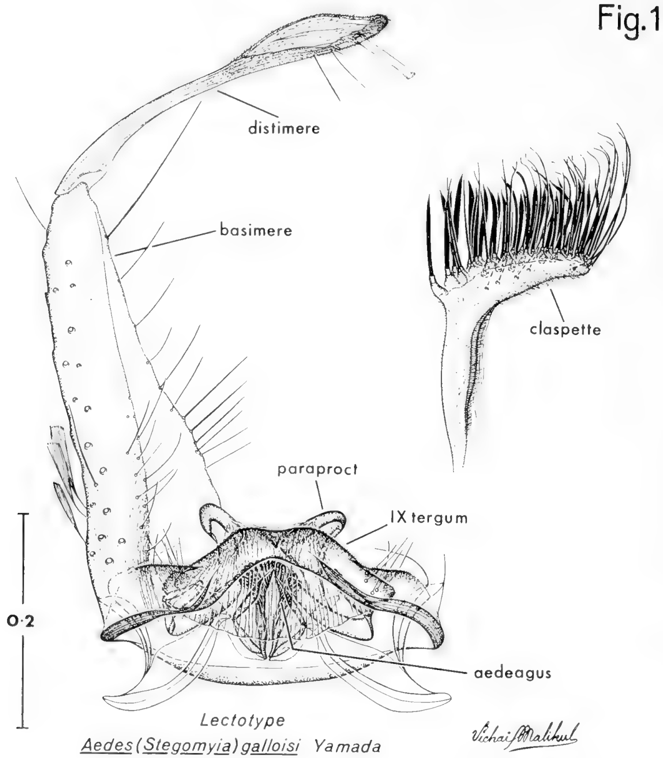

Fig. 1. *Aedes* (*Stegomyia*) *galloisi* Yamada, tergal aspect of the lectotype male terminalia with claspette enlarged.

white scales; patches of broad white scales on propleuron, on the upper and lower portions of sternopleuron and on the upper and lower portions of mesepimeron; mesepimeron scale patches connected; lower mesepimeron without bristles; metameron bare. *Wing.* With dark scales on all veins except for a minute basal spot of white scales on the costa; frist forked cell 1.5 times as long as its stem. *Halter.* With dark scales. *Legs.* Coxae with patches of white scales; knee-spots present on all femora; fore and mid femora dark anteriorly, paler posteriorly; hind femur anteriorly with a broad white longitudinal stripe which widens at base and on about the basal ¾; fore and mid tibiae dark anteriorly, paler posteriorly; hind tibia dark; fore and mid tarsi with basal white bands on tarsomeres 1, 2; hind tarsus with basal white bands on tarsomeres 1–5, the ratio of the length of the white band to the total length of each tarsomere is 1/4, 1/4, 1/2, 3/5 and 2/3; fore and mid legs with tarsal claws unequal, the larger one toothed, the smaller one simple; hind leg with tarsal claws equal, simple. *Abdomen.* Abdominal segment I with white scales on laterotergite; terga III–IV each with a basal transverse white band; with lateral white spots; the lateral spots do not connect with the basal transverse bands; terga II, VII with lateral white spots only; sterna III–VI with basal white bands; sternum VIII largely covered with white scales. *Terminalia.* Basimere 3.5 times as long as wide; its scales restricted to dorsolateral, lateral and ventral areas; with a patch of hairs on the basomesal area of dorsal surface; mesal surface membranous; claspette with a 90° lateral distal angle in lateral aspect (dissected claspette), with a mesal distal projection forming a distinct distal mesal hook, with numerous setae and several widened specialized ones on the sternal side of the distal part; distimere simple, elongate, as long as basimere, slightly swollen near the tip; with a spiniform process and a few hairs near apex; aedeagus with a distinct sclerotized lateral toothed plate on each side; paraprocts without teeth; cercal setae absent; ninth tergum with middle part produced into a rounded lobe with shallow emargination medially and with a hairy lobe on each side.

TAXONOMIC DISCUSSION. *A. galloisi* is a member of the *albopictus* subgroup, having the supraalar white line not clearly defined and with only narrow scales over the wing root. It is very similar to *albopictus* (Skuse), *seatoi* Huang and *unilineatus* Theobald in having the scutum with a patch of broad flat white scales on the lateral margin just before the level of the wing root. It differs from *albopictus* and *seatoi* in scutal ornamentation and in this respect resembles *unilineatus* lacking, however, the white spot on the anterior surface of the mid femur of the latter. The male terminalia of *galloisi*, though very similar to those of *subalbopictus* Barraud, differ in having the claspette with stem rather narrow in lateral aspect (dissected claspette), with a distinct distal mesal hook and with numerous setae and several widened specialized ones on the sternal side of the distal expanded part.

A. galloisi Yamada was originally assigned to Group C. (*scutellaris* group), by Edwards (1932). Mattingly (1965) transferred it from Group C. to Group B. Based on the great similarity to members of the *scutellaris* group, however, it is here transferred back to the *scutellaris* group.

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BOOK REVIEW

The Insects of Australia. A Textbook for Students and Research Workers. Division of Entomology, C.S.I.R.O., Canberra, 1970. Melbourne Univ. Press. xiii + 1029 pp. $22.10. U.S. sales by International Scholarly Book Services, Inc., Portland, Ore.

One is immediately impressed with the sheer size and weight of this book. A perusal of the contents reveals that this is indeed a major entomological work that will undoubtedly be a standard reference for many years. The text is supplemented by numerous, excellently done drawings which are mostly original. Seldom has a book of this type had such an abundance of fine artwork, and the figures represent one of the strong points of the volume. Included are 9 beautiful color plates, one of which displays various Batesian mimicry patterns found in Australia. The text is printed on high quality paper in easy-to-read type, and we noticed very few printing errors. The book is the work of 30 specialists, mostly Australian.

The first 9 of the 37 chapters cover the customary general subjects such as anatomy, physiology, reproduction and biology, but well organized treatments of classification theory, evolution, cytogenetics, and Australian zoogeography are also included. The zoogeography section will interest taxonomists worldwide, and the extensive chapter on fossils is a fairly up-to-date summary of knowledge of this subject. Although designed for Australians, this text should find wide appeal because of the broad application of the information in these early chapters.

The bulk of the book is given to treatments of the various insect orders. It is refreshing to see that some traditional but outdated textbook concepts of the orders have been replaced in this volume by more modern ideas of insect classification. For example, the Collembola, Protura, and Diplura are treated as classes distinct from the Insecta. Twenty eight insect orders are recognized, including the Archaeognatha for the machilid types usually included in the Thysanura. The classical order Orthoptera is broken up into various separate orders such as Mantoidea and Blattoidea. On the other hand, the order Hemiptera includes the suborders Heteroptera and Homoptera. We wonder if too much weight has been given to cytogenetical evidence in lumping the Anoplura and Mallophaga as suborders of the order Phthiraptera, however. Keys to families and often subfamilies of each order are provided, and sections on anatomy, immatures (including keys in some instances), biology, and special features of the Australian fauna supplement each ordinal treatment.

The chapter on Neuroptera is noteworthy because it includes a new familial classification based on considerations of wing venation and the larval head. The keys in this section utilize many new characters which provide more positive identification than keys previously available and these should find wide acceptance outside of Australia. The recognition of the Megaloptera as an order separate from the Neuroptera seems weakly supported morphologically. This separation is based primarily on different types of larval jaws (chewing in Megaloptera versus piercing-sucking in Neuroptera), but certainly even greater larval mouthpart differences are found within other orders, such as Diptera. Megaloptera adults appear to offer no ordinal distinctions from Neuroptera.

We noted some discrepancies in the Aculeate wasp section of the Hymenoptera chapter. When Maa and Yoshimoto proposed the family Loboscelidiidae in 1961, they showed rather convincingly that it belonged in the Aculeate superfamily Bethyloidea. It is difficult therefore, to understand why this family is assigned without explanation to the non-Aculeate superfamily Proctotrupoidea, especially since the paper of Maa and Yoshimoto is cited in the chapter on Hymenoptera. The separation of the Cleptidae from the Chrysididae is perhaps not well founded, but the placement of the latter in a monotypic superfamily Chrysidoidea is certainly unjustified. Both groups belong in the Bethyloidea. The recognition of the Ampulicidae as a family distinct from the Sphecidae is a subjective matter, but in any case the characters used in the key and discussion are not diagnostic.

Evidently the literature survey for the book ended with 1965, but some papers published as late as 1967 are cited in footnotes or inserted at ends of paragraphs. In our areas of competence we noted the absence of a few important references such as the catalog of Indoaustralian Ichneumonidae of Townes, Townes, and Gupta, 1961, and Evans' 1964 paper on the classification of the Sphecidae based on larval characters.

None of these criticisms detract seriously from the book however, and some are subjective. The authors are to be congratulated for a very fine piece of work. Compared to most areas of the world, the insects of Australia have been poorly collected, and therefore the entomofauna represents one of the last frontiers in taxonomic entomology. This impressive book provides an excellent summary of current knowledge of the insects in this part of the world, and hopefully it should give Australians as well as others incentive to intensify their collecting and taxonomic research of the fauna.

A. S. MENKE, *Systematic Entomology Laboratory, U.S. Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560 and* L. A. STANGE, *Instituto Miguel Lillo, Tucuman, Argentina.*

NEW COMBINATIONS FOR NEOTROPICAL SAWFLIES (HYMENOPTERA: TENTHREDINIDAE)

The following new combinations are proposed for some sawflies from Mexico, Central America, and South America so that these species may be properly identified. The new combination is given first, and the original generic name is given in parentheses following the reference. All are in the family Tenthredinidae.

Adiaclema ictericum (Klug), 1818, Mag. Gesell. Naturf. Freunde Berlin 8:79, ♀ ♂ (*Tenthredo*). Brazil.

Adiaclema plesium (Rohwer), 1911, Proc. U.S. Natl. Mus. 41:393, ♀ (*Stromboceros*). Mexico.

Adiaclema urichi (Rohwer), 1911, loc. cit. supra, p. 393, ♂ (*Stromboceros*). Trinidad.

Proselandria carminea (Jörgensen), 1913, An. Mus. Nac. Hist. Nat. Buenos Aires 24:274, ♀ (*Stromboceros*). Argentina.

Proselandria roseomaculata (Enderlein), 1920, Sitz. Gesell. Naturf. Freunde Berlin 9:362, ♀ ♂ (*Strongylogaster*). Southern Brazil.

Stromboceridea albilabris (Konow), 1885, Wien. Ent. Zeit. 4:21, ♀ ♂ (*Stromboceros*). Bolivia.

Stromboceridea barretti (Rohwer), 1911, loc. cit. supra, p. 391, ♀ (*Stromboceros*). Mexico.

Stromboceridea pilosula (Rohwer), 1911, loc. cit. supra, p. 392, ♀ (*Stromboceros*). Mexico.

Rohwerina ornaticornis (Cameron), 1883, Biol. Centr.-Amer., v. 1, p. 3, ♂ (*Siobla*). Guatemala.

Caribea illuminata (Norton), 1868, Trans. Amer. Ent. Soc. 2:222, ♀ ♂ (*Strongylogaster*). Mexico.

Eustromboceros diversicolor (Rohwer), 1911, loc. cit. supra, p. 390, ♂ (*Aneugmenus*). Mexico.

Inea pygmaea (Enderlein), 1920, loc. cit. supra, p. 365, ♂ (*Strongylogaster*). Costa Rica.

Inea rufonota (Rohwer), 1911, loc. cit. supra, p. 389, ♂ (*Nesoselandria*). Mexico.

Liliacina gandarai (Rohwer), 1911, loc. cit. supra, p. 395, ♂ (*Eustromboceros*). Mexico.

Ametastegia championi (Cameron), 1883, loc. cit. supra, p. 35, ♀ (*Emphytus*). Guatemala.

Ametastegia mexicana (Cameron), 1883, loc. cit. supra, p. 35. (*Emphytus*). Mexico.

Periclista antarctica (Malaise), 1944, Arkiv för Zool. 36B:1, ♀ (*Pseudomonophadnus*). Chile (Tierra del Fuego).

Periclista limbata (Enderlein), 1920, loc. cit. supra, p. 352, ♀ (*Monophadnus*). Chile.

Waldheimia fumipennis (Ashmead), 1898, *In* Dyar, Jour. N.Y. Ent. Soc. 6:128 (*Parazarca*). Mexico.

Waldheimia pallens (Klug), 1818, loc. cit. supra, p. 80, ♀ (*Tenthredo*). Surinam.

Metapedias rufonota (Rohwer), 1912, Smith. Misc. Coll. 59:2, ♀ (*Erythraspides*). Panama.

DAVID R. SMITH, *Systematic Entomology Laboratory, U.S. Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560.*

REDISCOVERY OF EXOCHUS ALBICEPS

(HYMENOPTERA: ICHNEUMONIDAE)

The species *Exochus albiceps* Walsh was published in 1873 (Trans. Acad. Sci. St. Louis 3:96). Before the description was printed, Walsh had died and his collection (including the type of *E. albiceps*) had been destroyed in the Chicago fire of 1871. During the next hundred years, no specimens fitting the description of *E. albiceps* could be found, and with the type destroyed, this was a lost species. In my revision of the Nearctic species of *Exochus* (1959. U.S. Natl. Mus. Bul. 216 (1):170–267), I could do no more with *E. albiceps* than to republish the original description. Privately, I speculated that the species might be extinct, but this idea proved to be incorrect.

In the summer of 1971, my brother George Townes was collecting with Malaise traps at his home near Cleveland, South Carolina. Among the specimens trapped were four females that agree perfectly with the description of *Exochus albiceps.* These specimens were collected August 3 to August 12. Soon after this discovery, I received from Gerd Heinrich a fifth female of *E. albiceps* collected September 8 to 15, 1971 in Chilcot State Park, Louisiana.

Further, George Townes collected a male *Exochus* in the same traps on July 28 that matches the type male of *Exochus sulcatus* Townes (from New Jersey) and is evidently the male sex of *Exochus albiceps. E. sulcatus* is thus a junior synonym of *E. albiceps.* Walsh states that his description was of a male, but his description fits only the female, and the male coloration is different enough from that of the female to make it certain that Walsh mistook the sex.

Exochus sulcatus Townes was used as a basis for a new species group, the "Sulcatus Group" (1959. U.S. Natl. Mus. Bul. 216(1):210). Since *sulcatus* is a synonym of *albiceps*, the group should be renamed the "Albiceps Group."

Specimens recently acquired show that the Albiceps Group is primarily a Neotropic one. We have six undescribed species of the group from South America, and *Exochus tegularis* Ashmead (from St. Vincent) is another member of the group. The eight species known to date are rather similar, with the most obvious differences in the shape of the areola and in details of the color pattern.

HENRY TOWNES, *American Entomological Institute, 5950 Warren Road, Ann Arbor, Michigan 48105.*

A NOTE ON THE GENERIC TRANSFER OF "CATABENA" ESULA (DRUCE) AND NEW SYNONYMY

(LEPIDOPTERA: NOCTUIDAE)

In 1909, Hampson (Catalogue of the Lepidoptera Phalaenae in the British Museum, 8:234, fig. 58) placed *Xylina esula* Druce (1889, Biol. Cent.-Amer., Insecta, Lepidoptera, Heterocera, 1:297, pl. 28, fig. 1) in the genus *Catabena* Walker, 1865. The type-species of *Catabena* is *Catabena lineolata* Walker, 1865, by monotypy. The genus was placed by Hampson in the noctuid subfamily Amphipyrinae. The combination proposed by Hampson has been used by all subsequent workers treating the species. It is a common species that is known to occur in the southern United States (California, Arizona, Texas, and Florida) south through the Antilles, México, and Central America to Paraguay and northern Argentina in South America. It was intentionally introduced into Hawaii in 1955 for control of the weed, *Lantana*.

In the course of the study of the genus *Catabena*, especially the *vitrina* complex, and a study of the noctuid species of the Antilles, I discovered that Hampson had apparently also described this species as new and as a new genus of cuculline noctuids, *Neogalea*, in 1906 (Catalogue of the Lepidoptera Phalaenae in the British Museum, 6:7 and 8, fig. 2). The type-species is *Neogalea braziliensis* Hampson, 1906, by original designation and monotypy. Through the assistance of Mr. D. S. Fletcher of the British Museum (Natural History) I was able to determine that Hampson had, indeed, redescribed *esula*. My studies of *esula*, the other species of *Catabena*, and some other related but undescribed species indicate to me that *esula* is related to *Catabena*, but that it is not congeneric. The corona of the male genitalia is of a very different kind than that of the species of *Catabena*. In *esula* the corona is composed of a dense mass of curved spines arising from an elevated elliptoid plate that is rounded apically and pointed toward the ventral margin of the valve. In the species of *Catabena* the corona is always composed of a single row of spines that extend from the apex toward the ventral margin of the valve. The number of spines present and the length of the corona varies according to the species and there is a tendency toward reduction or even loss of the corona. In consideration of the difference and the taxonomic history, the following nomenclatural actions are deemed necessary.

Xylina esula Druce [= *Catabena esula* (Druce)] is now transferred to *Neogalea* Hampson, 1906, and the type-species of that genus, *Neogalea braziliensis* Hampson is placed as a junior synonym of *esula*. NEW SYNONYMY. The species will now be known by the combination, *Neogalea esula* (Druce).

E. L. TODD, *Systematic Entomology Laboratory, Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560.*

NOTES ON BEMBIDION ROLANDI FALL

(COLEOPTERA: CARABIDAE)

The purpose of this study is to determine the distribution, the habitat, the biology and the dynamics of *Bembidion rolandi* Fall in Canada. The habitat, the biology and the dynamics were unknown to Lindroth (1963, p. 300). In the locality records, the following abbreviations are used to indicate the collections in which the specimens were located: AL—André Larochelle Collection, Rigaud; CC—Claude Chantal Collection, Sainte-Foy; CNC—Canadian National Collection, Ottawa; JCA—Jean-Charles Aubé Collection, Québec; JPL—Jean-Paul Laplante Collection, Sainte-Foy; LRF—Laboratoire des Recherches Forestières Collection, Sainte-Foy; MAQ—Musée de l'Agriculture de Québec, Québec; MJL—Firmin Laliberté Collection, Sainte-Foy; UM—Université de Montréal Collection, Montréal; YB—Yves Bousquet Collection, Boucherville; !—specimen seen by me.

Distribution.—In the east, south at least to District of Columbia, north to Ontario and Québec (Lindroth, 1963, p. 300).

QUEBEC: Arthabaska Co.: Arthabaska, 19.VI.1932 (1, MJL!). Chambly Co.: Longueil, 19.IX.1938 (1, MAQ!; 6, UM!), 24.IX.1937 (1, UM!), 8.X.1937 (2, UM!) and 21.X.1936 (1, UM!; Lindroth, 1963, p. 300). Dorchester Co.: Saint-Léon-de-Standon, 7.V.1965 (1, AL!). Lotbinière Co.: Saint-Antoine, 20.VII.1955 (1, AL!); Sainte-Croix, 4.VI.1960 (1, AL!), 27.VI.1943 (1, AL!; 1, JCA!), 14.VIII.1964 (1, CC!) and 22.VIII.1964 (1, CC!). Nicolet Co.: Bécancour, 15.V.1971 (13, AL!), 10.VI.1961 (1, JCA!; 3, MJL!), 5.IX.1959 (1, CC!), 7.IX.1968 (1, MJL!) and 16.IX.1967 (1, AL!; 1, CC!; 3, JCA!; 1, LRF!). Portneuf Co.: Saint-Augustin-de-Québec, 7.VI.1963 (1, MJL!), 10.VI.1963 (1, JPL!), 9.VII.1955 (7, MJL!), 6.IX.1960 (1, JPL!) and 8.IX.1960 (4, JPL!; 2, LRF!). Québec Co.: Cap-Rouge, 5.VI.1954 (2, JCA!), 7.VI.1961 (1, CC!), 21.VI.1955 (1, JCA!), 22.VI.1960 (1, AL!) and 5.IX.1959 (1, AL!; 1, JCA!). ONTARIO: Ottawa, exact date unrecorded (1, CNC!; Lindroth, 1963, p. 300), 5.VI.1965 (1, AL!; 3, YB!) and 10.VIII.1917 (1, MJL!). Trenton, 10.X.1906 (1, CNC!; Lindroth, 1963, p. 300).

Habitat.—Among gravel on banks of rivers; the soil is moist, barren, sometimes mixed with clay or sand. Other associated ground beetles: *Bembidion nigrum* Say, *B. planum* Haldeman, *Chlaenius cordicollis* Kirby and *Schizogenius lineolatus* Say.

Biology.—Immature beetles: Sainte-Croix, 15.VIII.1964 (1, CC!); Saint-Augustin-de-Québec, 9.VII.1955 (1, MJL!).

Dynamics.—Flight observed in captivity: Bécancour, 15.V.1971 (13, AL!).

ANDRÉ LAROCHELLE, *Collège Bourget, Rigaud, Québec.*

SUMMARY REPORTS OF SOCIETY OFFICERS FOR 1971

CORRESPONDING SECRETARY

(For the fiscal year 1 November 1970 to 31 October 1971)

Membership on 1 November 1970	500
Membership on 31 October 1971	507
Circulation and distribution of *Proceedings* (September, 1970 issue)	842

The membership is distributed among 46 states, the District of Columbia, 2 territories, and 16 foreign countries. The *Proceedings* go to members and subscribers in 49 states, the District of Columbia, 2 territories, and 42 foreign countries. A detailed report is on file with the recording secretary. Respectfully submitted, David R. Smith, *Corresponding Secretary.*

TREASURER

(For the fiscal year 1 November 1970 to 31 October 1971)

	General Fund	Special	Publication Fund	Total
1 November 1970	$-1,083.21	$1,578.11	$9,272.70	$ 9,767.60
Receipts	8,161.78	252.50	616.67	9,030.95
Expenditures	7,732.86	45.00	0.00	7,777.86
31 October 1971	− 654.29*	1,785.61*	9,889.37**	11,020.69

* These two columns represent one account in the National Bank of Washington, balance $1,131.32. ** In the Columbia Federal Savings and Loan, $5,000 in a certificate, the remainder in a pass book account. A detailed report is on file with the recording secretary. Respectfully submitted, Theodore J. Spilman, *Treasurer.*

CUSTODIAN

(For the fiscal year 1 November 1970 to 31 October 1971)

The value of stock sold by the Custodian's office amounted to $574.80. Of this, $182.30 was for 18 copies of the *Memoirs*, $6.00 for 3 copies of Weld's gall paper, and 386.50 for miscellaneous numbers and reprints of the *Proceedings.* A copy of the complete detailed report is on file with the recording secretary. Respectfully submitted, Robert D. Gordon, *Custodian.*

EDITOR

(For the calendar year 1971)

Four numbers of the *Proceedings* were published in 1971. All of the 460 pages were devoted to scientific papers, notes, book reviews, minutes of meetings, announcements, and obituaries. Eighty-six scientific papers and notes were published. The Society and the *Proceedings* benefitted from two fully paid papers of 16 pages which did not cause the articles of regular contributors to be delayed. This was the first complete year for income from page charges but it is apparent that these charges will not be enough to cover an anticipated increase in printing costs next year. Respectfully submitted, Paul M. Marsh, *Editor.*

Information for Contributors

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Manuscripts for publication, proof and other editorial matters should be addressed to the *Editor* (for address, see inside front cover of this issue).

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First page—The page preceding the text of the manuscript should include (1) the complete title, (2) the order and family in parentheses, (3) the author's name or names, (4) the institution with city, state and zip code or the author's home city, state and zip code if not affiliated, (5) in the upper left hand corner, the complete name and address to which proof is to be sent.

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Names and descriptions of organisms—The first mention of a plant or animal should include the full scientific name with the author of a zoological name *not* abbreviated. Descriptions of taxa should be in telegraphic style.

References—Citations in the text of papers longer than one printed page should be by author and date and should refer to a list of concluding References listed alphabetically. See a recent issue of the Proceedings for style of references. In shorter articles, references to literature should be included in parentheses in the text.

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Acceptance of papers is based only on their scientific merit without regard to the author's financial support.

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DEPARTMENT OF ENTOMOLOGY
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(Continued on back cover)

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884

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Entomological Society of Washington
c/o Department of Entomology
Smithsonian Institution
Washington, D. C. 20560

MEETINGS.—Regular meetings of the Society are held in Room 43, Natural History Building, Smithsonian Institution, on the first Thursday of each month from October to June, inclusive, at 8 P.M. Minutes of meetings are published regularly in the *Proceedings*.

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PROCEEDINGS OF THE

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Vol. 74 SEPTEMBER 1972 No. 3

THE GENUS PARATROPIDIA HULL

(DIPTERA: SYRPHIDAE)

F. CHRISTIAN THOMPSON, *10 Edmunds Roads, Wellesley Hills, Massachusetts 02181*

ABSTRACT—The genus *Paratropidia* Hull is reviewed and placed in the *Criorhina* Group of the tribe Milesini, subfamily Milesinae. Keys to the genera of the *Criorhina* Group and species of *Paratropidia* are presented. *Paratropidia bilineata* Walker is redescribed and *P.* **alex** n. sp. and *P.* **margarita** n. sp. are described from New Guinea.

The genus *Paratropidia* was proposed by Hull (1949) for a single species of Syrphidae from New Zealand. Among the unidentified syrphid specimens at the Bishop Museum, Honolulu, two new species of *Paratropidia* were found from New Guinea. Discovery of these new species has prompted a review of the whole genus, the result of which is presented below.

The type species of *Paratropidia* Hull is *Milesia bilineata* Walker (1849). Miller (1921) tentatively placed the species in *Tropidia*, but stated that there was "many excellent grounds for the establishment of a new genus upon this species . . ." (1921:313). Hull placed his new genus *Paratropidia* in the Xylotinae, a group equivalent to the tribe Milesini of the two subfamily system currently used (Wirth *et al.*, 1965 and Thompson, 1970). Within the Xylotinae, Hull recognized six tribes: Xylotini, Temnostomini, Milesini, Criorhinini, Pocotini, and Tropidini. *Paratropidia* was placed in the Xylotini by Hull and he suggested that it was "perhaps" related to *Brachypalpus*. I (1970) have followed Hull's basic arrangement of genera within the Milesini (his Xylotinae), but I have included his Pocotini within the *Xylota* group and I have broken down his Criorhinini into two groups, the *Criorhina* group and the *Blera* group.

The position of *Paratropidia* in the phylogeny and classification of the Milesini is problematic. The following characteristics of *Paratropidia* are considered to exclude it from the various groups of the Milesini: 1) metasterna developed (*Temnostoma* and *Blera* groups) and pilose (*Blera* group); 2) face straight or with a trace of tubercle in *Paratropidia alex* (*Xylota* group), without carinae (*Tropidia* group); 3) hind femora swollen and tuberculate (*Temnostoma* and *Blera* groups), without plates or carinae (*Tropidia* group) or spurs (*Milesia* group); 4) anterior crossvein at apical third of discal cell (*Temnostoma* and *Blera* groups); 5) frontal prominence low (*Blera* group); 6) anal cell with short petiole, not long or bent (*Milesia* group); and 7) distinctive male genitalia (all groups). Thus *Paratropidia* clearly does not belong to any group of the Milesini as they are presently characterized, but rather than setting it off as a new group I prefer to tentatively place *Paratropidia* within the *Criorhina* group. This placement of *Paratropidia*, besides being based on exclusion from the other groups, is also based on two characters: 1) metasterna pilose; and 2) face straight or tuberculate (*P. alex* n. sp.). *Paratropidia* differs from the other members of the *Criorhina* group (except *Aneriophora*) in that it lacks a segmented aedeagus.

The presence of a distinct but reduced tubercle on the face of *P. alex* strongly indicates that *Paratropidia* was derived from a group with tuberculate faces. The tubercle in *P. alex* is considered a primitive trait rather than a secondary development, because: 1) tuberculate faces are found in related groups as well as in less derived ones, and 2) tuberculate faces seem to be an intermediate condition in the facial morphocline as discussed by Hull (1945 and 1949) and Thompson (1970).

This qualification of being derived from a group with tuberculate faces would probably eliminate the *Xylota*, *Tropidia* and *Milesia* groups as the source of *Paratropidia's* ancestral group. These three groups predominantly have concave or carinate, not tuberculate faces. *Paratropidia*, with its pilose metasterna, couldn't have been derived from a member of the *Blera* group, which all have bare metasterna, a derived character. Thus, the ancestral group of *Paratropidia* is restricted to either the *Temnostoma* or *Criorhina* group, with the *Criorhina* group the more plausible choice as indicated above. The following key will distinguish *Paratropidia* from the other criorhine genera.

Key to the Genera of the **Criorhina** Group of Milesini

1. Subcostal cell with numerous crossveins (fig. 7) ..... *Lycastris* Walker (Oriental)
   Subcostal cell without crossveins (figs. 8–11) 2
2. Metasterna pilose 3
   Metasterna bare ..... *Caliprobola* Rondani (Palearctic)
3. Posterior and apical crossveins disjunctive, not continuous; with an external spur at base of apical crossvein (figs. 10–11) 4
   Posterior and apical crossveins continuous; without an external spur at base of apical crossvein (Figs. 8–9) 5
4. Apical cell petiolate, with petiole longer than humeral crossvein (fig. 11) ..... *Aneriophora* Stuardo and Cortes (Chile)

Apical cell not petiolate, closed at wing margin (fig. 10) .... *Flukea* Etcheverry (Chile)

5. Scutellum with a distinct emarginate rim 6

Scutellum without an emarginate rim, evenly rounded 7

6. Barrette bare .... *Paratropidia* Hull (Australian)

Barrette pilose .... *Deineches* Walker (Australian)

7. Arista inserted at tip of a conically produced third antennal segment (fig. 3) .... *Merapioidus* Bigot (Nearctic)

Arista not inserted at tip of conically produced third antennal segment ... 8

8. Face tuberculate, oral margin not produced forward (figs. 5–6) 9

Face straight with oral margin produced forward (fig. 2) *Paratropidia* Hull

9. Short, sparsely pilose flies, wasplike, with distinct yellow pollinose marking on thorax and abdomen (fig. 5) .... *Sphecomyia* Latreille (Holarctic)

Long, densely pilose flies, bumblebeelike, without yellow pollinose markings (figs. 6, 8) .... *Criorhina* Meigen[1] (Holarctic, Oriental)

Paratropidia Hull

Paratropidia Hull, 1949, Trans. Zool. Soc. London 26(4):363. Type-species, *Milesia bilineata* Walker, 1849 (as *Tropidia bilineata* White) (original designation).

Head.—About ⅓ higher than long; face bare except narrowly pilose on sides, extensively pollinose except with shiny medial stripe in female of *bilineata*, straight or slightly slanted forward above, with epistoma strongly produced below, with slight trace of tubercle in *alex*; oral opening 3 to 4 times as long as broad; cheeks linear, more than twice as long as broad; facial grooves distinct, elongate, extending along lower third eyes; facial stripes distinct, narrow, pollinose and pilose; frontal prominence low, slightly above middle of head; front of male short, about 3 times as long as eye contiguity, as long as or longer than vertical triangle; vertical triangle of male long, about as long as face, about twice as long as broad at occiput; front of female narrow, from 2 (*bilineata*) to 5 (*alex*) times as long as broad at vertex, slightly shorter than face, with convergent sides above, from 2 (*bilineata*) to 4 (*alex*) times as broad at antennae as at vertex; ocellar triangle distinctly before posterior margin of eyes. Eyes bare, holoptic in males. Antennae short, slightly shorter than face except longer in *alex*; third segment quadrate with apical end slightly rounded except with elongate point in *alex*; arista bare, long, more than twice as long as antennae.

Thorax.—Slightly longer than broad, with short sparse pile and a pair of submedial longitudinal light pollinose stripes; mesokatepisterna with broadly separated dorsal and ventral pile patches; meso-anepisterna with anterior portion bare and posterior portion pilose; meso-anepimera with anterior portion pilose and posterior portion bare; meropleura bare; metathoracic pleura bare; metasterna pilose, greatly developed, with indistinct membraneous line dividing base from developed ventral portion in *bilineata* and *margarita* but absent in *alex*; postmeta-

[1] *Criorhina* of authors is apparently a polyphyletic and paraphyletic group and needs to be studied in detail. Shiraki's *Narumyia* belongs within the limits of *Criorhina* of authors and may represent a valid group. Some of the Nearctic species I have studied, such as *tricolor* Coquillett, appear to fit the description of *Narumyia*.

coxal bridge absent; metathoracic spiracle small, smaller than third antennal segment; plumulae short; scutellum with ventral pile fringe and distinct apically emarginate rim except indistinct to absent in *bilineata*, especially females. Legs: hind femora strongly swollen with a small low ventral tubercle near apex. Wings: marginal cell open, without petiole; apical cell closed distinctly before reaching costa, with petiole ranging from very short (*bilineata*) to long (*alex* and *margarita*); anterior crossvein at outer third of discal cell, strongly oblique; apical and posterior crossveins continuous, without external spurs at their bases; anal vein straight, without right angle bend before reaching wing margin (as in *Milesia*).

Abdomen.—Elongate with slightly convergent sides.

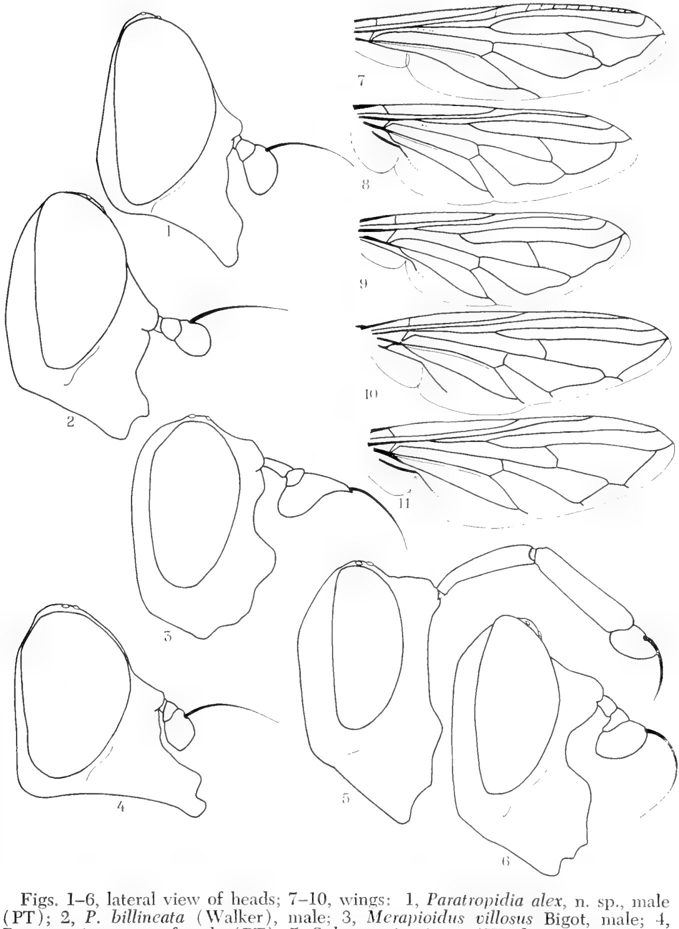
DISCUSSION: *Paratropidia* Hull with its pollinose longitudinal mesonotal stripes and facial shape, is not easily confused with any other milesine genus. *Senogaster* Macquart is the only other genus of the Milesini with longitudinal mesonotal stripes, but *Senogaster* can be easily separated from *Paratropidia* by its bifid spur on the hind femora, etc. *Paratropidia* is also one of the few genera of the Milesina with snoutlike faces. The only other genera of the Milesinae with snoutlike faces are *Lycastris* Walker, *Lycastrirhynchus* Bigot, *Rhingia* Macquart, and *Rhinotropidia* Stackelberg. *Paratropidia* can be separated from *Lycastris* by its lack of costal crossveins, from *Lycastrirhynchus* by its open marginal cell and straight R4 + 5 vein, from *Rhingia* by its apical anterior crossvein and short costa, which ends before the apex of the wing and from *Rhinotropidia* by its pollinose mesonotal strips.

Paratropidia is easily delimited by its male genitalia: 1) elongate, tubular aedeagus; 2) sclerotized elongate, tubular ejaculatory duct, which is almost completely enclosed within the aedeagus; and 3) simple hook-shaped styles. The elongate tubular construction of the aedeagus appears to be an unique development within the Milesini[2].

Key to the Species of **Paratropidia** Hull

1. Scutellum black; petiole of apical cell very short, much shorter than humeral crossvein; legs brownish black ---- *bilineata* Walker (New Zealand)
   Scutellum orange; petiole of apical cell long, much longer than humeral crossvein; legs orange and black ---- 2
2. Tarsi orange; abdomen black, without orange markings; hind femora with apical third orange and basal ⅔ black ---- *alex*, n. sp. (New Guinea)
   Tarsi black on apical four segments of anterior legs and all segments of hind

[2] Since writing this revision I have examined the male genitalia of *Orthoprosopa grisea* (Walker), a genus of the tribe Eristalini, subtribe Helophilina. The male genitalia of this species is almost identical to that of *Paratropidia* and indicates that *Orthoprosopa* should be placed in the tribe Milesini with *Paratropidia* despite its looped third vein, a typical eristaline characteristic. *Orthoprosopa* will run out to *Paratropidia* in the key given above and it can be separated from *Paratropidia* by its looped third vein and lack of pollinose mesonotal vittae.



Figs. 1–6, lateral view of heads; 7–10, wings: 1, *Paratropidia alex*, n. sp., male (PT); 2, *P. billineata* (Walker), male; 3, *Merapioidus villosus* Bigot, male; 4, *P. margarita*, n. sp., female (PT); 5, *Sphecomyia vittata* (Wiedemann), male; 6, *Criorhina ascilia* (Fallén), male; 7, *Lycastris cornutus* Enderlein, (after Hull 1949); 8, *Criorhina caudata* Curran; 9, *P. bilineata* (after Miller 1921); 10, *Flukea vockerothi* Etcheverry, (after Etcheverry 1966); 11, *Aneriophora aureorufa* (Philippi).

legs; abdomen with pairs of orange spots on second through fourth segments; hind femora with black dorso-apical band and basal third orange. .... *margarita*, n. sp. (New Guinea)

Paratropidia bilineata (Walker)
(Figs. 2, 3, 12, 14 & 16)

Milesia bilineata Walker, 1849:566. Type-locality, "Port Nicholson, New Zealand"; type location, British Museum (Natural History), London.
Milesia bilineata Walker: Kertesz, 1910. (2 references).
Tropidia bilineata White: Miller, 1921:314, (description, figures) (heads, ♂ ♀; mesonotum; tarsi; hind leg; male genitalia; abdomen, female).
Tropidia bilineata Walker: Hull, 1936:201, (catalog citation); Miller 1950:98, (catalog citation).

MALE. *Head.*—Face reddish brown, light golden pollinose except for shiny broad stripe between face and cheeks; cheeks reddish brown, light golden pollinose, yellow pilose; frontal lunule dark reddish brown; frontal triangle reddish brown, light golden pollinose, yellow pilose; vertical triangle dark brown, dark brownish pollinose except light golden pollinose in front of ocellar triangle, black pilose except yellow pilose in front of ocellar triangle; occiput black, light golden pollinose, with long yellow pile below becoming shorter above, with a few black cilia above. Antennae black, black pilose; third segment quadrate, slightly shorter than first two segments; arista black, about 1.5 times as long as antenna.

Thorax.—Golden pilose except with black pile intermixed on posterior half of mesonotum; pleura light golden pollinose; mesonotum with sides light golden pollinose, with two broad submedial and one narrow medial longitudinal silvery brown pollinose stripes, with rest of mesonotum black pollinose; scutellum black, lightly brown pollinose, golden pilose; metasterna orange, golden pilose, covered on ventral surface with many short, recurved, thick spinelike hairs; squamae and plumulae whitish yellow; halters light orange. Legs: light brownish black except darker brown on anterior apical third of femora and all of tibiae, black on tarsi; pile golden except black pilose as follows: a few black hairs intermixed on coxae; intermixed on trochanters; dorso-apical half of front femora; antero-apical half and all of ventral edge of middle femora; apical half of hind femora; ventrobasal half of front and middle tibiae; all of hind tibiae except medially; and tarsi. Wings: light brownish, completely microtrichose.

Abdomen.—Black except first sternum light brownish orange, shiny except silvery-gray pollinose as follows: base of first tergum; in form of lateral and submedial triangular spots on 2nd, 3rd and 4th terga; and lightly on venter. Spots as figured. Pile appressed black except golden as follows: ventrally and laterally on all segment except genitalia; basal ¾ of second tergum; and basal submedial half of third tergum. Hairs on apical margin of fourth tergum strongly developed and bristlelike.

FEMALE. *Head.*—Similar to male except as follows: face more extensively shiny, with a median shiny stripe and broader shiny lateral stripes; front with two large shiny spots above and lateral to antennal bases, dark brown pollinose with a few black hairs above antennal bases, light golden pollinose medially with golden pile, shiny on upper half with black pile, with sides convergent above,

½ as wide at vertex as at antennal bases, ⅙ as wide as head width at anterior ocellus, with a faint medial impressed groove on upper ⅔.

Thorax.—Similar to male except black pile on posterior half of mesonotum and on legs is more extensive and black spinelike hairs of metasterna are fewer.

Abdomen.—Similar to male except broader and with pollinose spots frequently reduced in size.

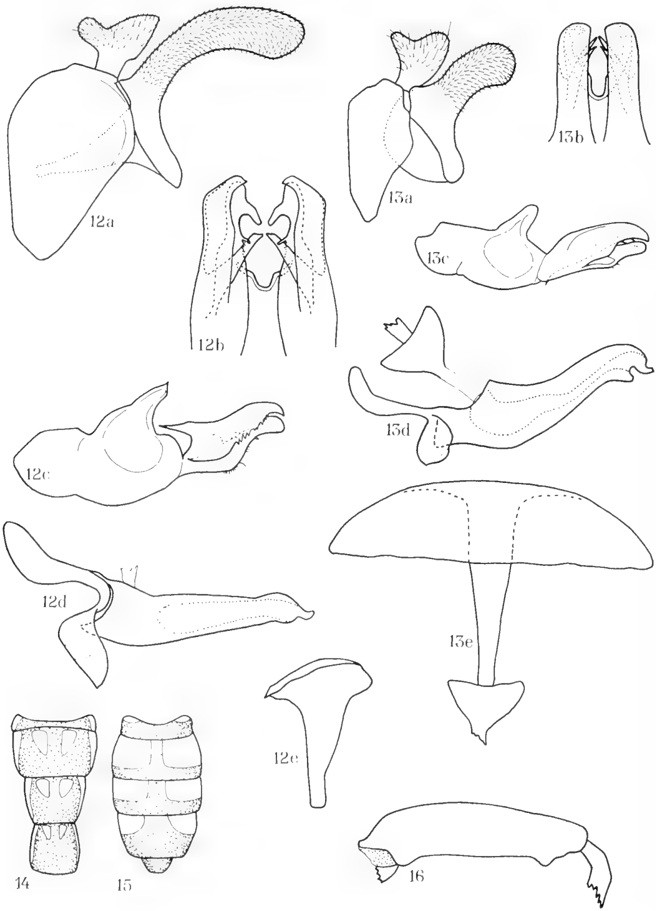
MATERIAL EXAMINED: NEW ZEALAND: Titirangi, Auckland, 4–X–1927, E. S. Gourlay, 2 ♂ (FCT); Ohakune, Wellington, 20–II–1919, 1 ♂ (USNM); Days Bay, Wellington, 24–III–1922, 1 ♀ (FCT); Blackball, Nelson I–I–1918, 1 ♀ (USNM); Tisbury, Otago, 5–XII–1916, 1 ♀ (FCT).

DISCUSSION: Besides the differences mentioned in the key, *bilineata* can be easily separated from both *alex* and *margarita* by: 1) the presence of short black spinelike pile on the metasterna; 2) less produced epistoma; 3) straight face; 4) much broader front in the female: 4) abdominal pattern; 5) pile color of legs; and 6) pale yellowish-white squamae (not bright orange). *P. bilineata* is further distinguished from *margarita* by the presence of black pile on the mesonotum and front, and from *alex* by its: 1) completely microtrichose wings; 2) black antennae; and 3) quadrate third antennal segment. The broader front in the female, less produced face, short petiole on the apical cell and the weakly emarginate (in some female non-emarginate) scutellum of *bilineata* are considered to be primitive traits. On the basis of these characters, I suggest that *bilineata* was derived before either *alex* or *margarita*. *P. alex* and *margarita* have in common: 1) a narrower front in the female, 2) a more produced face, 3) a much longer petiole on apical cell, and 4) a strongly emarginate scutellum. This demonstrates both their later origin and common ancestry.

Walker credits *bilineata* to White and cites *Voy. "Erebus" and "Terror"* as the source. Some authors, such as Miller (1921), have followed Walker in attributing *bilineata* to White but since, as Miller points out, there is no record of the species in White's contribution to the *Voyage*, the species must be considered as Walker's.

Paratropidia alex, n. sp.
(Figs. 1, 13)

MALE. *Head.*—Face reddish orange except dark reddish-brown snout, golden pollinose with pollinosity darker on snout, with a shiny stripe between face and cheeks; cheeks reddish brown, golden pollinose, yellow pilose; frontal lunule reddish orange; frontal triangle reddish orange, golden pollinose, yellow pilose; vertical triangle black, brownish-yellow pollinose in front of ocellar triangle, yellow pilose; occiput black, golden pollinose, long yellow pilose below becoming shorter above. Antennae orange except black dorsal third and apex of third seg-



Figs. 12–13, male genitalia; a, lateral view of tergite 9 and associated structures; b, dorsal view of apex of sternite 9; c, lateral view of sternite 9; d, lateral view of aedeagus and apodeme; e, lateral view of ejaculatory apodeme; 14–15, dorsal view of abdomen; 16, lateral view of hind femora: 12, *Paratropidia bilineata* (Walker); 13, *P. alex*, n. sp., (PT); 14, *P. bilineata*, male; 15, *P. margarita*, n. sp., (PT); 16, *P. bilineata*.

ment, black pilose above and orange pilose below; third segment slightly longer than basal two segments, elongate ventrally; arista black, twice as long as antenna.

Thorax.—With upper part of sternopleura laterally produced to form a blunt cone, golden-yellow pilose except black pilose across mesonotum between wings; pleura golden pollinose; mesonotum with sides broadly dark golden-brown pollinose, with two submedial longitudinal dark golden-brown pollinose stripes that are connected to lateral stripes across transverse sutures, with rest of mesonotum black pollinose; scutellum orange, translucent, shiny, orange pilose; squamae white with brownish-orange fringe; plumulae dark brown; halters orange. Legs: anterior four legs completely orange, sparsely golden pollinose, orange pilose; hind coxae brown, golden pollinose, orange pilose; hind trochanters brownish orange, orange pilose except for short black pile in small apical patch; hind femora with basal ⅔ dark reddish brown, with apical third orange, orange pilose except black pilose ventrally; hind tibiae and tarsi orange, orange pilose except with a few black hairs on apical tarsal segments. Wings: slightly smoky, dark in area of stigma, with stigma brown, microtrichose except bare medially and basally (1st and 2nd basal cells, basal third of discal cell, anterior half of anal cell, posterior half of costal cell, area around anal vein, basal half of alula—all bare).

Abdomen.—Terga shiny black except orange pollinose on first tergum and two median spots of grayish pollinosity on basal margin of second tergum, with pollinose areas orange pilose except black pilose on apical half of first tergum, with shiny areas long orange pilose laterally and appressed black pilose medially; venter shiny black except orange pollinose on first sternum, orange pilose on first and second sterna, black pilose on fourth sternum and genitalia, orange and black pilose on third sternum.

FEMALE. *Head.*—Similar to male except: snout more extensively dark; with a large bare spot above antennal bases; frons with sides convergent above, ¼ as wide at vertex as at antennal bases, 1/10 as wide as head width at anterior ocellus, and with a faint medial impressed groove on upper ⅔.

Thorax.—Similar to male except black pile on mesonotum greatly reduced and medial stripes grayish pollinose, not golden-brown pollinose as in holotype male (paratype male also with grayish pollinose stripe).

Abdomen.—As in male.

MATERIAL EXAMINED: Holotype—male: Wau, Morobe Distr., NEW GUINEA; 20 December 1961, 1400m; J. and J. H. Sedlacek, collectors. Allotype—female: same data as holotype. Paratype—male: Wau, NEW GUINEA; 7 August 1965, 1250m; J. and M. Sedlacek, Malaise Trap. Holotype and allotype in Bishop Museum, Honolulu and paratype in author's collection.

DISCUSSION: *Paratropidia alex* is easily separated from the other two species of *Paratropidia* by its produced sternopleuron. Besides the differences mentioned in the key, *alex* can be contrasted with *margarita* as follows: 1) face straight above, with a distinct trace of a tubercle, not concave above; 2) epistoma not as strongly produced; 3) front of female very narrow and shiny, not broad and pollinose above antennae; 4) third antennal segment slightly pointed, longer than broad, not round and as long as broad; 5) pleuron uniformly dark, not with the pectus black and strongly contrasting with rest of pleuron; 6) mesonotum with black pile across the middle, not uniformly yellow pilose; 7) coxae and trochanters with orange, not black, pile; 8) front and middle coxae and trochanters orange, not black; 9) metasterna with orange, not black, pile; 10) wings with medial areas bare, without microtrichia, not uniformly microtrichose; and 11) abdominal margins continuous orange pilose, not alternating black and orange pilose.

This species is affectionately dedicated to Dr. Charles Paul Alexander. Dr. Alexander has lived one of the longest and most distinguished lives in the history of Systematic Biology. During the last 60 years Dr. Alexander has written over 900 papers on the taxonomy of Diptera, particularly the Tipulidae. He has described approximately one per cent of the total diversity of life on earth and is the first man to have named more than 10,000 species in a single family of organisms. It is hoped that Dr. Alexander may have more productive and successful years.

Paratropidia margarita, n. sp.

FEMALE. *Head.*—Mainly brownish orange except brown snout; face light brown-yellow pollinose except more brownish on snout; cheeks golden pollinose yellow pilose; frons light brownish-yellow pollinose except large brownish pollinose spot above antennal bases, light brownish-yellow pilose, with a faint medial ridge on upper ⅔, with sides convergent above, about twice as wide at antennal bases than at anterior ocellus, one eighth the width of head at anterior ocellus; frontal lunule dark reddish brown, vertex and ocellar triangle brown pollinose, black pilose, with both brown pollinosity and black pilosity extending laterally down on to frons; occiput completely golden pollinose, yellow pilose below becoming browner above. Antennae dark reddish brown except dark brown on dorsal third of third segment; third segment approximately quadrate, 1.3 times longer on ventral edge than on dorsal, twice as long as first two segments; arista brownish black, twice as long as antennae.

Thorax.—Orange brown except black pectus and diagonal stripe on mesopleura; pleura light pollinose and yellow pilose except with a few black hairs intermixed on metasterna; mesonotum dark brown pollinose except for four light yellow longitudinal stripes, with two stripes lateral and other two submedial, yellow pilose; scutellum orange, shiny, orange pilose; Squamae, plumulae and halters orange. Legs: coxae black, silvery pollinose, black pilose except with a few white hairs intermixed on outer portions; trochanters black, shiny, black pilose except with a few white hairs intermixed; anterior four femora orange except black anterobasal third, golden pilose except black pilose on black areas and posterior dorsoapical edge (more extensive on front femora than middle femora); hind femora orange except black dorsobasal spot and large dorso-apical spot which extends dorsally from basal third (connected to basal black spot) to apical tip and laterally to ventral margin on apical half, golden pilose on orange areas and black pilose on black areas; tibiae orange, orange pilose; tarsi black except orange on first segment of anterior four tarsi, dark pilose on dark areas and orange pilose on orange areas. Wings: brownish, with stigma brown, uniformly microtrichose.

Abdomen.—First tergum black except orange base and lateral margins, appressed black pilose medially and longe yellowish-orange pilose laterally; second through fourth terga black except two large orange lateral quadrate spots, with spots extending from base to apical fourth on second tergum, to apical third on third tergum, and to apical half on fourth tergum, appressed black pilose except for orange triangular pile patches extending from base of tergum medially to end of orange spots laterally; fourth tergum with a small lateral white pollinose spot; fifth tergum dark orange, black pilose; first sternum dark, silvery pollinose, white pilose; second through fourth sterna orange, white pilose except black on apical half of fourth sternum; fifth sternum black, black pilose; cerci bright orange.

MATERIAL EXAMINED: Holotype, female. Daulo Pass, Asaro-Chimbu Dic., NEW GUINEA (NE); 11 June 1955, 2400m; J. L. Gressitt, collector. Paratype, female. Daulo Pass, NEW GUINEA (NE); 2 May 1959, 2500m; C. D. Michener, collector. Holotype in Bishop Museum, Honolulu and paratype in author's collection.

DISCUSSION: This species is named after Dr. Alexander's devoted wife, Mabel Margarita, who has not only made me feel free at home with them but a part of it. For a discussion of the differences between *margarita* and the other species, see the discussions under those species.

Acknowledgments

I would like to thank Dr. J. L. Gressitt of the Bishop Museum, Honolulu for the loan of the material described in this study; Dr. G. Kuschel of New Zealand Department of Scientific and Industrial Research for the gift of the *Paratropidia bilineata* material used; and Dr. Lloyd V. Knutson of the Systematic Entomology Laboratory, USDA, for his critical reading of this manuscript.

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OBSERVATIONS ON THE MATING PERIODS OF SOME GROUND BEETLES

(COLEOPTERA: CARABIDAE)

The majority of North American Carabidae apparently mate in spring. During June and July, 1971, I observed, in the field and in captivity, mating pairs of sixteen species of ground beetles, in Saguenay County, and in Schefferville, New Quebec, Quebec. The following is a list of the mating pairs, with their dates and numbers.

Agonum decentis Say: Tadoussac, June 14, in captivity, a pair.

A. muelleri Herbst: Port-Menier, July 13, in captivity, a pair.

A. propinquum G. and H.: Natashquan, June 28, in captivity, a pair.

Amara torrida Panzer: Blanc-Sablon, July 4, in the field, two pairs; Brador, July 7, in the field, three pairs; Havre-Saint-Pierre, June 24, in the field, a pair; Magpie, June 23, in the field, a pair; Mingan, June 21, in the field, a pair; Port-Menier, July 13, in captivity, a pair.

Bembidion carinula Chaud.: Rivière-Saint-Jean, June 22, in the field, a pair.

B. petrosum Gebler: Rivière-Saint-Jean, June 22, in the field, three pairs.

B. sejunctum Casey: Magpie, June 23, in the field, a pair.

Blethisa multipunctata L.: Natashquan, June 28, in captivity, a pair.

Carabus chamissonis Fischer: Blanc-Sablon, July 4, in captivity, a pair, and July 8, in captivity, two pairs; Brador, July 6, in captivity, a pair.

Harpalus affinis Schrank: Baie-Trinité, June 17, in captivity, a pair; Havre-Saint-Pierre, June 20, in the field, two pairs, and June 24, in the field, two pairs; Port-Menier, July 13, in captivity, a pair; Rivière à l'Huile, July 14, in captivity, four pairs.

H. rufipes De Geer: Rivière à l'Huile, July 14, in captivity, a pair.

Nebria gyllenhali Schön.: Blanc-Sablon, July 4, in the field, a pair; Schefferville, July 23, in captivity, a pair.

Pterostichus coracinus Newman: Port-Menier, July 12, in captivity, two pairs.

P. melanarius Illiger: Baie-Sainte-Claire, July 18, in captivity, a pair.

P. punctatissimus Randall: Middle Bay, July 5, in captivity, a pair.

Sphaeroderus nitidicollis Chev.: Rivière Jupiter, July 17 and 18, in captivity, four pairs.

This study was supported by a grant from the Ministère des Terres et Forêts du Québec.

ANDRÉ LAROCHELLE, *Collège Bourget, C.P. 1000, Rigaud, Québec.*

MYCTEROTHRIPS TRYBOM, A REVIEW OF THE NORTH AMERICAN SPECIES
(THYSANOPTERA: THRIPIDAE)

KELLIE O'NEILL, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland 20705*

ABSTRACT—The genus *Mycterothrips* Trybom is distinguished from *Taeniothrips* Amyot and Serville, which is retained as a valid genus distinct from *Thrips* L. A key to species of *Mycterothrips* in North America and notes on their characteristics, distribution, and synonymies are given. *Sericothrips floridanus* (Watson) n. comb. is transferred from *Mycterothrips* and it preoccupies *S. campestris* Hood (n. syn.).

The purpose of this paper is to clarify the relationship between *Mycterothrips* Trybom (1910:158) and *Taeniothrips* Amyot and Serville (1843:644) and to distinguish the North American species of *Mycterothrips*.

I am indebted for their help and kindness to the Entomology staff of the California Academy of Sciences, especially E. S. Ross, formerly Curator of Insects; C. Don MacNeill, formerly curator of the Moulton Collection; and P. H. Arnaud, Jr., present Chairman of Entomology. I am grateful to L. A. Mound and B. R. Pitkin, British Museum (Natural History), London; R. zur Strassen, Senckenberg Museum, Frankfurt, Germany; E. Titschack, Hamburg, Germany; L. J. Stannard, Illinois Natural History Survey, Urbana; E. W. King, Clemson University, Clemson, South Carolina; W. R. Richards, Systematic Entomology, Canada Department of Agriculture, Ottawa; and B. S. Heming, University of Alberta, Edmonton, Canada, for making specimens and references available to me.

Most species of the genus *Mycterothrips* were assigned to *Taeniothrips* until Priesner (1957:161) recognized them as distinct and restored the name *Physothrips* Karny (1912:336) for them. Priesner maintained *Rhopalandrothrips* Priesner (1922:68) for those species whose males have bizarre antennae (fig. 1). The status of the name *Physothrips* was equivocal (Stannard, 1968:330) because it was based on a misidentified species. Mound and I (1969:51) appealed to the International Commission on Zoological Nomenclature to designate *Thrips salicis* Reuter (1879:220) as the type-species of *Physothrips* so as to make it available in Priesner's sense. However, Bhatti (1969:378) placed both *Physothrips* and *Rhopalandrothrips* in the synonymy of *Mycterothrips*. *Mycterothrips* was not previously known to me, for its African type-species, *laticauda* Trybom (1910:158), is represented only by 2 specimens in the Institut für Spezielle Zoologie und Zoologischen Museum der Humboldt-Universität, Berlin (zur Strassen, 1966:44).

My knowledge of *Mycterothrips* is based on *acaciae* Priesner (1932:5), which Mound (personal communication) and zur Strassen (1966:444) compared and found congeneric with the type-specimens of *laticauda*. Having studied *acaciae* females that Mound made available to me and Priesner's (1960:300) description of the male, I concur that *Mycterothrips* is the correct name for this group of species. I also agree with Bhatti (1969:378) that *Rhopalandrothrips* is a synonym of *Mycterothrips*, because females of species with bizarre male antennae can scarcely be distinguished specifically from females of species with normal male antennae.

I cannot agree with Bhatti's (1969:380) action in synonymizing the genus *Taeniothrips* with *Thrips* L. The type-species of *Taeniothrips*, *picipes* (Zetterstedt), and several other species including *major* Bagnall, are amply distinct, for they lack the lateral ctenidia that are present in all species of *Thrips*. There are also many species assigned to *Taeniothrips* that lack a better assignment and until their status is clarified I prefer to continue them in *Taeniothrips*.

The two North American species that were the first assigned to *Mycterothrips* do not belong there. *Sericothrips floridanus* (Watson, 1918:68), new combination, was described as a species of *Frankliniella* and transferred by Watson (1923:45) to *Mycterothrips*. I compared the syntype of *floridanus* in the Canadian National Collection with the holotype of *Sericothrips campestris* Hood (1939:556) in our National Collection and found that *campestris* is a synonym of *floridanus* (new synonymy). *Taeniothrips longirostrum* (Jones, 1912:12), as Bailey (1957:200) stated, is near *Taeniothrips ehrhornii* (Moulton). Jones described it in *Euthrips* and Karny (1921:216) assigned it to *Mycterothrips*.

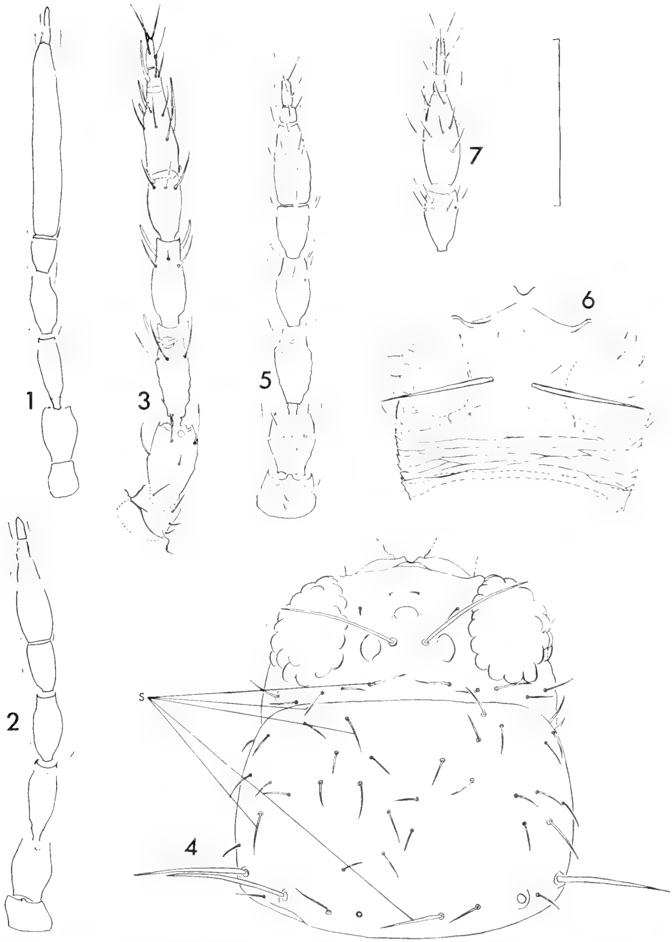
Mycterothrips Trybom

Mycterothrips Trybom, 1910, Denksch. med.-naturw. Ges. Jena 16:158; zur Strassen, 1966, Senck. biol. 47(6):444; Bhatti, 1969, Oriental Insects 3(4):378. Type-species by original designation and monotypy *M. laticauda* Trybom, 1910:158.

Physothrips Karny, 1912, Zool. Annal. 4(4):336; Priesner, 1957, Zool. Anz. 159 (7/8):161; Mound and O'Neill, 1969, Bul. Zool. Nomencl. 26(1):51–53. Type-species (as currently understood) *Thrips salicis* O. M. Reuter, 1879:220.

Rhopalandrothrips Priesner, 1922, Akad. Wiss. Wien, Math.-naturw. Klasse, Sitzber. (1) 131(4/5):68; Priesner, 1957, Zool. Anz. 159(7/8):161. Type-species by subsequent designation by Priesner, 1925, Konowia 4(3/4):148, *Thrips consociata* Targioni-Tozzetti, 1886:425 (= *Physopus ulmifoliorum obscura* Uzel, 1895:123).

Species of *Mycterothrips* resemble those of *Taeniothrips* in having 2 major setae on each posterior angle of the pronotum and none at the anterior angles; in having the forewing with the fore vein setae widely interrupted and the hind vein setae in a complete row; and in having the antennae typically thripine with



FIGS. 1–7. *Mycterothrips* spp.: 1, *albus* (Moulton), ♂ antenna; 2, *albus*, ♀ antenna; 3, *aureus* (Moulton), holotype ♀ antenna; 4, *aureus*, holotype ♀ head, s = setae sometimes enlarged in *Mycterothrips* spp.; 5, *betulae* (Crawford), ♀ paratype antenna; 6, *betulae*, ♀ paratype head; 7, *consociatus* (Targioni-Tozzetti), ♀ antenna V–VIII. Line = 0.1 mm; microtrichia and sculpture omitted from figs. of antennae; setae omitted from fig. 1–2.

forked sense cones on segments III and IV and a 2-jointed style. Though the antenna of the male is bizarre (fig. 1) in certain *Mycterothrips* species, it agrees with typical thripines in the number of segments and number and disposition of sense cones and differs chiefly in the lengths of segments.

Mycterothrips species can be recognized by: Head as in figs. 4 & 6; ocellar seta pair i present; pair iii major, within ocellar triangle; postocular setae disposed as shown, pairs i or iii or both sometimes well developed but not as long as ocellar pair iii. Antenna of female as in figs. 3, 5, and 7; microtrichia and minor setae conspicuous; segment VI abruptly narrowed at base (fig. 5), tapered (fig. 3), or intermediate. Antenna of male similar to that of female or bizarre as in fig. 1; only one form known to occur in the male of a single species; bizarre form with V short, VI elongate and densely clothed with microtrichia and fine setae, and VII–VIII reduced and rarely coalesced. Pronotum with only 2 pairs of posteromarginal setae between inner pair of major setae; certain setae (fig. 4, *s*) sometimes well developed, but not as large as major setae at posterior angles. Metanotum without discal pores; meso- and usually metaspinula present; forewing with only 2 distal setae on fore vein. Abdominal terga without lateral ctenidia; II–VII transversely striate except for about mesal third, striae weakly craspedote or bordered with cusps or sometimes dense microtrichia; posterior margins with short microtrichia except in mesal third; tergum VIII with complete, long, posterior marginal comb of fine, regular microtrichia. Abdominal sterna not craspedote; with none to many accessory setae, sometimes in one sex only. Male without sternal glandular areas.

Key to Females of Nearctic Species of **Mycterothrips** Trybom

1. Body entirely dark brown; abdominal tergum II usually with 4 setae at each lateral margin; tergum IX with 2 pairs of pores. Illinois northeastward, on birch and willow .... *betulae* (Crawford)
   Body pale or maculate; abdominal tergum II with 3 setae at each lateral margin; tergum IX with 1 or 2 pairs of pores 2
2. Body brownish yellow; abdominal terga II–VII each with brown wash in middle behind distinct antecosta. California, on grass? ..... *aureus* (Moulton)
   Body entirely pale except for internal pigment. California to British Columbia eastward to Colorado; Illinois; possibly South Carolina; on tree leaves .... *albus* (Moulton)

Mycterothrips betulae (J. C. Crawford)
(Figs. 5–6)

Taeniothrips salicis (O. M. Reuter): Hood, 1927, Ent. Amer. (n. s.) 7:215. Misidentification.

Taeniothrips betulae J. C. Crawford, 1939, Jour. N.Y. Ent. Soc. 47: 74: O'Neill and Bigelow, 1964, Can. Ent. 96(9):1232, fig. 13, 25, 42; Stannard, 1968, Bul. Ill. Nat. Hist. Sur. 29(4):361. Type from New Jersey in USNM no. 52667.

Physothrips betulae (Crawford): Priesner, 1957, Zool. Anz. 159(7/8):161.

Mycterothrips betulae (Crawford): Bhatti, 1969, Oriental Ins. 3(4):378.

This species is close to the European *salicis* in having antennal segment VI (fig. 5) abruptly narrowed at the base and similar in the two sexes. In *betulae* the lateral sculpture of abdominal terga extends mesad to seta pair i, whereas in *salicis* this sculpture extends no farther mesad than seta pair ii. The major setae of the head (fig. 6) and pronotum are stouter in *betulae* than in *salicis*. Males of *betulae* are light brown with rich yellow internal pigment.

Probably *betulae* occurs wherever birch is common in eastern North America. The National Collection contains specimens from birch and willow in New York, New Jersey, and Illinois, and a single female from birch in Quebec.

Mycterothrips aureus (Moulton), n. comb.
(Figs. 1–2)

Taeniothrips aureus Moulton, 1946, Pan-Pac. Ent. 22(2):59–60. Type from Echo Lake, California in California Academy of Sciences, Moulton no. 4210.

Nec *Thrips orionis* (Treherne) (? = *aureus* Moulton), Bhatti, 1969, Oriental Ins. 3(4):380.

Bhatti (1969:380) listed *aureus* Moulton as a probable synonym of *Taeniothrips orionis* Treherne (1924) when he suggested transferring *orionis* to the genus *Thrips*. Neither species belongs to *Thrips*; *aureus* belongs to *Mycterothrips* and *orionis* is a *Taeniothrips* in the strictest sense.

M. aureus resembles *betulae* but the female is pale with only a brown area behind the antecosta of each of the intermediate abdominal segments; and it has 3 setae on each lateral margin of abdominal tergum III where *betulae* has 4. The sculpture of the abdominal terga is not as extensive as that in *betulae*, and antennal segment VI (fig. 1) is narrowed more gradually at the base. Heming collected a female from *Alnus* sp. at the altitude of 5400′, R. B. Miller Biological Station, Alberta, Canada, 22 June 1970, that seems to be this species although it has postocular setae iii stout and dark brown instead of minor as in the holotype (fig. 2). Otherwise *aureus* is known only from the type-series, the female holotype, 1 female paratype, and 2 larvae, which were swept from grass, Echo Lake, Calif., 23 July 1930, Moulton no. 4210. Heming also swept a male from low damp meadow south of Whitecourt, Alberta, 12 July 1969, that may be this species. This male has normal antennae and is entirely pale; it may have been bleached in preparation. Since the type-series was collected by sweeping, *aureus* is not necessarily a grass inhabitant but may live on tree leaves as do other members of its genus.

Mycterothrips albus (Moulton)
(Figs. 3–4)

Euthrips albus Moulton, 1911, U.S. Dept. Agr. Bur. Ent. Tech. Ser. 21:39–40, pl. 3, fig. 20–22; pl. 4, fig. 30. Type from Red Bluff, California in California Academy of Sciences.

Euthrips costalis Jones, 1912, U.S. Dept. Agr. Misc. Papers Tech. Ser. 23(1):13–14, pl. 4, fig. 1–4. Type from San Jose, California in USNM no. 71250.

Physothrips albus (Moulton): Karny, 1912, Zool. Ann. 4:340; Priesner, 1957, Zool. Anz. 159(7/8):161.

Physothrips costalis (Jones): Karny, 1912, op. cit.:344.

Taeniothrips (*Physothrips*) *albus* (Moulton): Watson, 1923, Fla. Agr. Expt. Sta. Bul. 168:42.

Taeniothrips (*Physothrips*) *costalis* (Jones): Watson, 1923, op. cit.:42.

Taeniothrips albus (Moulton): Treherne, 1924, Can. Ent. 56(4):83; Bailey, 1957, Bul. Calif. Insect Surv. 4(5):198–199.

Rhopalandrothrips corni Moulton, 1927, Pan-Pac. Ent. 4(1):34–35; Bailey, 1957, op. cit.:191–192, pl. 23, fig. 54–56; O'Neill and Bigelow, 1964, Can. Ent. 96(9):1219. Type from Big Trees, Calaveras Co., California in California Academy of Sciences, Moulton no. 967. NEW SYNONYMY.

Taeniothrips albipennis Moulton, 1929, Pan-Pac. Ent. 5(3):129–130; Bailey, 1957, op. cit.:198. Type from "Eel River, Shasta County," California in California Academy of Sciences, Moulton no. 2975. NEW SYNONYMY. Bailey stated that Eel River does not pass through Shasta County.

Taeniothrips costalis (Jones): Bailey, 1936 (1935), Pan-Pac. Ent. 11(4):166.

Taeniothrips albidus Stannard, 1968, Bul. Ill. Nat. Hist. Surv. 29:360. Type from Atlas, Pike Co., Illinois in Natural History Survey. NEW SYNONYMY.

Mycterothrips albidus (Stannard): Bhatti, 1969, Oriental Ins. 3(4):378.

Mycterothrips albipennis (Moulton): Bhatti, 1969, op. cit.:378.

Mycterothrips corni (Moulton): Bhatti, 1969, op. cit.:378.

Mycterothrips albus (Moulton): Bhatti, 1969, op. cit.:378.

This is a pale, immaculate species similar to *albidicornis* (Knechtel, 1923:73) of the European fauna, but with more extensive brown shading on antennal segments and finer minor pronotal setae. In *albus* the often scant ocellar pigment is reddish orange, and the internal pigment is pale dull yellow. Setae of ocellar pair iii are subequal to the pronotal posteroangular setae, which vary from 30–60μ but are usually 50–55μ. Abdominal lines of sculpture have minute to scarcely visible teeth. Tergum IX in both sexes has only the anterolateral pair of pores. The female antenna (fig. 3) has segment VI gradually narrowed at the base, and the male antenna (fig. 4) is bizarre.

Examination of the holotypes of Moulton's *albus*, *corni*, and *albipennis*, the holotype of *costalis* Jones, and a paratype of *albidus* Stannard convinced me that all represent a single species. They were identified—as were specimens from peach disease vector surveys in the National Collection—as *Rhopalandrothrips corni* when males were present and as *albus* or another *Taeniothrips* species when males were lacking. Specimens exhibit variation in lengths of antennal segments and apparent length of mouth cone, which is highly subject to distortion in mounting; but I can see no constant difference, regardless of host or locality.

Specimens have been found on peach, dogwood, maple, *Salix* sp., *Bromus* sp., *Aesculus californica*, *Amelanchier cusickii*, and oak. Nationwide searches for peach disease vectors yielded specimens from peach, *Prunus spp.*, weeds, cover crops, and soil of peach orchards, in western U.S., but none in eastern U.S. Specimens found under bark and in plant debris, in moss, and in soil were probably hibernating. Adults of both sexes were found in soil in peach vector surveys, but if pupae were present they could not be distinguished from those of other thripids.

Though *albus* is rarely collected, it occurs from British Columbia to California and eastward to Idaho, Colorado, and New Mexico. Stannard found it in Illinois, and J. G. Watts collected a single specimen that may be this species from chestnut in South Carolina.

Mycterothrips species

Heming swept a female from sedge at 2900′ in the Caribou Mts., Alberta, Canada, that I cannot place. It is uniformly washed with pale brown as a teneral specimen of *betulae* might be, and appears to have had 4 setae on each lateral margin of abdominal tergum II. However, its sculpture is delicate and scant as in *albus*, and it has the base of antennal segment VI gradually narrowed basad as in the European *consociatus* (Targioni-Tozzetti) (fig. 7).

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A NEW GENUS AND TWO NEW SPECIES OF NEOTROPICAL CHARIESTERINI

(HEMIPTERA: COREIDAE)[1]

THOMAS R. YONKE,[2] *Department of Entomology, University of Missouri, Columbia, Missouri 65201*

ABSTRACT—A new genus, **Ruckesius,** and two new species, **R. medleri** and **R. kapleri,** are described from Paraguay and Bolivia, respectively. *Ruckesius* is placed in the coreid tribe Chariesterini near *Chariesterus* to which it is most allied. A key to the four genera of Chariesterini is provided.

Much work is needed on the alpha taxonomy of the Coreidae. The family has been largely neglected in the last 100 years, since the work of Carlos Stål who in 1867 erected the tribe Chariesterini. In their catalogue of the Hemiptera, Lethierry and Severin (1894) listed eight species of *Chariesterus*, seven of *Plapigus*, and one of *Staluptus*. Four species of *Chariesterus* have since been described (Fracker, 1919; Van Duzee, 1937; and Ruckes, 1955). Of the 22 species of Chariesterini, including the two described here, only four are known to occur in the Nearctic region and of these only one, *Chariesterus antennator* (Fab.), is exclusively Nearctic. The rest are Neotropical.

Ruckesius, n. gen.

Elongate, slender bugs about 12 mm long or less, somewhat dorso-ventrally flattened; light brown in color; generally devoid of spines; body densely covered with blunt-tipped setae; length of antennae about ½ that of body, first antennal segment triquetral, second slender cylindrical, third foliaceous, fourth incrassate acuminate; labium extending to mesosternum; distinct labial groove in pro- and mesosterna; pronotum elongate, humeral width nearly twice basal width; antero-lateral pronotal spines well developed; lateral carinae entire; humeri rounded, not produced; pronotum and propleura sparsely punctate; scutellum longer than wide; metathoracic scent apparatus with reduced evaporative area; hemelytra extending to near tip of abdomen; abdomen elongate somewhat dorso-ventrally flattened; legs devoid of spines.

Type-species: *Ruckesius medleri,* n. sp.

This genus is most closely related to *Chariesterus* Laporte, and is therefore placed in the tribe Chariesterini to which it is readily keyed in Stål (1867), as in the key below.

The genus is named in honor of the late Dr. Herbert Ruckes who has published the most recent work on the species of *Chariesterus*

[1] Contribution from the Missouri Agricultural Experiment Station. Journal series no. 7182.

[2] Associate Professor of Entomology.

(Ruckes, 1955) and who had examined one specimen in the C. J. Drake collection labelling it a new genus and species. He, however, never described it.

Key to the Genera of Chariesterini

1. Antennal segment I triquetral, almost equally incrassate throughout length; pronotal collar absent 2
   Antennal segment I cylindrical for ½ to ¾ its length, apically incrassate; pronotal collar distinct 3
2. Anterior lateral pronotal spine prominent; humeral angles rounded, not produced; length of antennae ½ that of body; antennal segment I devoid of spines .... *Ruckesius* Yonke
   Anterior lateral pronotal margin rounded, not spined; humeral angles prominently dentate, acuminate, or acute; length of antennae subequal to that of body; antennal segment I usually bearing thick spines at triquetral angles .... *Chariesterus* Laporte
3. Humeral angles acute; antennal segment I longer than II, segment III strongly foliaceous .... *Plapigus* Stål
   Humeral angles rounded or obtuse; antennal segments I and II subequally long, segment III narrowly foliaceous .... *Staluptus* Stål

Ruckesius medleri, n. sp.
(Fig. 1)

Body slender, somewhat flattened, length of female 8.48 mm, humeral width 1.60 mm; abdominal width 2.20 mm; light brown except alternating fuscous and yellowish bands on connexivum, antennal dilation of segment III fuscous; short blunt white setae profuse over entire body, antennal segments I, II, and III, and legs; antennae one-half body length; antero-lateral spines large, blunt tipped, projecting forward beyond anterior pronotal margin; humeri broadly rounded; legs devoid of spines.

Head.—Elongate, nearly cylindrical, 1.28 mm long, outer ocular width 0.92 mm, inner ocular width 0.60 mm, inner ocellar width 0.31 mm, median fovea extending from base of tylus to between ocelli, small pit in front of each ocellus; no post-antennal tubercles; antenniferous tubercles prominent, broadly rounded on inner apical margin, extending well beyond jugae; jugae only slightly exceeding tylus; ocelli farther from each other than from compound eyes; length from ocellus to tip of antenniferous tubercle 0.94 mm; bucculae short, extending to less than ½ length of head to vertical midline of compound eye, posterior face of bucculae open; venter forming shallow labial groove; labium reaching middle of mesosternum, length of labial segments: I—0.59 mm, II—0.59 mm, III—0.51 mm, IV—0.43 mm; antennal segment I stout, moderately triquetral; segment II slender cylindrical; segment III foliaceous, width of dilation 0.56 mm; antennal segment IV incrassate, then acuminate distally; length of antennal segments: I—1.28 mm, II—1.20 mm, III—1.28 mm, IV—0.60 mm.

Thorax.—Pronotum 1.76 mm long, slightly longer than humeral width and twice as long as basal pronotal width (0.88 mm); lateral pronotal margin carinate, entire, with antero-lateral spine projecting along head; collar absent; pronotum with median carina, large tubercle on either side of carina anterior to posterior

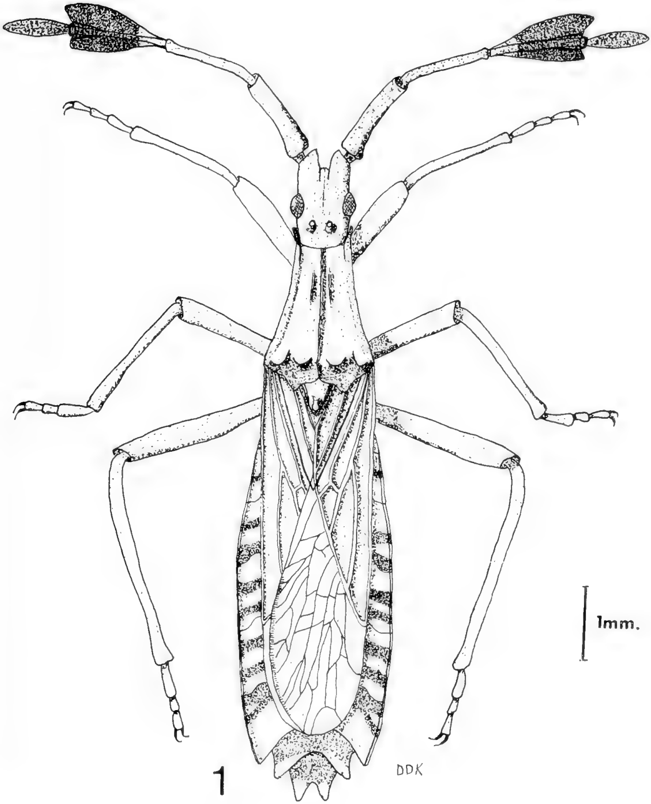

Fig. 1. *Ruckesius medleri*, n. sp., dorsal view, female holotype.

pronotal margin; humeri broadly rounded; posterior angle distinct on either side of scutellum and reflexed between angles; scutellum longer (0.62 mm) than basal width (0.47 mm) with median and lateral carina distinct; disc and propleura sparsely punctate; propleura oblique; labial groove distinct but shallow on prosternum, deeply grooved in anterior half of mesosternum, less so in posterior half; metathoracic scent apparatus opening laterally, peritreme absent from posterior half, prominently raised disc anterior to ostiole with groove extending from vestibule to near apex of disc, a narrow band of evaporative cuticle extending around ostiole and disc; femora simple, gradually stouter apically; tibiae slender, cylindrical; hemelytra extending to just beyond seventh tergite.

Abdomen.—Connexivum from tergites 3–7 well exposed, each with 1 or 2 fuscous bands alternating with dull yellow bands; spiracles on sternites 3–7 one-third distant from anterior margin of respective segments, slightly less displaced from lateral margin.

Holotype. Female, labelled "Grand Chaco, Paraguay, 59–40, W. 22–23, N.; 260 Km West Paraguay River, VI–10–1936; Alberto Schulze; J. C. Lutz collection." (In United States National Museum, Type No. 71755). Paratypes: 2 females, same label data as holotype, both deposited in the collection of the USNM. Males are presently unknown. Labels on the three specimens are obviously incorrect in the designation of "22–23, N." and probably should read 22°23′, S.

This species is named in honor of my former mentor, Dr. John T. Medler of the University of Wisconsin who, through his encouragement and direction, was initially responsible for my interest in the Hemiptera.

Ruckesius kapleri, n. sp.

Body slender, somewhat flattened, length of female 11.40 mm, humeral width 2.07 mm, abdominal width 2.90 mm; light brown except for fuscous and yellowish areas on connexivum, antennal dilation of segment III fuscous; short blunt setae profuse over entire body, antennal segments I, II, and III, and legs; antennae over one-half as long as body, antero-lateral spines large, blunt tipped, projecting forward beyond anterior pronotal margin; humeri broadly rounded; legs devoid of spines.

Head.—Elongate cylindrical, 1.40 mm long, outer ocular width 1.10 mm, inner ocular width 0.75 mm, inner ocellar width 0.38 mm, median fovea extending from base of tylus to between ocelli, a small pit in front of each ocellus; no post-antennal tubercles; antenniferous tubercles prominent, acute on inner apical margin; length from ocellus to tip of antenniferous tubercle 1.18 mm; bucculae short, extending almost ⅔ length of head to posterior margin of compound eye; labium reaching mesosternum, length of labial segments: I—1.00 mm, II—0.75 mm, III—0.60 mm, IV—0.50 mm; antennal segment I stout, moderately triquetral; segment II slender, cylindrical; segment III foliaceous, width of dilation 0.65 mm; segment IV incrassate, then acuminate distally; length of antennal segments: I—2.20 mm, II—1.75 mm, III—1.50 mm, IV—1.30 mm.

Thorax.—Pronotum 2.50 mm long, longer than humeral width, over twice as long as basal pronotal width (1.07 mm); lateral pronotal margin carinate, entire, with antero-lateral spine projecting along head; collar absent; pronotum with median carina, large tubercle on either side of carina anterior to posterior pronotal margin; humeri broadly rounded; posterior angle distinct on either side of scutellum and reflexed between angles; scutellum longer (0.85 mm) than basal width (0.60 mm) with median and lateral carina distinct; disc and propleura punctate; labial groove extending through mesosternum; metathoracic scent apparatus opening laterally, paritreme present on posterior half on dorsal margin above ostiole, a raised oval disc anterior to ostiole with groove extending from vestibule to top of disc, a narrow band of evaporative cuticle extending around ostiole and disc; femora simple, gradually stouter apically; tibiae slender, cylindrical; hemelytra extending to tip of abdomen.

Abdomen.—Connexivum broad with fuscous bands; spiracles on sternites 3–7 one-third distant from anterior margin of respective segments, slightly less displaced from lateral margin.

Holotype: Female, labelled "Cochambamba, Bolivia; 20–III–1950; M. Zischka"; C. J. Drake collection. (In United States National Museum, Type No. 71756). No males are presently known.

This species is named in honor of Dr. Joseph Kapler, my former undergraduate advisor in Biology at Loras College, Dubuque, Iowa, who encouraged me to pursue graduate work in entomology.

Key to Species of **Ruckesius**

Antennal segments I and III subequal, each subequal to length of head; outer apical angle of antennal dilation III acute (fig. 1) .... *medleri* Yonke

Antennal segment I much longer than either antennal segment III or head; outer apical angle of antennal dilation III rounded .... *kapleri* Yonke

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THOMAS ELLIOTT SNYDER
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DAVID R. SMITH, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—A list of the more than 300 publications of Dr. Thomas Elliott Snyder is presented. For those articles where new taxa were proposed, a list of the new taxa is given.

During a span of 58 years, Dr. T. E. Snyder (Obituary, Proc. Ent. Soc. Wash., 1971, 73:239–242) authored or co-authored over 300 articles, mostly on termites but many on other insects destructive to forests and forest products. Based on his notes, reprints, Bibliography of Termites and both Supplements (1956, 1961, 1968), and his Catalog of the Termites of the World (1949), the following complete compilation of Dr. Snyder's articles is presented. This does not include many news or press releases and mineographed reports. Dr. Snyder's interests were broad, as his publications reveal, and deal with biology, control, and taxonomy. He described over 170 new species and other taxa, and these are listed, in parentheses, following the article in which they appear. After his retirement and between 1952 and 1957, Dr. Snyder ran a column in *Pest Control* called "Borer Lines" which account for many of the articles during that period.

The first listing is those for which Dr. Snyder was sole author. This is followed by the articles for which he was senior author and those for which he was junior author. I have attempted to arrange the publications chronologically in the order in which they appeared in the same year.

Snyder, T. E.

1910. Insects injurious to forest and forest products: Damage to chestnut telephone and telegraph poles by wood-boring insects. U.S. Dept. Agr., Bur. Ent. Bull. 94, pt. I, pp. 1–12.

1911. Damage to telephone and telegraph poles by wood-boring insects. U.S. Dept. Agr., Bur. Ent. Circ. (2nd ser.) 134, pp. 1–6.

1912. Insect damage to mine props and methods of preventing the damage. U.S. Dept. Agr., Bur. Ent. Circ. (2nd ser.) 156, pp. 1–4.

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1913. Changes during the quiescent stages in the metamorphosis of termites. Science (n.s.) 38:487–488.

——. Record of the rearing of *Cupes concolor* Westw. Proc. Ent. Soc. Wash. 15:30–31.

[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

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THE GENUS ACROMETOPIA SCHINER IN NORTH AMERICA

(DIPTERA: CHAMAEMYIIDAE)

McAlpine (1965. U.S.D.A. Handbook 276:707) lists only one species of *Acrometopia* for America north of Mexico, *A. punctata* Coquillett, with *Trigonometopus reticulatus* Johnson as a synonym. This synonymy was first brought forth by Sturtevant (1923. Amer. Mus. Nov. 76:4). I have examined the types of both species, as well as the additional material listed below, and I am convinced that they represent distinct species separable as follows.

KEY TO NORTH AMERICAN SPECIES OF **Acrometopia** SCHINER

Wing with brown borders of posterior crossvein (*im*) continued to costa as a band, more or less divided anteriorly; tarsus and apical ⅔ of tibia of foreleg blackish .... *A. punctata* Coquillett

Wing with markings consisting of seams along crossveins and transverse bars in the cells, the marks rarely coinciding with any in an adjacent cell; foretarsus with at least basitarsus and second segment yellowish; foretibia wholly yellowish .... *A. reticulata* (Johnson)

Besides the type of *A. punctata*, a ♀ specimen from "S. Georgia (Morrison)" in the U.S. National Museum, only a ♂ specimen from Saraland, Mobile County, Alabama, October 26, 1916, cited by Sturtevant (l.c.) and now in the U.S. National Museum, has been seen.

The type of *A. reticulata*, a ♀ specimen from Crescent City, Florida, April 1908 (M. C. Van Duzee), and another ♀ specimen from Royal Palm Park, Florida, March 20–April 4 (W. S. Blatchley), are in the Museum of Comparative Zoology, Harvard University. There are in the U.S. National Museum 6 ♂ and 2 ♀ specimens of *A. reticulata* from Hialeah, Florida, 5 October 1970, swept from grass (Carl E. Stegmaier, Jr.).

GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, c/o U.S. National Museum, Washington, D.C. 20560.*

NOTES ON THE GENUS SUILLIA IN MEXICO, WITH THE DESCRIPTION OF A NEW SPECIES

(DIPTERA: HELEOMYZIDAE)

GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—*Suillia* **valleyi,** new species, is described and a key to the species of *Suillia* known to occur in Mexico is presented.

Four species of *Suillia* Robineau-Desvoidy were described from Mexico more than 70 years ago (Gill, 1968:7), but apparently no specimen of 3 of them (*S. distigma*, *S. polystigma*, and *S. punctulata*, all by Wulp, 1897) has been seen since and their only appearance in the literature has been copies of the original descriptions and attempts at placing them in keys on the basis of those descriptions (Aldrich and Darlington, 1908; Czerny, 1904, 1924; Steyskal, 1944). The 4th species, *S. iniens* (Giglio-Tos, 1893, 1895) has been accorded the same treatment, except that Wulp recorded additional material at the same time that he presented the descriptions of the other species.

Recently Karl Valley presented the U.S. National Museum with a fine pair of *Suillia iniens* taken at Tenancingo, Mex., Mexico, elevation 2022 m, 2 August 1969 (K. Valley). There is in USNM also a specimen of *S. iniens* taken by O. S. Flint, Jr., at Tecojotes, Oaxaca, Mexico, 8 June 1967. Also taken by Mr. Valley at the same time he took the *S. iniens* was a specimen of the new species described below.

As Wulp stated in 1897, *S. iniens* was well described for its time and is quite recognizable. Czerny erred, however, in presuming that its mesopleuron is bare. I am grateful to Brian H. Cogan, of the British Museum (Natural History) for determining from the type specimens that the mesopleuron of all of the Mexican species except *S. punctulata* have hairs on the mesopleuron. In *S. iniens* there are numerous setae on the posterior half of the mesopleuron. The black spot laterad of the ocellar field (Czerny, 1924:10) consists of an infuscated border around the frontal plates.

Suillia valleyi, n. sp.

(Fig. 1)

Female. Length of wing 5.5 mm. Body generally tawny, blackish as follows: orbito-antennal spot; tip of palpus; apical 0.28 of fore, 0.25 of middle and hind tibiae; subbasal annulus of hind tibia; preapical blotch on inner and lower side of fore femur; rather small preapical blotch on lower side of middle and hind femora;

[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

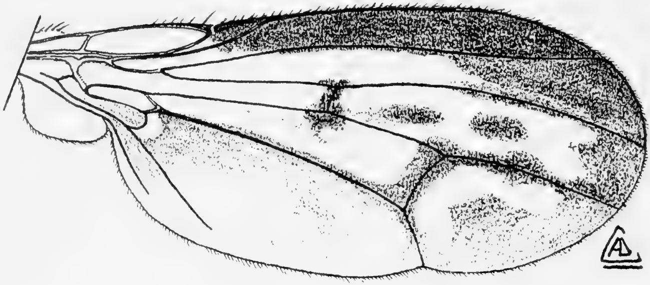

Fig. 1. *Suillia valleyi*, n. sp.: wing.

more or less of apical part of 2nd and all of apical 3 segments of tarsi; border of abdominal terga laterad of lateral bristles; rather narrow lateral margin of abdominal sterna. Brown markings are as follows: supracervical blotch; horizontal band across occiput just above neck; margins of frontal plates; apical extension of ocellar triangle; extreme base of fore coxa and margin of prosternal membranous area; rather indistinct basal parts of all femora; complete band from lower side of humerus to metathoracic spiracle; narrow median longitudinal mesoscutal stripe; spots at base of *dc* bristles; irregular supra-alar stripe; fine dots at base of mesoscutal setulae; postscutellar roll; broad but indistinctly margined median longitudinal dorsal abdominal stripe.

Wing venation and color pattern as in fig. 1; humeral and costal cells and middle part of wing generally tawny, markings dark brown, posterior part of wing smoky.

Special chaetotaxy: aristal hairs spreading to distance equal to width of 3rd antennal segment; posterior half of mesopleuron bearing numerous setulae; 5 setulae on anterior part of pteropleuron; dorsal surface of scutellum with numerous setulae over entire surface; hind femur with 3 strong dorsal bristles, all apicad of middle; row of anterior bristles in basal half of hind femur scarcely distinguishable from surrounding setulae.

Holotype, female Route 55 at Tenancingo, Mex., Mexico, elevation 2022 m, 2 August 1969 (Karl R. Valley), no. 71491 in USNM.

The specific name is a genitive form of the collector's name.

Key to Mexican Species of **Suillia** R.-D.

1 (2) Marginal cell of wing with row of 8 dark spots blending anteriorly with dark costal border; 1st posterior cell with 5 dark median spots; hairs present on mesopleuron; hairs of arista very short .... *S. polystigma* (Wulp)

2 (1) Marginal cell beyond pterostigma more or less uniformly darkened, at most with ill-defined preapical pale area; 1st posterior cell without or with only 2 median spots.

3 (6) 1st posterior cell without median spots, or with only light brown streak; mesopleuron haired or bare.

4 (5) 1st posterior cell without median streak, with broad dark apical area; darkening on *tp* not extending laterally at either side along 4th vein; mesopleuron bare; arista plumose .... *S. punctulata* (Wulp)

5 (4) 1st posterior cell with light brown median streak, preapical dark cloud, and apical yellowish area; mesopleuron with hairs; arista short-plumose .... *S. iniens* (Giglio-Tos)

6 (3) 1st posterior cell with 2 median spots; mesopleuron with hairs.

7 (8) Median spots of 1st posterior cell small and round; with dark spot in middle of last section of 4th vein; arista nearly bare .... *S. distigma* (Wulp)

8 (7) Median spots of 1st posterior cell elongate-elliptical; last section of 4th vein with dark-bordered median zone narrowly connected with brown seam of *tp* and with dark apex of wing; arista with long plumosity .... *S. valleyi*, n. sp.

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NOTES ON THE GENUS NERTHRA, INCLUDING THE DESCRIPTION OF A NEW SPECIES

(HEMIPTERA: GELASTOCORIDAE)

JOHN T. POLHEMUS, *University of Colorado Museum, Boulder, Colorado 80304*

ABSTRACT—Distribution records are given for *Nerthra* Say in Central and North America, and *Nerthra* **spangleri,** n. sp. is described from Western Mexico. The following new locality records are established: *Nerthra manni* Todd, Arizona; *Nerthra martini* Todd, Sonora, Mexico; *Nerthra hungerfordi* Todd, Chiapas, Mexico.

In this paper, distributional records are given for various species of *Nerthra* Say collected in the Western United States, Mexico and Central America. *Nerthra spangleri*, n. sp. is described from the West Coast of Mexico, where it is apparently restricted to a narrow area along the coast.

Upon correlating this work with Dr. E. L. Todd, I discovered that he too was planning to publish on *Nerthra spangleri*, n. sp. He has generously turned over to me the responsibility of describing this species, and arranged for the loan of specimens under his care at the U.S. National Museum (USNM).

Part of the material reported here was collected during an expedition financed in part by the University of Colorado Museum (CU); the remainder of the material is from the Polhemus collection (JTP).

Nerthra spangleri, n. sp.

Size.—Male: Length, 5.8 to 6.9 mm; width of pronotum, 3.5 to 4.1 mm; width of abdomen, 3.5 to 4.0 mm. Female: Length, 6.2 to 7.5 mm; width of pronotum, 3.8 to 4.6 mm; width of abdomen, 4.0 to 5.1 mm. (All specimens available were measured.)

Color.—Light brown to dark blackish brown; some light colored specimens with a distinct dark brown longitudinal stripe as wide as the scutellum starting at the anterior margin of the pronotum and extending to the apex of the membrane, lateral hemelytral margins dark also; posterior margins of the segments of the connexivum pale yellowish brown; disc of pronotum pale to dark brown, often mottled; posterior margins of hemelytra and pronotum usually mottled; ventral surface mottled even in darkest specimens; legs pale brown, annulated with deep brown.

Structural Characteristics.—Apex of head slightly concavely excavated, a broad tubercle on either side of the excavation; one weak lateral tubercle on each side; a slight excavation between each eye and lateral tubercle; ocelli present. Pronotum widest at the level of the transverse furrow, usually less than width of abdomen but in some males slightly wider; lateral margins with median part weakly concave, rarely straight, converging evenly along anterior third, postero-lateral angles rounded. Scutellum wider than long (5:3), about two thirds the width of prono-

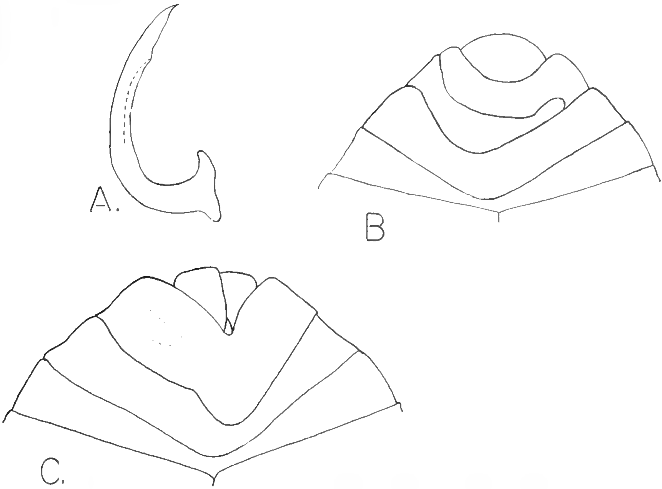

Fig. 1. *Nerthra spangleri*, n. sp.: A, right clasper, ♂ genitalia; B, abdominal sternites, ♂; C, abdominal sternites, ♀.

tum (5:8); depressed at basal angles; with small tumescence at apex. Hemelytra extending beyond the end of the abdomen in normal specimens; lateral margin of embolium usually faintly sinuate, weakly convex on basal third. Connexivum thinly to broadly exposed in females, barely to broadly exposed in males. Abdominal sternites 6–8 of female unsymmetrical, segment 7 with a lateral tumescence on left side and an irregular transverse depression extending across the sternite medially; shape of sternites and ovipositor lobes shown in fig. 1 C. Abdominal sternites of male as shown in fig. 1 B; clasper of male without processes (fig. 1 A).

Material examined.—Holotype male (USNM 71445) and allotype female, Mexico, Sinaloa, Mazatlan, VII–17–23–1963, P. J. Spangler, in U.S. National Museum.

Paratypes: *Mexico*: Same data as holotype above, 7 ♂♂, 17 ♀♀, 1 nymph (USNM); Sinaloa, Mazatlan, CL1021, IV–21–1964, J. T. & M. S. Polhemus, 9 ♂♂, 7 ♀♀, 3 nymphs (CU); Sinaloa, Mazatlan, CL1208, V–31–1966, J. T. Polhemus, 11 ♂♂, 8 ♀♀, 3 nymphs (JTP); Sonora, no date or collector, P. R. Uhler collection, 1 ♂ (USNM); Colima, Santiago, CL1227, XI–25–1968, J. T. Polhemus, 2 ♂♂ (JTP).

Two paratypes will be deposited in the collections of the Snow Entomological Museum at Lawrence, Kansas and two in the California Academy of Sciences, San Francisco; other paratypes will be found in the collections of the University of Colorado, U.S. National Museum and J. T. Polhemus.

Comparative notes.—*Nerthra spangleri* n. sp. is most closely related to *N. parvula* (Signoret) from Chile, and the Sonora specimen was included under this species in Todd's monograph. In *parvula* the apex of the head is weakly produced, and there is no tumescence on the last female sternite; in *spangleri*, the apex of the head is concave with two superapical tubercles, there is a strong tumescence on the left side of the last female sternite, the female sternites are differently shaped and the last abdominal segment of the male is larger than in *parvula*.

This species is named in honor of Dr. Paul J. Spangler who collected a series of these bugs at the request of Dr. Todd.

Nerthra hungerfordi Todd

Nerthra hungerfordi Todd, 1955, Univ. Kansas Sci. Bull. 37, pt. 1(11):398 (Costa Rica).

This species is listed by Todd (1955, 1961) as occurring from Guatemala to Panama, but this is the first record for Mexico.

Material examined.—*Mexico*: Chiapas, Puente la Flor, CL1247, XII–19–1969, J. T. Polhemus, 25 ♂♂, 21 ♀♀ (JTP).

Nerthra manni Todd

Nerthra manni Todd, 1955, Univ. Kansas Sci. Bull. 37, pt. 1(11):396 (Guerrero, Mex.).

Todd (1955) noted that *N. manni* had been found in the crop of a chicken at Nogales, Arizona on the mexican border. He speculated that it might be found in Arizona, but the record below is the first definite record for the U.S.

Material examined.—*Arizona*: Patagonia, CL1200, V–27–1966, J. T. Polhemus, 1 ♂, 3 ♀♀. *Mexico*: Jalisco, 15 mi. S. Ixtlan del Rio, CL1029, 22 April 1964, J. T. & M. S. Polhemus, 7 ♂♂, 4 ♀♀ (CU); Sinaloa, Mazatlan, C11205, V–31–1966, J. T. Polhemus, 1 ♂ (JTP).

Nerthra martini Todd

Nerthra martini Todd, 1954. Pan-Pac. Ent. 30(2):113, figs. 1, 5 (California).

Todd (1955) in his monograph on Gelastocoridae listed two indefinite Arizona records for this species; the record below seems to be the first definite one for the state. While records exist (Todd, 1954) for the species in Baja California, the Sonoran locality given here is the first for the mexican mainland east of the Gulf of Lower California. The Nevada record is also apparently new, and I am indebted to Dr.

Chapman for this material. The record of *Nerthra fuscipes* G.-M. from Nevada by La Rivers (1953) probably pertains to this species.

Material examined.—Arizona: Patagonia CL1200, V–27–1966, J. T. Polhemus, 1 ♂, (JTP). *California*: E. of Fresno, Wonder Canyon, IV–28–1962, J. T. Polhemus, many specimens; China Ranch, Tecopa, C1302, X–5–1964, J. T. Polhemus, 1 ♂, 1 nymph (JTP); Death Valley, Saratoga Springs, CL303, X–5–1964, J. T. Polhemus, 2 ♀♀, 1 nymph (JTP). *Nevada*: Ash Meadows, VI–24–1959, H. C. Chapman, 1 ♂, 1 ♀ (JTP). *Mexico*: Sonora, Santa Ana, CL1201, V–28–1966, J. T. Polhemus, 1 ♀ (JTP).

Nerthra mexicana (Melin)

Mononyx mexicanus Melin, 1929. Zool. Bidrag Fran Uppsala 12:187, figs. 80–3 (Mexico).

Material examined.—Mexico: Chiapas, Puente la Flor, CL1247, XII–19–1969, J. T. Polhemus, 1 ♀ (JTP); Chiapas, Rio Sesecapa, CL1248, XII–19–1969, J. T. Polhemus, 1 ♂, 1 ♀ (JTP); Oaxaca, Tequisistlan, CL1066, IV–30–1964, J. T. & M. S. Polhemus, 2 ♂♂, 1 ♀, 3 nymphs (CU); Veracruz, Rio Paso de Ovejas, CL513, I–6–1971, J. T. & M. S. Polhemus, 1 ♀, (JTP).

Nerthra fuscipes (Guerin-Meneville)

Mononyx fuscipes Guerin-Meneville 1843. Rev. Zool. Travaux Ined. 6:114 (Colombia).

This species is by far the most abundant one occurring in Eastern and Southern Mexico and Central America, judging from Todd's records (1955) and my collecting.

Material examined.—Mexico: Oaxaca, 29 mi. W. of Tequisistlan, CL1064, IV–30–1964, J. T. & M. S. Polhemus, 18 ♂♂, 12 ♀♀ (CU); Veracruz, 16 mi. S. La Tinaja, C1505, I–4–1971, J. T. & M. S. Polhemus, 1 ♀ (JTP); Veracruz, Conejos, C1514, I–6–1971, J. T. & M. S. Polhemus, 18 ♂♂, 21 ♀♀ (JTP). *Nicaragua*: N. of Esteli, C11262, XII–23–1969, 3 ♂♂, 2 ♀♀ (JTP).

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THE TYPES OF NEOTROPIC ICHNEUMONIDAE IN THE TRANSVAAL MUSEUM

HENRY TOWNES, *American Entomological Institute, 5950 Warren Road, Ann Arbor, Michigan 48105*

ABSTRACT—Holotypes or lectotypes of 13 species of ichneumonids described by Kriechbaumer from Brazil are in the Transvaal Museum. These belong to the genera *Enicospilus, Joppa, Stenolonche, Tetragonochora,* and *Thyreodon.*

Joseph Kriechbaumer in the 1890's described a number of South American Ichneumonidae whose types have not been located in European museums. In 1971, while studying the types of Ethiopian Ichneumonidae in the Transvaal Museum (Pretoria, South Africa) specimens were found that appeared to be some of the missing Kreichbaumer types from South America. These were acquired by the Transvaal Museum with the collection of Dr. Johannes Brauns. They bore Kriechbaumer's hand written labels, and red type labels apparently affixed by Brauns. Dr. L. Vari, curator of the collection, agreed to lend these specimens for a study that would determine which of them were true types.

The subsequent study showed that all of these specimens labeled as types are original holotypes or syntypes. In some cases lectotypes have already been designated, these being specimens in Munich, Berlin, or Vienna (Townes and Townes, 1966, Mem. Amer. Ent. Inst. 8: 226, 231, 233, 235, 246, 261, 275, 277, 286). In these cases the specimens in Pretoria have become paratypes. In other cases the specimens in Pretoria are the only types known.

Specimens where lectotypes are already designated in some other museum and where those in Pretoria may be considered paratypes are as follows:

Conopyge tibialis Kriechbaumer. Paratype ♀, Santos, Brazil, Sept. 30, 1894, Dr. Brauns. Lectotype in Vienna.

Macrojoppa confusa Kriechbaumer. Paratype ♀, Ilha Grande, Brazil, July 10, 1893, Dr. Brauns. Lectotype in Berlin.

Macrojoppa fulva Kriechbaumer. Paratype ♂, Brazil, Dr. Brauns. Lectotype in Berlin.

Microjoppa brunnii Kriechbaumer. Paratypes ♂, ♀, Santos, Brazil, Feb. 2, 1894 and Apr. 2, 1894, Dr. Brauns. Lectotype in Berlin. Belongs in the genus *Joppa.*

Microjoppa limbata Kriechbaumer. Paratypes 2 ♂, 1 ♀, Santos, Brazil, Jan. 10, 1894 and Aug. 29, 1894, Dr. Brauns. Lectotype in Vienna. A synonym of *Joppa geminata* Kriechbaumer.

Microjoppa mesoxantha Kriechbaumer. Paratype ♀, Santos, Brazil, Jan. 25, 1894, Dr. Brauns. Lectotype in Berlin. A synonym of *Joppa geniculata* Cameron.

Microjoppa polyxantha Kriechbaumer. Paratype ♀, Santos, Brazil, Jan. 25, 1894, Dr. Brauns. Lectotype in Berlin. A synonym of *Joppa verticalis* Fabricius.

Stenolonche varicolor Kriechbaumer. Paratype ♂, Santa Cruz, Rio Grande do Sul, Brazil, Dr. Brauns. Lectotype in Vienna.

Tricyphus apicalis Kriechbaumer. Paratype ♀, Santa Cruz, Rio Grande do Sul, Brazil, Dr. Brauns. Lectotype in Berlin.

Trogus pompeji Kriechbaumer. Paratype ♀, Rio de Janeiro, Brazil, Dr. Brauns (with pupa of *Papilio pompejus* from which it emerged). Lectotype in Munich.

Holotypes or lectotypes among the specimens in Pretoria are as follows:

Eremotylus tenuigena Kriechbaumer. Holotype: ♀, Santos, Brazil, Jan. 25, 1894, Dr. Brauns. Belongs in the genus *Enicospilus* and is closely related to *E. americanus.*

Microjoppa braunsii Kriechbaumer. Lectotype: ♀ (lacking abdomen beyond segment 4), Santos, Brazil, Sept. 30, 1894, Dr. Brauns. Paratype ♂, with same data. Belongs in the genus *Joppa.*

Microjoppa dromedarius Kriechbaumer. Lectotype: ♀, Santa Cruz, Rio Grande do Sul, Brazil, Dr. Brauns. Paratype ♂, with same data. Belongs in the genus *Joppa.*

Microjoppa furcifera Kriechbaumer. Holotype: ♀ (lacking head and most of thorax and abdomen), Santos, Brazil, Nov. 23, 1893, Dr. Brauns. Belongs in the genus *Joppa.*

Microjoppa fuscata Kriechbaumer. Holotype: ♂, Santos, Brazil, Dec. 13, 1891, Dr. Brauns. Belongs in the genus *Joppa.*

Microjoppa hypoxantha Kriechbaumer. Holotype: ♂, Pernambuco, Brazil, Jan. 1, 1894, Dr. Brauns. Belongs in the genus *Joppa.*

Microjoppa linearis Kriechbaumer. Holotype: ♀ (lacking abdomen beyond segment 3), Santa Cruz, Rio Grande do Sul, Brazil, Dr. Brauns. Belongs in the genus *Joppa.*

Microjoppa mesopyrrha Kriechbaumer. Lectotype: ♂ (lacking most of head), Santos, Brazil, Nov. 23, 1893, Dr. Brauns. Paratype ♂, Santa Cruz, Rio Grande do Sul, Brazil, Dr. Brauns. Belongs in the genus *Joppa.*

Microjoppa noctilio Kriechbaumer. Holotype: ♂, Santos, Brazil, Sept. 30, 1894, Dr. Brauns. A synonym of *Joppa verticalis* Fabricius (new synonym).

Microjoppa subvittata Kriechbaumer. Lectotype: ♀ (lacking head, prothorax, and abdomen beyond segment 3), Santa Cruz, Rio Grande do Sul, Brazil, Dr. Brauns. Another ♀ (perhaps a paratype) is labeled Santa Cruz, Rio Grande do Sul, Brazil, Fr. Stieglmayr. Belongs in the genus *Joppa.*

Stenolonche rufipectus Kriechbaumer. Holotype: ♂, Santa Cruz, Rio Grande do Sul, Brazil, Dr. Brauns. A synonym of *Stenolonche varicolor* Kriechbaumer (new synonym).

Tetragonochora metzii Kriechbaumer. Lectotype: ♀, Santa Cruz, Rio Grande do Sul, Brazil, Dr. Brauns. Paratypes ♂, ♀, with same data.

Tipulophion gigas Kriechbaumer. Holotype: ♀, Rio de Janeiro, Brazil, Dr. Brauns. Correct name: *Thyreodon atriventris gigas* Kriechbaumer.

Bibliographic references concerning all of the above names are to be found in Townes and Townes, 1966, Mem. Amer. Ent. Inst. 8, 367 pages.

A NEW GENUS AND SPECIES OF CHEYLETIDAE
(ACARINA)

ROBERT L. SMILEY, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C. 20250*

and

G. L. WILLIAMS, *Department of Entomology, University of Maryland, College Park, Maryland 20742*

ABSTRACT—**Neochelacheles messersmithi**, a new genus and species of cheyletid mite, is described and illustrated. The species was collected in large numbers from the punctations on the elytra and pronotum of the tenebrionid *Boletotherus cornutus* (Panzer).

In a recent study by Summers and Price (1970) the genera of the family Cheyletidae were redefined. Here another new genus is described. Specimens were collected from the tenebrionid *Boletotherus cornutus* (Panzer) initially found at Cranesville, West Virginia. This new genus is similar to *Chelacheles* Baker (1958) which has no shields, but differs by having two well-defined shields on the dorsum of the idiosoma.

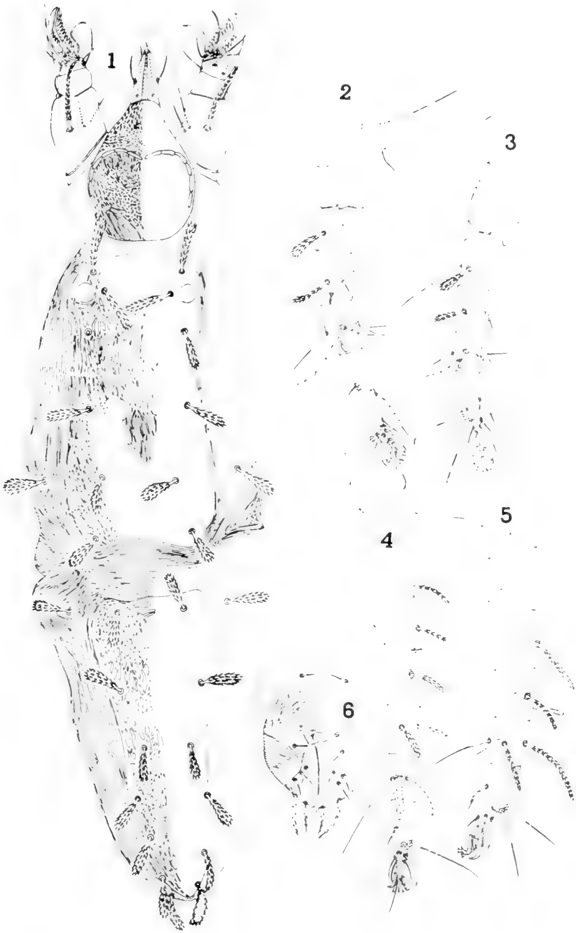
Neochelacheles, n. gen.

Palpal tarsus with one comblike and two sicklelike setae; palpal tibia with claw bearing five strong pointed teeth. Protegmen and tegmen conspicuously ornamented with small alveoli and merged with rostrum. Eyes present, corneas almost hemispherical. Dorsum of idiosoma slender and elongated; with two strongly sclerotized shields consisting of longitudinal alveoli of different sizes and shapes and covering propodosoma and hysterosoma. Each shield with six pairs of palmate-serrate setae. Peritreme with six segments. Legs I–II and III–IV are widely separated; legs IV point directly to rear of idiosoma. All tarsal claws smooth, without basal projections, and with a padlike empodium with tenent hairs. Solenidion W I extremely long, longer than greatest diameter of tarsus; guard seta shorter than W I, smooth, in duplex position. Anogenital apparatus relatively short; two pairs of simple paragenital setae, three pairs of simple genitals, and two pairs of serrate anals.

Type-species: *Neochelacheles messersmithi*, n. sp.

Neochelacheles messersmithi, n. sp.
(Figs. 1–6)

This species may be recognized by the long slender idiosoma with two dorsal shields bearing longitudinal alveoli of irregular sizes and shapes and with each shield possessing six pairs of subequal palmate-serrate setae.



Figs. 1–6. *Neochelacheles messersmithi*, n. gen., n. sp., ♀: 1, dorsum; 2, right leg I; 3, right leg II; 4, right leg III; 5, right leg IV; 6, venter, anogenital.

Female.—Palpal claw with five strongly pointed teeth; palpal tarsus with one comblike seta with ten teeth, and two sicklelike setae. Rostrum almost triangular in outline, surface with no obvious ornamentation. Protegmen and tegmen conspicuously ornamented with small alveoli and merged with rostrum. Peritremes obtusely bent where short transverse segments give rise to much longer descending segments, and with six segments on each side of tegmen. Two subequal shields which cover entire dorsum of idiosoma, separated by fine striae transversely. One pair of eyes present, corneas almost hemispherical. Fifteen pairs of subequal palmate-serrate setae, including humerals, present on dorsum. Propodosomal shield rectangular, with six pairs of palmate-serrate setae, and densely ornamented with longitudinal alveoli of different shapes and sizes.

Hysterosomal shield subtriangular in shape, narrowing posteriorly; with six pairs of subequal palmate-serrate setae and longitudinal alveoli of different sizes and shapes. Legs I–II and III–IV widely separated; tarsal claws smooth and with a padlike empodium with tenent hairs. Setae on coxae I–IV 2-1-2-2, as figured. Anogenital apparatus relatively short; two pairs of subequal, simple paragenital setae, three pairs of subequal, simple genital setae, and two pairs of serrate anal setae, outer pair longer than inner pair. Length of body including gnathosoma 439 μ; width 120 μ.

Male.—Unknown.

The female holotype, USNM No. 3470, was collected from the tenebrionid *Boletotherus cornutus* (Panzer) which was taken from an errarium, Department of Entomology, University of Maryland, College Park, Maryland on 1 April, 1971, by G. L. Williams. *Paratypes.* Thirty paratypes and many unmounted specimens with the same data.

Initially adults and pupae of this tenebrionid were collected from a large shelf fungus on an Eastern Hemlock stump at "Famous Swamp," Cranesville, West Virginia, on 14 June, 1970, by the junior author. The fungus bearing the beetles was placed in an established twenty-gallon errarium containing wood soil and organic matter and sealed by a glass top to prevent the escape of arthropods. The constant high humidity and rich substrate provided ideal conditions for the rapid growth and reproduction of organisms confined therein. This errarium contains other arthropods introduced over the past years. Cissidae, Passalidae, with associated mites, Entomobryidae, Collembola, Spirobolidae, and Diplopoda are among those present. None of these animals was found to harbor this particular species of mite, although a few have their own species of mite. On 1 April, 1971, a deformed *B. cornutus* was collected from the errarium. Both elytra were shortened and twisted away from the body. *Neochelacheles messersmithi* covered most of the dorsum and extended down to the sides, with a few on the ventral surface. In May other specimens of *cornutus* were collected from the errarium; all of these had normal wings and fewer specimens of *messersmithi*. This orange-yellow mite seems in normal concentrations to prefer the punctations on the elytra and pronotum near the front of the body.

The species is named for Dr. D. H. Messersmith, a dedicated professor of Entomology, at the University of Maryland in College Park.

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ON THE PUERTO RICAN MOTH GENUS APHANOSARA FORBES

(Lepidoptera: Cosmopteriginae)

In 1931 (Jour. Dept. Agr. Puerto Rico 15:361), W. T. M. Forbes described a new Puerto Rican moth for which he erected the generic name *Aphanosara*, type-species *planistes* Forbes. Forbes assigned the genus to the Hawaiian group "Diplosaridae" of Meyrick, and he said (p. 362) that it was "the only Diplosarid in the restricted sense known to me outside of Hawaii."

During the writing of my volumes on the Microlepidoptera of Hawaii (in press), I had occasion to investigate the *Aphanosara* problem, and I can report that *Aphanosara* does not belong to the so-called "Diplosaridae" and that it bears no relationship to the Hawaiian fauna as supposed by Forbes. *Aphanosara* is a normal member of the Cosmopteriginae of America.

The only other non-Hawaiian genus which, to my knowledge, has been referred to the "Diplosaridae" is the New Zealand *Irenicodes* Meyrick, 1919 (which Forbes excusably overlooked). I have shown (1971. New Zealand Ent. 5:53) that Meyrick's family placement of *Irenicodes* was erroneous, and the type-species is a typical "elachistid" which in no way is allied to any part of the Hawaiian fauna.

Almost any attempt to use the literature on most groups of Lepidoptera for biogeographical studies or conclusions is doomed to failure because of erroneous taxonomy.

Written during the tenure of a grant from the National Science Foundation.

Elwood C. Zimmerman, *Bishop Museum, Honolulu, Hawaii 96818.*

A REDESCRIPTION OF HEMIGYMNASPIS EUGENIAE (LINDINGER)[1,2]
(HOMOPTERA: DIASPIDIDAE)

JOHN A. DAVIDSON, *Department of Entomology, University of Maryland, College Park, Maryland 20742*

ABSTRACT—A lectotype is designated for *Hemigymnaspis eugeniae* (Lindinger). The adult female is figured for the first time, redescribed, and transferred from *Melanaspis* to the monotypic genus *Hemigymnaspis* Lindinger which is diagnosed.

Lindinger (1934) described *Melanaspis* (*Hemigymnaspis*) *eugeniae* from *Eugenia cordata*, Puerto Rico. Ferris (1942) in discussing *M. eugeniae* noted, "It is impossible to draw any satisfactory conclusions concerning the species on the basis of the published description." He retained the species in *Melanaspis*. Lindinger (1943) then elevated *Hemigymnaspis* to generic rank for the single species *eugeniae*. Borchsenius (1966) returned *H. eugeniae* to *Melanaspis*.

Genus **Hemigymnaspis** Lindinger

Hemigymnaspis Lindinger, 1943:221. Type-species, *Melanaspis* (*Hemigymnaspis*) *eugeniae* Lindinger, orig. desig. and monotypy.

Hemigymnaspis contains only *H. eugeniae*.

Diagnosis.—Adult female about 1.0 mm long. Pygidium retracted at maturity. Dorsal prepygidial derm heavily sclerotized at maturity, bearing gland tubercles and microducts. Prepygidial venter bearing gland spines and microducts. Antennae with 2–4 setae each. Pygidium with numerous dorsal macroducts and long, narrow, tubular ducts arising from plates, 5 pairs of lobes, and very slender paraphyses which rarely touch the margin.

Hemigymnaspis may be distinguished from all other aspidiotine genera by the following combination of characters; with multisetose antennae, gland tubercles, and prepygidial gland spines bearing microducts while pygidial plates bear long, narrow, tubular ducts.

Hemigymnaspis eugeniae (Lindinger)

Melanaspis (*Hemigymnaspis*) *eugeniae* Lindinger, 1934:45
Hemigymnaspis eugeniae (Lindinger): Lindinger, 1943:221
Melanaspis eugeniae Lindinger: Borchsenius, 1966:348

Type Data.—Two adult females, 1 second instar, and 2 scale covers are present on 1 slide deposited in the Zoologisches Staatsinstitut und Zoologisches Museum, Hamburg, Germany.

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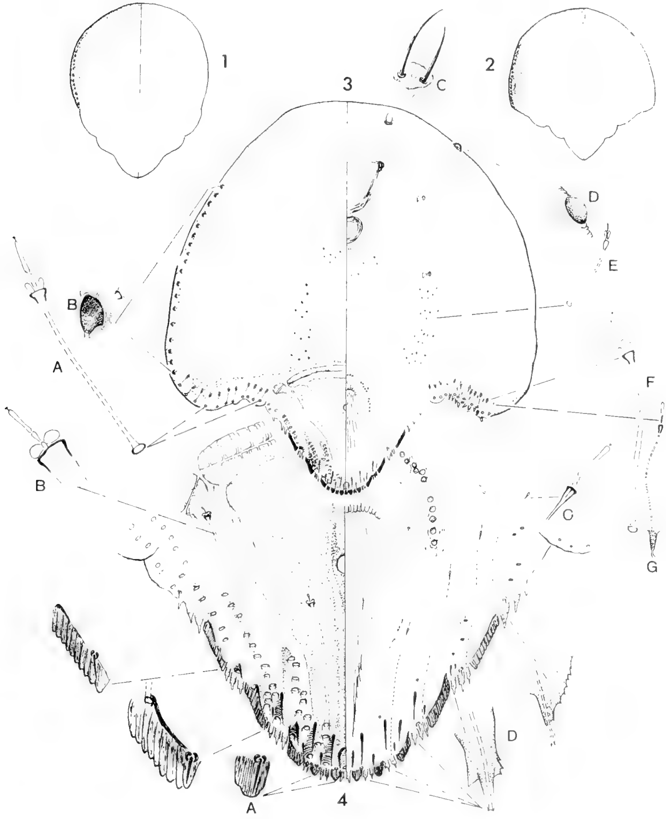


Figs. 1–4. *Hemigymnaspis eugeniae* (Lindinger): 1, young adult female before pygidial retraction; 2, older female showing partial pygidial retraction; 3, fully mature lectotype female showing complete pygidial retraction and dorsal prosomal sclerotization (A = dorsal marginal microduct; B = gland tubercle; C = antenna; D = eye tubercle; E = ventral submedian microduct; F = ventral marginal microduct; G = gland spine); 4, enlargement of lectotype pygidium (A = 1st and 2nd lobes; B = dorsal macroduct; C = long, narrow, tubular duct arising from plate; D = plate).

Lectotype.—Female syntype left hand specimen on a slide which bears a label on the left, "NO 588, Station fur Pflanzenschutz, *Hemigymnaspis eugeniae* Lindg., *Eugenia cordata*, Puerto Rico: Auf dem Berg Cienaga bei Adjuntas." A small upper right label reads "*Melanaspis* eugeniae Lind., Eing. 13/66." A small red, lower right label reads "Syntypen".

Paralectotype.—1 female, same slide, same data.

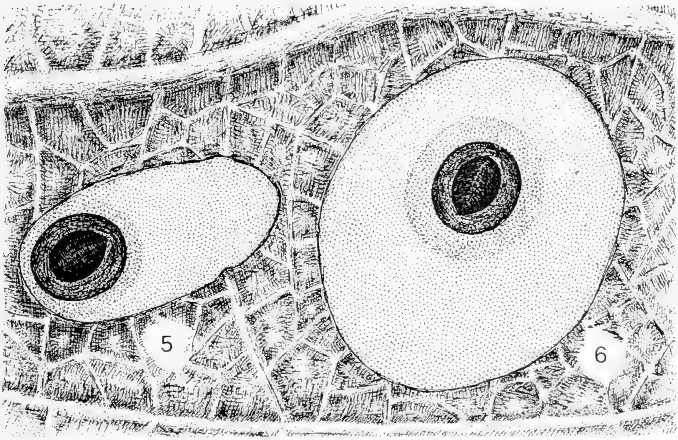
Field Characters.—The 2 scale covers mounted with the 2 adult female syntypes are circular, whitish, with dark, centrally located exuviae. Dry material of this scale collected on El Yunque Rock, Puerto Rico, on *Eugenia boringuenais* was also seen. The male cover (fig. 5) is beige colored, elongate, exuviae black and terminal. The female cover (fig. 6) is beige colored, circular to oval, exuviae central to subcentral. Most scales occurred on the upper leaf surface of the 8 leaves seen.

Recognition Characters.—Body of young adult female (fig. 1) about 1.0 mm long, turbinate, sclerotization of prosomal dorsum present only on margins and submargins. Older female (fig. 2) exhibits partial retraction of pygidium, and nearly half of prosomal dorsum sclerotized. Fully mature female lectotype (fig. 3) exhibits pygidium retracted to level of anal opening, and entire prosomal dorsum sclerotized.

Prosomal dorsum with 4–5 submedian clusters of microducts on each side posterior to the mouthparts; submargin posterior to mouthparts with 12–18 gland tubercles (fig. 3B) on each side. Dorsum of prepygidial abdominal segments with an irregular marginal to submarginal band of 6–15 microducts (fig. 3A) on each side. Prosomal venter with 2 antennae (fig. 3C) bearing 2–4 setae each; 1 large marginal eye tubercle (fig. 3D) on each side of mouthparts; 4 clusters of submedian microducts (fig. 3E) on each side posterior to spiracles. Venter of prepygidial abdominal segments with irregular marginal to submarginal band of 6–15 microducts (fig. 3F) and 6–12 gland spines (fig. 3G) on each side.

Pygidium (fig. 4) subacute, dorsum bearing 1 broad, median, vase-shaped sclerotized area; 3 slender macroduct-bearing sclerotized areas on each side arising from the 3rd, 4th and 5th pairs of lobes respectively; about 50 macroducts (fig. 4B) on each side. Anal opening located slightly anterior to pygidial midlength. Pygidial lobes 1 and 2 (fig. 4A), each 1 notched mesally and laterally, longer than wide, and each bearing 1 dorsal seta about as long as the lobe and somewhat mesally placed; lobes 3, 4 and 5 wider than long, serrate, with dorsal setae located nearest mesal end of each lobe. Two slightly fimbriate plates (fig. 4D) between median lobes; 2 between median and 2nd, and 2nd and 3rd lobes; 3 between lobes 3 and 4, and 4 and 5; 3 anterior to lobe 5, on each side, each bearing 1 long, slender, tubular duct (fig. 4C). Pygidial venter bearing 5 loose clusters of perivulvar pores. Vulva situated on or slightly anterior to pygidial midlength. Paraphyses long, slender, rarely touching margins, usually 2 between each pair of lobes.

Specimens Examined.—Puerto Rico, on Cienaga Mtn. nr. Adjutnas, 16–V–1886, on *Eugenia cordata* (Myrtaceae), (2 ad. females on 1 slide, Zoologisches Staatsinstitut und Zoologisches Museum, Hamburg, Ger-



Figs. 5–6. *Hemigymnaspis eugeniae* (Lindinger): 5, male scale cover; 6, female scale cover.

many); Puerto Rico, on El Yanque Rock, on *Eugenia boringuenais*, 22–11–1947, G. N. Wolcott (7 ad. females on 2 slides, USNM); Virgin Islands, St. John and St. Thomas, on *Canella winterana* leaves, 25–11–1955, J. Conroy (4 ad. females on 1 slide, USNM).

Hosts: Wolcott (1948) recorded a second *Eugenia* species, *E. boringuenais*, as a host for *H. eugeniae*. This is the first report of the host *Canella winterana* for *H. eugeniae*, and also the first record of this scale species from the Virgin Islands.

Taxonomic Discussion: *H. eugeniae* exhibits no close relationship to any aspidiotine genus. The shape of the pygidium, rows of numerous dorsal macroducts, and slender paraphyses slightly resemble *Melanaspis*, while the plate structure, perivulvar pore arrangement, multisetose antennae, serrate pygidial margin anterior to lobe 3, and 10 to 20 gland tubercles on each ventral submargin suggest a possible relationship to *Furcaspis biformis* (Cockerell). The latter character was not mentioned or figured by Ferris (1938).

Variation.—The specimens examined showed little variation in morphological characters with one exception. The lectotype and paralectotype had very similar gland spines between all lobes. The remaining specimens exhibit much variation in these gland spines, including an occasional forked gland spine.

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STRIDULATION AND FLIGHT IN SOME OMOPHRON
(COLEOPTERA: CARABIDAE)

A stridulatory apparatus has been reported by Dudich (1921, Ent. Blätt. pp. 145–155) in the following genera of the Carabidae: *Blethisa*, *Cychrus*, *Elaphrus*, *Graphipterus*, *Harpalus*, *Platyderus*, *Scaphinotus*, *Siagona* and *Sphaeroderus*. Likewise, the genus *Diacheila*, according to Lindroth (1954, K. Fysiogr. Sällsk. Handl. 65:1–28), is said to possess a stridulating organ. Chittenden (1889, Ent. Amer. 5:220) observed the habit of stridulation in *Omophron americanum* Dejean. Benschoter and Cook (1956, Ann. Ent. Soc. Amer. 49:411–429) described the prosternum of the genus *Omophron* with a file-like surface on mesal anterior margin, and added that this may be a stridulating organ. My friend C. Gélinas and I observed repeatedly the habit of stridulating in *Omophron americanum* Dejean and in *Omophron tesselatum* Say. These beetles, if held between the fingers, produce a pronounced sound which may be a distraction device when disturbed.

With regard to flight, Benschoter and Cook (*loc. cit.*) recorded the capture of beetles of this genus from light traps but did not indicate which species were concerned. The only species known to fly is *Omophron labiatum* Fabricius (Leng, 1915, Bull. Amer. Mus. Nat. Hist. 34:555–601; Frost, 1964, Fla. Ent. 47:129–161). In addition, I examined a specimen of *Omophron americanum* Dejean seen flying in the daytime by my friend J.-P. Lebel, while collecting insects in Vaudreuil Co., Québec.

ANDRÉ LAROCHELLE, *Collège Bourget, C.P. 1000, Rigaud, Québec.*

NEW SYNONYMY AND HOMONYMY IN CECIDOMYIIDAE (DIPTERA)

RAYMOND J. GAGNÉ, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—Twenty-six disregarded or overlooked European species of Cecidomyiidae described by Kaltenbach and Bremi are discussed. Twelve new synonymies are proposed and 5 junior homonyms are renamed.

One of my colleagues, George C. Steyskal, recently brought to my attention an old, rare book, *Die Pflanzenfeinde aus der Klasse der Insekten*, by Kaltenbach (1874), in which several new species were described. I made a routine check for the names in Kieffer (1913), which I had heretofore considered a thorough catalog of the Cecidomyiidae described up to 1913, and found to my surprise that the Kaltenbach names were not listed. A more thorough search showed that the Kaltenbach species had been disregarded by subsequent workers on the Cecidomyiidae because only the larvae and galls had been described. There was a belief shared by several early workers that a species based on other than the "perfect insect", the adult, was invalid. As a result many of the more common Kaltenbach species were renamed by subsequent authors when adults were reared. While looking into this problem I found another paper, this one by Bremi (1847), in which many species described from larvae and galls only were also disregarded and in some cases renamed. It is surprising that most of these disregarded names were not recognized or were ignored by later workers such as Kieffer, who himself described species on the basis of larvae only.

As a result of these "lost names", this paper is written to present the necessary changes, including new cases of synonymy and homonymy. Of the five cases of homonymy, four affect a revision I have in progress of the North American Cecidomyiinae. The details of the Kaltenbach names and Bremi names and the consequent changes are discussed below in two separate sections. I should point out here that 11 of the 12 "new synonyms" are actually new junior synonyms: the fact of synonymy has been noted in the past but the positions of junior and senior synonyms are transposed.

THE KALTENBACH NAMES

Kaltenbach (1874) described seven new species and listed one other as a new species in the index. Not only have these names been

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[1] Mail address: c/o U.S. National Museum, Washington, D.C. 20560.

generally disregarded, but, whenever they were noted, an incorrect date of publication has been given. The Zoological Record (1877), after listing the new Kaltenbach species, pointed out that Kaltenbach (1874) was a second edition of the same book with the same pagination that had been printed earlier in two installments, one in 1872, and the other in 1873. Furthermore, most of the book had appeared in a different format and in serial form in *Decheniana* between 1856 and 1869. I found that three of the Kaltenbach species of Cecidomyiidae were described earlier in *Decheniana.* Löw (1877, 1878, 1889) and Rübsaamen (1899) had been aware of Kaltenbach (1874) but did not recognize the new species. They described the adults and renamed five of the Kaltenbach species, and Löw considered another as simply a synonym of an older taxon. Barnes (1946, 1948a, 1948b, 1951) had occasion to report four of the renamed species but listed them conservatively under the Löw and Rübsaamen names which were and are in general use. Panelius (1965) recently corrected one case in a taxonomic revision. The specific names in question are listed below in alphabetical order.

Contarinia coryli (Kaltenbach)

Cecidomyia coryli Kaltenbach 1859:284; 1873:637; 1874:637; Löw 1878:397 (not recognized as valid); Barnes 1951:138 (as synonym under *Contarinia corylina* (Löw)).

Diplosis corylina Löw 1878:397 (for *coryli* Kaltenbach). NEW SYNONYMY.

Parallelodiplosis coryli (Felt), originally described in *Cecidomyia,* is here renamed *Parallelodiplosis sarae* Gagné. NEW NAME. *Contarinia coryli* Kieffer, a junior secondary homonym, is here renamed *Contarinia cybelae* Gagné. NEW NAME.

Cecidomyia euphrasiae, error

Cecidomyia euphrasiae appears only in the index of Kaltenbach (1873 and 1874:838) which leads one to page 471. On that page there is no "*euphrasiae*", although there is a "*Phytomyza euphrasiae*" on page 469. The "*euphrasiae*" of page 469 does not appear in the index under *Phytomyza,* an indication that the "*euphrasiae*" of the index was erroneously placed under *Cecidomyia.*

Cecidomyia frauenfeldi Kaltenbach

Cecidomyia frauenfeldi Kaltenbach 1872:79; 1874:79. J. primary homonym of *frauenfeldi* Schiner 1868.

Except for the listing in Zoological Record (1877), this species has apparently been completely ignored. It is possibly synonymous with *Didymomyia tiliacea* (Bremi), q.v.

Macrolabis heraclei (Kaltenbach)

Cecidomyia heraclei Kaltenbach 1862:34; 1873:785; 1874:785; Löw 1877:11 (not recognized as valid); Barnes 1946:65 (as synonym under *Macrolabis corrugans* (Löw)).

Cecidomyia corrugans Löw 1877:11 (for *heraclei* Kaltenbach). NEW SYNONYMY.

Dicerura iridis (Kaltenbach)

Cecidomyia iridis Kaltenbach 1873:717; 1874:717; Rübsaamen 1899:68 (not recognized as valid); Barnes 1948b:82 (as synonym under *Dicerura kaltenbachi* (Rübsaamen)); Panelius 1965:31 (*Dicerura*).

Iridomyza kaltenbachi Rübsaamen 1899:68 (for *iridis* Kaltenbach); Panelius 1965:31 (new synonym of *Dicerura iridis*).

Cecidomyia napi Kaltenbach
[= *Aphidoletes aphidimyza* (Rondani, 1847)]

Cecidomyia napi Kaltenbach 1858:145; 1872:34; 1874:34; Löw 1878:404 (as new synonym of *Diplosis aphidimyza* Rondani).

Löw (1878) considered *napi* to be identical to *aphidimyza*, now in *Aphidoletes*, because the larvae of *napi* were associated with cabbage aphids, known hosts of *aphidimyza*. This synonymy has not been disputed (Nijveldt, 1969).

Putoniella pruni (Kaltenbach)

Cecidomyia pruni Kaltenbach 1872:175; 1874:175; Löw 1889:536 (not recognized; original reference noted but name not used); Barnes 1948a:26 (as synonym under *Putoniella marsupialis* (Löw)).

Diplosis marsupialis Löw 1889:536. NEW SYNONYMY.

Contarinia sambuci (Kaltenbach), NEW COMBINATION

Cecidomyia sambuci Kaltenbach 1873:785; 1874:785; Löw 1877:17 (not recognized as valid).

Diplosis lonicerearum Löw 1877:17 (for *sambuci* Kaltenbach). NEW SYNONYMY.

Neolasioptera sambuci (Felt), originally described in *Cecidomyia*, is here renamed *Neolasioptera pierrei* Gagné. NEW NAME.

The Bremi Names

Bremi (1847) described a total of 39 species of Cecidomyiidae. Many were based on adults and were subsequently recognized. For completeness, I have listed here all 39 in one of the three following categories: A. Description usually based at least on adult specimens and subsequently reorganized; B. Description based on larvae and galls only and generally disregarded in subsequent literature; and C. Description based on larvae and galls only and renamed by later authors.

A. The names listed in this sub-section were recognized in literature subsequent to Bremi (1847). The adult stage was originally described for all of these species except two, *marginemtorquens* and *tornatella*, which were described on the basis of the galls and larvae only. *Cecidomyia veronicae* Bremi is a new synonym of *Jaapiella veronicae* (Vallot).

Cecidomyia bicolora Kieffer 1913:214 (new name for *Cecidomyia bicolor* Bremi 1847:54, preocc. *bicolor* Meigen 1818).
Oligotrophus bursarius (Bremi) 1847:20, 52, pl. 1, fig. 20 (*Cecidomyia*).
Dasineura capitigena (Bremi) 1847:23, 50, pl. 2, fig. 24 (*Cecidomyia*).
Hormomyia cornuta (Bremi) 1847:48 (*Cecidomyia*).
Camptomyia fenestralis (Bremi) 1847:55 (*Cecidomyia*).
Pachylabis formosa (Bremi) 1847:47, pl. 1, figs. 1, 6 (*Cecidomyia*).
Cecidomyia grisea Bremi 1847:49.
Hormomyia grossa (Bremi) 1847:46 (*Cecidomyia*).
Dasineura hyperici (Bremi) 1847:26, 53, pl. 2, fig. 26 (*Cecidomyia*).
Cecidomyia limbitorquens Bremi 1847:48.
Rhabdophaga marginemtorquens (Bremi) 1847:28, pl. 2, fig. 32 (*Cecidomyia*).
Bremiola onobrychidis (Bremi) 1847:27, 53, pl. 2, fig. 30 (*Cecidomyia*).
Cecidomyia pilosa Bremi 1847:31, 61 (junior synonym of *Cecidomyia pini* (DeGeer) 1782).
Dasineura ranunculi (Bremi) 1847:29, 54 (*Cecidomyia*).
Dasineura stachydis (Bremi) 1847:26, 55, pl. 2, fig. 27 (*Cecidomyia*).
Dasineura subpatula (Bremi) 1847:23, 50, pl. 2, fig. 25 (*Cecidomyia*).
Phegobia tornatella (Bremi) 1847:13, pl. 1, fig. 13 (*Cecidomyia*).
Dasineura ulmaria (Bremi) 1847:16, 52, pl. 1, fig. 15 (*Cecidomyia*).
Cecidomyia varicolor Bremi 1847:55 (*Cecidomyia*).
Cecidomyia veronicae Bremi 1847:26, 49, pl. 2, fig. 28. Listings in Sherborn (1922) and in Löw (1874) are the only references I have found to this species. However, from the excellent Bremi (1847) illustration of the gall, it is obvious that this species is identical with *Jaapiella veronicae* (Vallot 1827), which also preoccupies *veronicae* Bremi. NEW SYNONYMY.

B. Except for a listing in Sherborn (1922) these species were ignored in publications following Bremi (1847) or, as in the cases of *Cecidomyia reaumurii* and *C. tortilis*, noted only by oblique reference. With the exception of *C. frischii*, which is known from the gall only, these species were described from galls and larvae. Some of these are almost certainly senior synonyms of common European species. A North American species, *Cecidomyia irregularis* Stebbins (1910), is preoccupied by *C. irregularis* Bremi and is here renamed *Cecidomyia stebbinsae* Gagné. NEW NAME.

Cecidomyia degeerii (also as *degerii*) Bremi 1847:17, 45.
Cecidomyia erianea Bremi 1847:30, pl. 2, fig. 37.
Cecidomyia frischii Bremi 1847:24.
Cecidomyia gemini Bremi 1847:17, pl. 1, fig. 18.
Cecidomyia irregularis Bremi 1847:30, pl. 2, fig. 36.
Cecidomyia leontodontis Bremi 1847:19.
Cecidomyia polymorpha Bremi 1847:16, pl. 1, fig. 14.
Cecidomyia reaumurii Bremi 1847:19. Noted in Löw (1875) but unrecognized.
Cecidomyia rosae Bremi 1847:27, pl. 2, fig. 31.
Cecidomyia strobilina Bremi 1847:22, pl. 2, fig. 23.
Cecidomyia strumosa Bremi 1847:25, pl. 2, fig. 26.

Cecidomyia tortilis Bremi 1847:29, pl. 2, fig. 35. Löw (1877) and Barnes (1951) note this species only to point out that it may be synonymous with *Dasineura alni* (Löw) 1877.

C. The 7 species listed below were considered invalid by a subsequent author and renamed, or, in the case of *Cecidomyia fraxini*, considered a synonym under a junior name. A North American species is found to be a primary homonym: *Arthrocnodax fraxini* (Felt) 1907 is here renamed *Arthrocnodax irenae* Gagné. NEW NAME.

Rhabdophaga clausilia (Bremi)

Cecidomyia clausilia Bremi 1847:28, pl. 2, fig. 33; Mik 1886:317 (not recognized as valid); Barnes 1949:52 (as synonym under *Rhabdophaga inchbaldiana* (Mik)).

Cecidomyia inchbaldiana Mik 1886:317 (for *clausilia* Bremi). NEW SYNONYMY.

Dasineura fraxini (Bremi)

Cecidomyia fraxini Bremi 1847:18, pl. 1, fig. 17; Barnes 1951:98 (as synonym under *Dasineura fraxini* (Kieffer)).

Perrisia fraxini Kieffer 1897:301. NEW SYNONYMY.

Dasineura medicaginis (Bremi)

Cecidomyia medicaginis Bremi 1847:18, pl. 1, fig. 16; Wachtl 1884:162 (not recognized as valid); Barnes 1946:48 (as synonym under *Dasineura ignorata* (Wachtl)).

Cecidomyia onobrychidis, error for *medicaginis* Bremi, Löw, 1877.

Cecidomyia ignorata Wachtl 1884:163 (for *medicaginis* Bremi). NEW SYNONYMY.

Kiefferia pericarpiicola (Bremi)

Cecidomyia pericarpiicola Bremi 1847:21, pl. 1, fig. 10 (as *dauci* in figure legend, p. 70); Löw 1874:326 (not recognized as valid); Barnes 1946:27 (as synonym under *Kiefferia pimpinellae* (Löw)).

Asphondylia pimpinellae Löw 1874:326 (for *pericarpiicola* Bremi). NEW SYNONYMY.

Cystiphora sanguinea (Bremi), NEW COMBINATION

Cecidomyia sanguinea Bremi 1847:19; Löw 1874:144 (not recognized as valid).

Cecidomyia hieracii Löw 1874:144 (for *sanguinea* Bremi). NEW SYNONYMY.

Cystiphora sonchi (Bremi), NEW COMBINATION

Cecidomyia sonchi Bremi 1847:19; Löw 1875:18 (not recognized as valid).

Cecidomyia sonchi Löw 1875:18 (for *sonchi* Bremi). NEW SYNONYMY.

Didymomyia tiliacea (Bremi)

Cecidomyia tiliacea Bremi 1847:13, pl. 1, fig. 12; Löw 1878:387 (not recognized as valid); Barnes 1951:152 (as synonym under *Didymomyia reaumuriana* (Löw)).

Hormomyia reaumuriana Löw 1878:387 (for *tiliacea* Bremi). NEW SYNONYMY.

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PSOCOPTERA RECORDS FROM EASTER ISLAND

EDWARD L. MOCKFORD, *Department of Biological Sciences, Illinois State University, Normal, Illinois 61761*

ABSTRACT—Three species of psocids representing three families are recorded from Easter Island. These are the first psocid records from this island.

The material reported herein was received from Dr. Ian E. Efford of the Insitute of Animal Resource Ecology, University of British Columbia, in 1965. As far as I am able to determine, these are the only psocid specimens that have ever been taken on Easter Island. The specimens were deposited in the U.S. National Museum.

The Psocoptera are well represented on those Pacific islands where collecting has been done. In Hawaii, where intensive collecting was carried out in recent years, about 200 species are known, of which about 170 are endemic and the remainder recent immigrants (Thornton, 1965). Banks (1942) recorded thirteen species from Guam. Mumford (1942) recorded seven genera from the Marquesas Islands. Karny (1932) recorded ten species from Samoa. It would seem likely that more species will be found on Easter Island with additional collecting.

Little is known about how psocids cross major water barriers. It seems likely that they may be distributed by wind, since there are a number of records of capture of psocids in the upper atmosphere (Glick, 1939, 1957; Thornton, 1964). It is well established that many species are carried in human commerce, which may be the mode of arrival on Easter Island of the species listed below. Recently (Mockford, 1967) some of the smaller psocids have been found on the plumage of live-trapped birds, including some species apparently in migration, suggesting that certain species of psocids may be carried with regularity over long distances by this means.

FAMILY LIPOSCELIDAE

Liposcelis sp.

One nymph collected in cabin in camp at Hanga-Roa, 23 January, 1965. This specimen may have been brought in by the expedition.

FAMILY CAECILIIDAE

Caecilius casarum Badonnel

C. casarum Badonnel, 1931:234.
C. palmarum Mockford and Gurney, 1956:361.

One female on lemon tree in village of Hanga-Roa, 1 February, 1965.

This species, generally an inhabitant of palm foliage, was first described from Mozambique (Badonnel, 1931) where the type was beaten from a grass-thatched roof. Mockford and Gurney (1956) recorded it from Texas under the name *C. palmarum*. Mockford (1966) showed the synonymy of the latter name, and recorded the species from Florida, Mexico, northeastern South America, New Guinea (single record) and Hawaii (single record). He also presented data which suggest its spread in human commerce.

Family Peripsocidae

Ectopsocus fullawayi Enderlein

Twelve adults with following data: 2 in camp at Hanga-Roa, January, 1965; 2 on squash plant ("mautini") at Hanga-Roa; 1 in camp at Hanga-Roa, 21 January, 1965; 2 in corn field of Carlos Rapu, Hanga-Roa, 26 January, 1965; 1 on Islet of Motu-nui, 19 January, 1965; 1 no date, Hanga-Roa, on leaf; 4 no data.

One nymph of *Ectopsocus*, hence likely to be this species, bears the following data: Collected in insect box in camp, 21 January, 1965.

This species was originally described from Hawaii (Enderlein, 1913), where it is common. It has been taken on several occasions by U.S. Department of Agriculture quarantine inspectors on Hawaii in plant materials leaving the Islands (personal observations from U.S.D.A. material). It has been found on Guam, Samoa (Zimmerman, 1948), and on the Marquesas Islands (Mumford, 1942). Thornton and Wong (1968) recorded it also from Fiji, Tubuai, Rapa, and the Tuamotu Archipelago.

Comparison of wing markings and male terminal abdominal structures of the Easter Island material (all specimens are males) with Hawaiian material revealed no differences.

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WING-DIMORPHISM IN PTEROSTICHUS PATRUELIS DEJEAN AND PTEROSTICHUS FEMORALIS KIRBY

(COLEOPTERA: CARABIDAE)

Pterostichus patruelis Dejean. The hind-wings of this species are usually vestigial but a few fully-winged specimens have been seen from New Hampshire (Darlington, 1936, Ann. Ent. Soc. Amer. 29:136–179, and 1943, Ecol. Monogr. 13:37–61) and Ontario (Lindroth, 1966, Opusc. Ent., Suppl. 29:409–648). I investigated specimens of this species from Québec (195), Ontario (5), Alberta (4) and New Hampshire (3) and I found 9 fully-winged specimens from the following places: QUEBEC: Charlevoix-Est Co., Port-au-Saumon, 27–VI–1964 (1 female) and Saint-Fidèle, 26–VI–1964 (1 female); Montcalm Co., Saint-Emile, 24–VIII–1964 (1 female); Saguenay Co., Port-Menier, 13–VII–1971 (1 female); Témiscamingue Co., Rollet, 24–V–1968 (1 female); Vaudreuil Co., Choisy, 10–XI–1969 (1 female) and Rigaud, 15–IV–1965 (1 female), 28–IV–1967 (1 male). ONTARIO: Ottawa, 2–VII–1966 (1 female). In Québec, the fully-winged forms of *Pterostichus patruelis* Dejean are rare and not geographically restricted; in addition, they occur in the same populations as short-winged forms, and in both sexes; they are probably able to fly.

Pterostichus femoralis Kirby. The hind-wings of this species are dimorphic, usually vestigial, but 1 fully-winged specimen was seen from Ontario by Lindroth (1966, Opusc. Ent., Suppl. 29:409–648). I examined specimens of that species from Québec (42) and Ontario (1) but no fully-winged specimens were seen.

ANDRÉ LAROCHELLE, *Collège Bourget, C.P. 1000, Rigaud, Québec.*

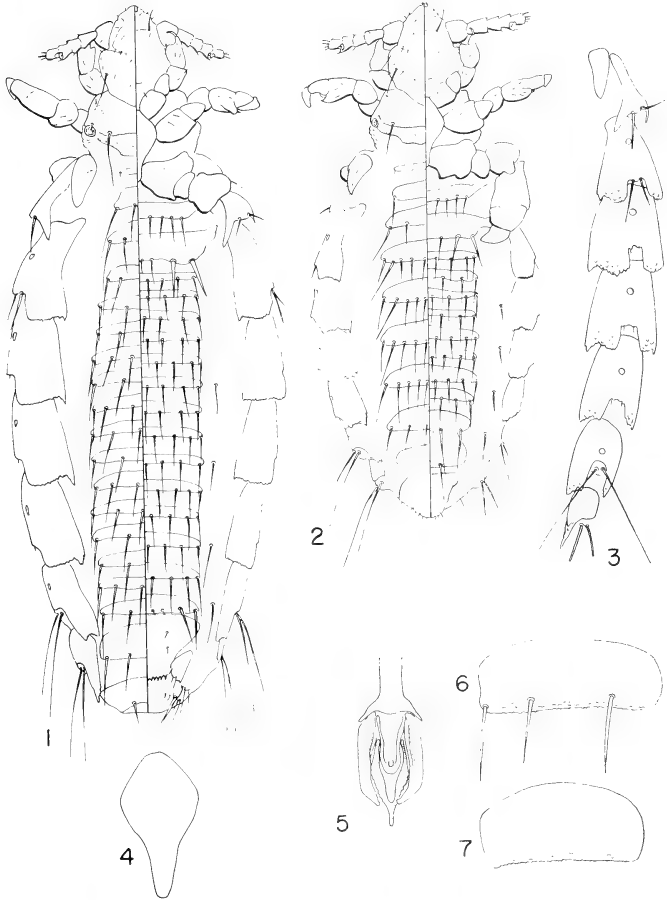
HOPLOPLEURA INTERMEDIA KELLOGG AND FERRIS AND ITS ALLIES, WITH THE DESCRIPTION OF A NEW SPECIES (ANOPLURA: HOPLOPLEURIDAE)

PHYLLIS T. JOHNSON, *National Marine Fisheries Service, Oxford, Maryland 21654*

ABSTRACT—The species of sucking lice related to *Hoplopleura intermedia* Kellogg and Ferris are discussed on the basis of a study of both adult and nymphal morphology. The first-instar nymph of *Hoplopleura inexpectans* Johnson is illustrated and described, and *Hoplopleura* **ismailiae,** new species, from Sudanese *Mastomys natalensis ismailiae* is described.

During the past decade the study of nymphal instars of *Hoplopleura* Enderlein has been used increasingly to solve problems of relationships of species in that genus (Cook and Beer, 1959; Kim, 1965; Johnson, 1972, and in press). Following Cook and Beer's pioneering work on North American *Hoplopleura* species, Kim's and Kim's and Emerson's (1968) papers have provided descriptions and figures of many *Hoplopleura* nymphs, thus laying the groundwork for their use in deciding intraspecific relationships.

Johnson (1960), using only adults, split the African species *Hoplopleura intermedia* Kellogg and Ferris (see Ferris, 1921, 1951) into three species: *Hoplopleura inexpectans* Johnson, from *Praomys jacksoni*; *Hoplopleura zelotomydis* Johnson, from *Zelotomys hildegardae*; and *intermedia* from *Mastomys natalensis*; and described a fourth related species, *Hoplopleura captiosa* Johnson, from *Mus musculus*. In that paper, *intermedia* and allies were considered close to *Hoplopleura hesperomydis* (Osborn) from North American *Peromyscus* species. However, Kim (1965) investigated the setation of the head of *Hoplopleura* and found that the presence or absence of the accessory dorsal head seta (ADHS of Kim) is of considerable taxonomic importance. This small seta, which lies medial to the principal dorsal head seta (PDHS), at the posterolateral angle of the head, is missing in *hesperomydis* and allies, but always present in *intermedia* and allies. (Johnson (1960, Fig. 31) incorrectly shows this seta to be missing in *inexpectans.*) A comparison of the nymphs of the two groups, as pictured and described by Cook and Beer (1959), Kim (1965, 1966), Wegner (1966), Kim and Emerson (1968) and Johnson (in press) offers convincing evidence that *hesperomydis*-like species are not particularly related to *intermedia*-like species. As is true of *hesperomydis* and allies, nymphal characters are sometimes superior for identification of *intermedia*-group species. In fact, Kim (1966), using nymphal morphology, found that paratypes of *captiosa* J., from Thai *Mus cervicolor* constituted a new species, *Hoplopleura johnsonae* Kim.



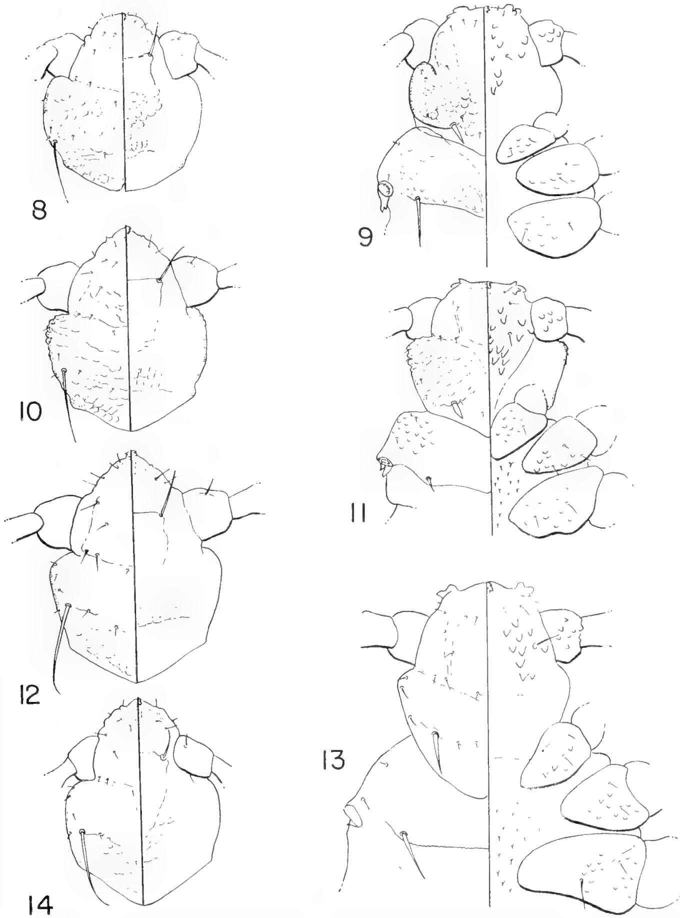
Figs. 1–6, *Hoplopleura ismailiae*, n. sp.: 1, holotype, distal part of third leg omitted; 2, allotype; 3, female, paratergal plates, Melut, Demtemma; 4, holotype, thoracic sternal plate; 5, allotype, aedeagus; 6, holotype, tergal plate of eighth abdominal segment. Fig. 7, *H. intermedia* K. and F., tergal plate of eighth abdominal segment, female, Sudan, host undetermined, no. HH-13038.

This paper includes remarks on adults and nymphs of the *intermedia* group, a description and figures of the first-instar nymph of *inexpectans*, and the description of a new species. All the setae of the legs, antennae, and anterior part of the head are not drawn in on the figures. The holotype and allotype of the new species are deposited in the collections of the U.S. National Museum, Washington, D.C.

Characterization of **H. intermedia** K. and F. and its Allies

Adults.—The accessory dorsal head seta is present and the four small lateral occipital setae (MHS, or marginal head setae of Kim (1965)) are present, with the anterior one placed posteriad to the postantennal angle. Sensoria of antennal segments four and five are large and contiguous. According to the species, the head is variously rugose, smooth, or reticulate dorsally (figs. 8, 10, 12, 14). The seta medial to the mesothoracic spiracle is usually long, never extremely short or minute. The thoracic sternal plate is longer than broad, and extended posteriorly into a narrowed process (fig. 4). Its shape is of limited taxonomic value in this group. There are well developed tergal and sternal abdominal plates; on a typical segment the female has three plates both dorsally and ventrally, and the male has two plates ventrally and one plate dorsally. The sternal plate of the second segment and first plate of the third segment are extended laterally to approach the corresponding paratergal plates. That of the third segment has a lateral group of two enlarged, apical setae on either side. According to the species, abdominal setae are swordshaped to varying degree or are long, thin, and flexible (figs. 16–19). There are no setae laterally off the tergal plates but four or more ventrolateral setae occur on segments 4–7, and sometimes on segment 8. The penultimate abdominal tergal plate bears 0–4 apical setae, depending on sex and species (figs. 6, 7). Paratergal plates III–VI each have two apical lobes which are roughly quadrate, and VII–VIII have a varying number of apical lobes depending on the species and sex. Shape of the aedeagus (fig. 5) apparently is of extremely limited taxonomic value in this group, although size varies according to the species.

Nymphs.—Like other *Hoplopleura*, all stages have thornlike tubercles ventrally on the head, antennae, and legs (fig. 15). Relative lengths of the principal dorsal head seta and the dorsal mesothoracic seta vary according to the species (figs. 9, 11, 13). Especially in second and third instar nymphs there may be a sclerotized denticulate extension on the posterior margin of the mesothoracic spiracle (macrotubercle of Kim and Emerson, 1968). The abdominal and thoracic venter is spiculated and the abdomen is scaly or reticulate dorsally. There is always a pair of small setae anteroventrally on the abdomen, and occasionally aberrant single setae posterior to these. Second and third instars have six pairs of paratergal plates which are scaly, variously shaped according to the species, and in some species the apex is drawn out into a long, heavily scaled lobe (figs. 20–22). Incipient nonfunctional spiracles are present on the paratergal plates. The first instar lacks any indication of paratergal plates. All instars have a single terminal abdominal seta on each side. In some species the terminal seta is set on a narrow, cylindrical prolongation of the integument, especially in the later instars. The anal lobe is extended and often apically bifurcate.



Figs. 8–9, *Hoplopleura inexpectans* J., heads, Angola ex *Rattus morio jacksoni*: 8, male; 9, third-instar nymph. Figs. 10–11, *H. intermedia* K. and F., heads: 10, male, data as Fig. 7; 11, third-instar nymph, Tanganyika ex *Mastomys natalensis microdon*. Figs. 12–13, *H. ismailiae*, n. sp., heads: 12, allotype; 13, third-instar nymph. Fig. 14, *H. captiosa* J., head, male paratype, Egypt ex *Mus musculus* no. HH-21984.

Hoplopleura inexpectans Johnson, first-instar nymph
(Fig. 15)

Description.—Lateral occipital head margins straight, slightly convergent posteriorly, inner sutural head seta (ISHS of Kim, 1965) stouter than outer sutural head seta (OSHS). Principal dorsal head seta stout, as large as dorsal mesothoracic seta. Mesothoracic spiracle borne on blunt lateral prolongation, lacking macrotubercle. Lateral margins of abdomen wrinkled, lacking spicules and scales, dorsum covered with vaguely indicated "plate" which is split anteroposteriorly on median line. Terminal abdominal setae set on very small protuberances, anal lobe apically bifurcate, bearing small lateral seta on each side.

Length.—0.25–0.35 mm.

Material examined.—28 first-instar, ten second-instar, and six third-instar nymphs, with associated adults, from *Rattus morio jacksoni*, Angola.

Hoplopleura ismailiae, n. sp.
(Figs. 1–6, 12, 13, 18, 22, 23)

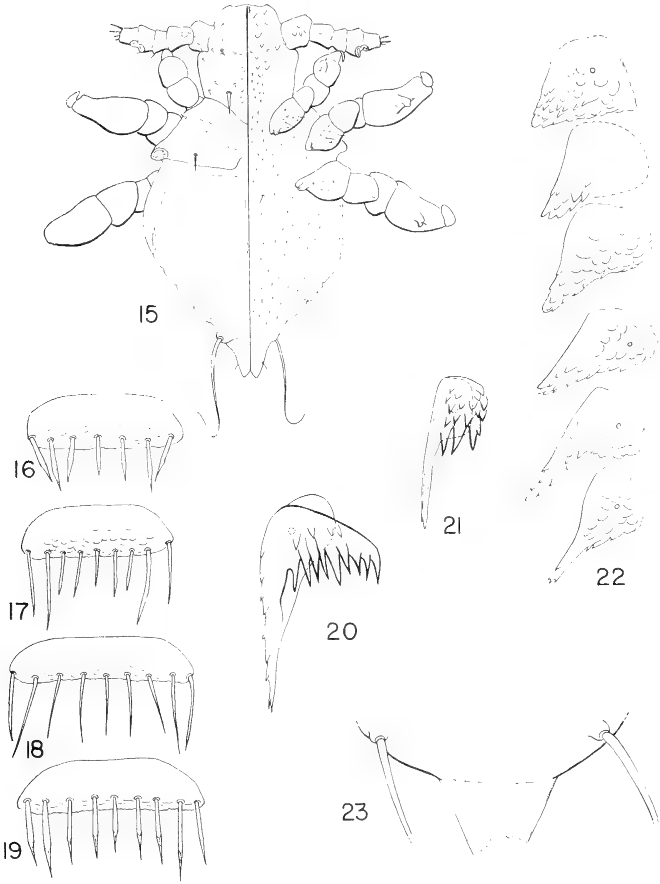
Type data.—Female holotype, male allotype, three female paratypes and one third-instar nymph (female) ex *Mastomys natalensis ismailiae*, Sudan: Upper Nile Province, Khor Adar, Paloich, 14 April 1960, Hoogstraal, Heyneman, and Gabor collectors. One female paratype as above but HH13097–13101. One female paratype ex *M. n. ismailiae*, Upper Nile Province, Melut, 31 March 1960, HH13014. One female paratype as above but 2 April 1960, HH13035. One female paratype as above but 4 April 1960, HH13046–48. One female paratype, ex *M. n. ismailiae*, Upper Nile Province, Demtemma, Melut, 5 April 1960.

Lengths.—Female: holotype, 1.35 mm, paratypes, 1.25–1.3 mm, plus one teneral telescoped paratype of 1.0 mm. Male: 1.0 mm.

Diagnosis.—Separable from *intermedia*, *zelotomydis* and *inexpectans* by a combination of the following: male with apical setae of paratergal plate III both longer than the apical lobes; both sexes with two long apical setae on plate VII; both apical setae of plates IV–VI inserted on margin; head lacking dorsal rugosities or strong reticulation and with postantennal (occipital) margins straight and slightly convergent posteriorly (fig. 12). Female further separable from *intermedia* by having at least one seta on the tergal plate of abdominal segment 8 (compare figs. 6, 7). Closest to *captiosa* and *johnsonae*. Separable from both these species by lacking swordshaped setae on the abdomen (compare figs. 18, 19), and further from female *johnsonae*, according to the original description of that species, by having the apical setae of paratergal plate III of unequal lengths. Third-instar nymph differing from that of *captiosa* by having paratergal plates 3–6 produced apically into narrowed scaly processes (fig. 22) and from *johnsonae*, *intermedia* (fig. 21) and *inexpectans* by lacking marked apical processes on plates 1–2.

Description.—A member of the *intermedia* group. Only characters distinguishing *ismailiae* from other *intermedia*-group species are discussed.

Female (fig. 1): *Head* (fig. 12, male), postantennal angles rounded, lateral occipital margins straight, converging posteriorly, dorsum smooth except for slight reticulations and rugosities posterior to principal and accessory dorsal setae. Dorsal setae other than principal one all small, thin, but not minute.



Figs. 15, 16, 20, *Hoplopleura inexpectans* J., data as Figs. 8–9: 15, first-instar nymph; 16, male, tergal plate of abdominal segment five; 20, third-instar nymph, third paratergal plate, dorsal view. Figs. 17, 21, *H. intermedia* K. and F.: 17, male, tergal plate of abdominal segment five, data as Fig. 7; 21, third-instar nymph, third paratergal plate, dorsal view, data as Fig. 11. Figs. 18, 22, 23, *H. ismailiae*, n. sp.: 18, allotype, tergal plate of abdominal segment five; 22, third-instar nymph, paratergal plates; 23, third-instar nymph, terminus of abdomen, anal lobe broken apically. Fig. 19, *H. captiosa* J., male, tergal plate of abdominal segment five, data as Fig. 14.

Thorax.—Sternal plate as in fig. 4. *Abdomen.* Especially dorsally, setae of abdominal plates long, thin, flexible (fig. 18, male). Tergal plate of segment 1 present, indistinct, one seta at each posterolateral angle; both setae small in holotype and all but one paratype; remaining paratype with seta long on one side. Paratergal plates (fig. 3), III with two apical setae of unequal length, both extending beyond apical lobes; pairs of apical setae on plates IV–VI marginal, small, thin, of equal length (one paratype has one abnormally large apical seta on plate IV, one side); plate VII with two long apical setae; plates III–VI with usual quadrate apical lobes; plate VII with both apical lobes quadrate, ventral one narrower; plate VIII with one dorsoapical lobe, this narrow, rounded to acute apically, usually about length of plate proper but in two paratypes it is considerably shorter. Genital seta of ninth segment long not bladelike.

Male (fig. 2): *Head* (fig. 12), *thorax*, and *abdomen* as female except in usual sexually dimorphic characters and as follows: paratergal plate III with one apical seta extending beyond apical lobes, second seta not visible in only available specimen; plate VII with one acute dorsoapical lobe; ventral lobe merely indicated; plate VIII lacking apical lobes. Aedeagus (fig. 5) as in related species.

Third-instar nymph (figs. 13, 22, 23): nymphal skin broken and fragmented by emerging female within. Head (fig. 13) with dorsal setae not minute, principal dorsal seta equal in length to that of thoracic dorsum. Head not reticulate or rugose. Paratergal plates (fig. 22) with increasingly pronounced apical prolongations as they progress posteriorly. First plate lacking a prolongation; none of scales on plates extremely long. Terminal abdominal setae (fig. 23) not set on a pronounced protuberance. Anal segment apically broken off.

The host relationships of *H. ismailiae*, n. sp., are of particular interest since *intermedia* was taken from the type host of *ismailiae* and very near the type locality (Upper Nile Province, Boing Doro from *M. n. ismailiae*, and Melut, from an undertermined host). It is possible that *intermedia* and *ismailiae* are geographical replacements of one another, but we lack information on this. *H. intermedia* has a broad geographical range, occurring on subspecies of *Mastomys natalensis* from South Africa to the Sudan. Morphological differences between *intermedia* and *ismailiae* are as great as between any of the other species of the *intermedia* group, arguing against the idea that they might be subspecies.

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INCORRECT USAGE OF THE TERM NEW SYNONYM

Anonymity is the state of being anonymous; perfidy is the state of being perfidious; and synonymy is the state of being synonymous. When an author indicates that he is making a new synonymy, he is saying that a particular name has, in his opinion, newly acquired the state of being a synonym. The word may have been around a long while; what is new is its status.

Webster's dictionary is perhaps a bit like the Bible; what it says depends a good deal on the reader. The first meaning of the word synonymy is "the quality of expressing the same or nearly the same meaning by different words." The fourth meaning listed by Webster is "(a) the scientific names used . . . to designate the same species, etc.; (b) a list of such names." The word "collectively" quoted by Townes (1972, Proc. Ent. Soc. Wash. 74:229) does not appear in my Webster (1965, unabridged). In any case there is no justification for restricting the word to the *list* only, as he does. The synonymous names constitute the synonymy; to add another name is to indicate still another condition of synonymy. The name itself is not new, unless one is so hard up for publications that he deliberately creates a new name having the same meaning as an old one.

Anyway, few of us live according to Webster any more than we live according to the Bible. Webster says that a synonym, in biology, is "an incorrect or outmoded systemic [sic] name." Is that an acceptable definition? I think most of us know what a synonym is and what a new synonymy is without reading a discourse on the subject (of which this journal has now published two too many!).

HOWARD E. EVANS, *Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138.*

[Editor's comments—My Third Edition of Webster's Unabridged Dictionary does not define synonym or synonymy as quoted by either Townes or Evans. Furthermore, by using the abbreviation n. syn., the reader may choose the term he wishes. It is not my intention to allow the Proceedings to become an outlet for arguments on such trivial matters. These two will be the last such published.]

A REDESCRIPTION OF THE HOLOTYPE MALE OF AEDES (STEGOMYIA) TONGAE EDWARDS WITH A NOTE ON TWO TOPOTYPIC FEMALES

(DIPTERA: CULICIDAE)[1,2]

YIAU-MIN HUANG, *Southeast Asia Mosquito Project, Department of Entomology, Smithsonian Institution, Washington, D.C. 20560*

ABSTRACT—The holotype male of *Aedes* (*Stegomyia*) *tongae* Edwards from Ha'apai, Tonga, South Pacific is redescribed and illustrated. Two topotypic females of this species of Buxton & Hopkins' expedition to Ha'apai, Tonga, South Pacific, 1925 are also described here.

The name *Aedes tongae* Edwards 1926 has caused much confusion. At least two species were being mistaken for *tongae* Edwards as reported by Belkin (1962:476) and Ramalingam and Belkin (1965:2).

According to Ramalingam and Belkin (1965:2–3), the description and figures by Belkin (1962:475–476, 349–350) for "*tongae*" are actually those of another species which they named *tabu.* Thus, no detailed description and figures of true *tongae* are available at the present.

Through the kindness of Dr. P. F. Mattingly, I have had the opportunity to examine the holotype male of *tongae* Edwards and the two females which bear the same data as the holotype. I take advantage of this opportunity to give a full description of this holotype male and the two topotypic females so that the identity of Edwards' *tongae* should no longer remain in doubt.

Species of the *scutellaris* group in the Tonga area are being investigated further under a SEAMP-WHO project and the full results will be published later. Due to the highly variable nature of the group in both adult and immature characteristics, a large number of progeny rearings from many different localities are required to provide sound criteria for establishing the true identity of the species.

[1] This work was supported by Research Contract No. DA-49-193-MD-2672 from the U.S. Army Medical Research and Development Command, Office of the Surgeon General.

[2] Immediate publication secured by full payment of page charges—Editor.

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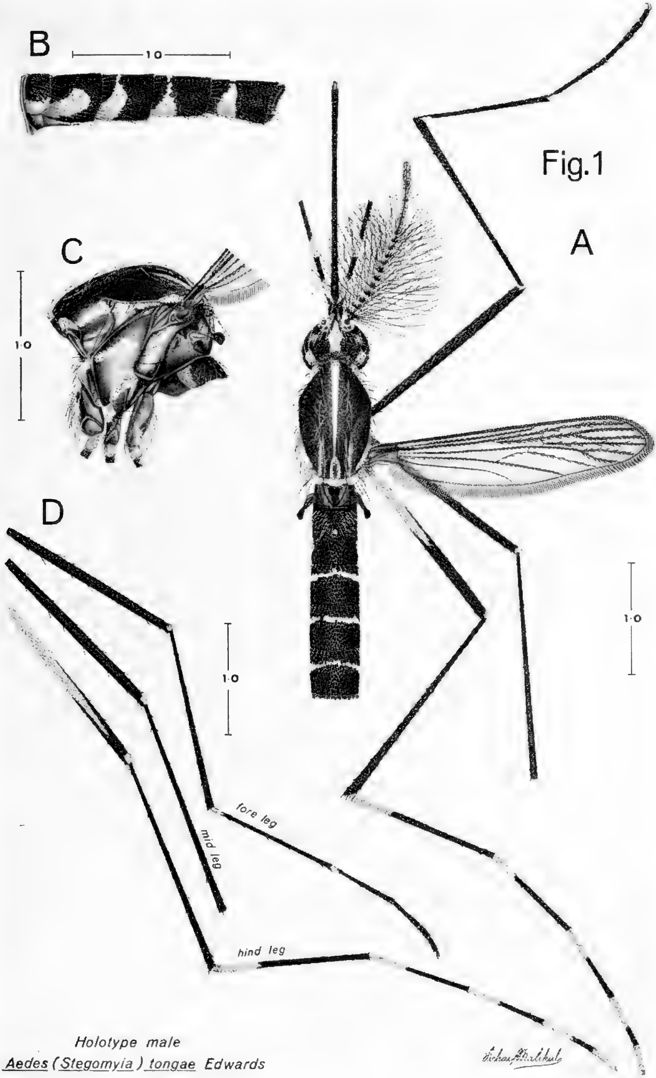
Fig. 1. *Aedes* (*Stegomyia*) *tongae* Edwards, holotype ♂: A, dorsal aspect; B, lateral aspect of abdomen; C, lateral aspect of thorax; D, anterior surface of legs.



Holotype male
Aedes (Stegomyia) tongae Edwards

Aedes (Stegomyia) tongae Edwards

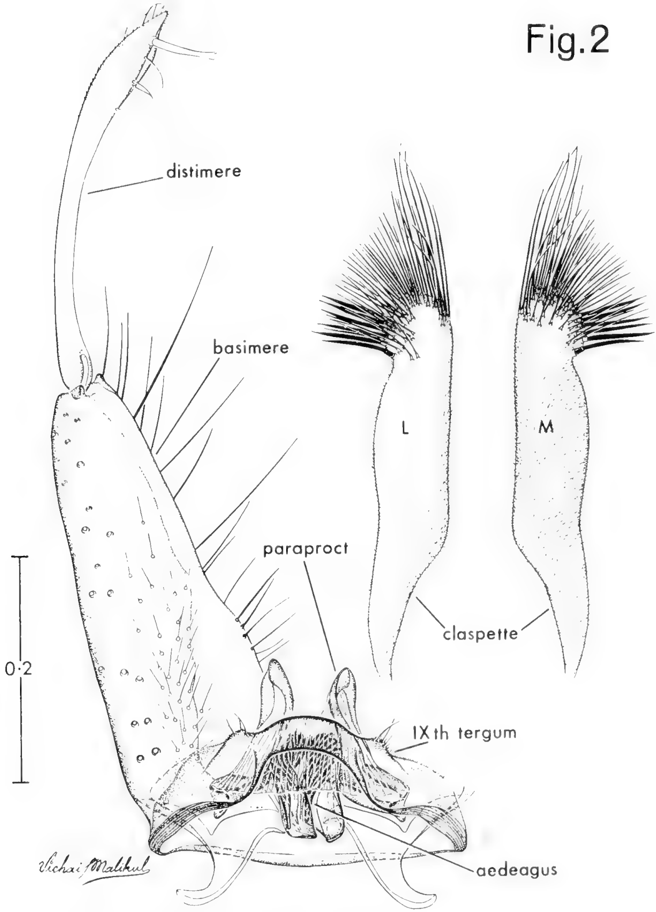
(Figs. 1, 2)

Aedes (*Stegomyia*) *variegatus* var. *tongae* Edwards, 1926, Bull. Ent. Res. 17:103 (♂ *, ♀). Type locality: Ha'apai, Tonga Islands.

Type male, in fair condition (Pres. by Imp. Bur. Ent. 1926. 62) with associated terminalia on a slide, Ha'apai, Tonga, South Pacific, 26–II–1925 (P. A. Buxton and G. H. Hopkins collectors). Deposited in the British Museum (Natural History), London.

Head.—Proboscis dark scaled, with a few pale scales on ventral side, slightly longer than fore femur; palpus dark, with a white basal band on segments 2, 3; rest of palpus missing; antenna plumose, shorter than proboscis; clypeus bare; torus covered with white scales except on dorsal side; decumbent scales of vertex all broad and flat; erect forked scales dark, not numerous, restricted to occiput; vertex with a median stripe of broad white scales, with broad dark ones on each side interrupted by a lateral stripe of broad white scales followed by a patch of white broad ones ventrally. *Thorax.* Scutum with narrow dark scales and a prominent median longitudinal stripe of similar white ones, median stripe narrows slightly posteriorly and forks at beginning of prescutellar space, prescutellar line with yellowish scales; posterior dorsocentral yellowish lines do not reach to middle of scutum; supraalar line of broad white scales present; acrostichal bristles absent; dorsocentral bristles present; scutellum with broad white scales on all lobes and with a few broad dark ones at apex of mid lobe; anterior pronotum with broad white scales; posterior pronotum with narrow dark scales on upper portion and with broad white scales on lower portion forming a white stripe instead of a white patch; paratergite with broad white scales; postspiracular area without scales; subspiracular area without scales; patches of broad white scales on propleuron, on upper and lower sternopleuron and on upper and lower mesepimeron; lower mesepimeral scale patch of medium size and narrowly connected to upper mesepimeral scale patch; lower mesepimeron without bristles; metameron bare. *Wing.* With dark scales on all veins except for a minute basal spot of white scales on costa; first forked cell 1.5 times as long as its stem. *Halter.* With dark scales. *Leg.* Coxae with patches of white scales; knee-spots present on all femora; fore and mid femora dark anteriorly, paler posteriorly; hind femur anteriorly with a broad white longitudinal stripe which widens towards base and is separated from apical white knee-spot; fore and mid tibiae dark anteriorly, paler posteriorly; hind tibia dark; fore tarsus with basal white bands on tarsomeres 1, 2; mid tarsus missing; hind tarsus with basal white bands on tarsomeres 1–4, ratio of length of white band to total length of tarsomere is ⅓, ⅓, ⅖ and ½; tarsomere 5 all white; fore leg with tarsal claws unequal, larger one toothed, smaller one simple; hind leg with tarsal claws equal, simple. *Abdomen.* Abdominal segment I with white scales on laterotergite; tergum II with a small basal median spot and with lateral white spots; terga III–V each with a complete sub-basal pale yellowish band connected to lateral white spots. *Terminalia.* Basimere 3.5 times as long as wide; its scales restricted to dorsolateral, lateral and ventral areas; with a patch of hairs on the basomesal area of dorsal surface; mesal surface membranous; claspette simple, slender, sternal and tergal sides parallel, rounded apically, with 6 modified setae in a row on apical ⅕ of sternal side; lateral surface with hairs extending basad

Fig.2



Aedes (Stegomyia) tongae Edwards

Fig. 2. *Aedes* (*Stegomyia*) *tongae* Edwards, holotype ♂, tergal aspect of terminalia with claspette enlarged.

to about level of modified setae; apex tergally with hairs about ½ as long as entire lobe length; distimere simple, elongate, as long as basimere, slightly swollen near tip; with a spiniform process and a few hairs near apex; aedeagus with a distinct sclerotized lateral toothed plate on each side; paraprocts without teeth; cercal setae absent; ninth tergum with middle rounded and with a hairy lobe on each side.

FEMALE. Based on 2 topotypic females, with same data as type male. Deposited in British Museum. Essentially as in male, differing in the following respects: palpus ⅕ of proboscis, with white scales on apical half. Wing with first forked cell about 2 times as long as its stem. Mid tarsus which is absent in the male, with basal white bands on tarsomeres 1, 2; fore and mid legs with tarsal claws equal, simple. Abdominal tergum II dark dorsally with lateral white spots only; terga III–VI each with a complete or incomplete sub-basal pale yellowish band and with lateral white spots which are turned dorsomesally and connected to sub-basal pale yellowish bands; tergum VII with lateral white spots only or with a small basal median spot as well; segment VIII completely retracted.

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NEW SYNONYMY AND A CHANGE OF NAME IN NORTH AMERICAN BUPRESTIS

(COLEOPTERA: BUPRESTIDAE)

One of the common species of *Buprestis* occurring in western North America has been known for many years as *Buprestis rusticorum* Kirby (1837, Fauna Bor. Amer. 4:151). Upon examining the type specimen of *B. rusticorum* in the British Museum (Natural History) recently I found it not to be a representative of this western species, but rather to be conspecific with the well-known *B. maculativentris* Say, 1824 of eastern North America. Accordingly, I am here establishing a new synonymy with *B. rusticorum* (Kirby) a junior synonym of *B. maculativentris.* Another name, *B. paganorum* (Kirby, 1837) already in synonymy with *B. rusticorum* must also be associated with *B. maculativentris.*

A new name is now needed for the western species and *Buprestis lecontei* Saunders (1871, Cat. Bupr. p. 40) must be the replacement. This name was proposed by Saunders for *Buprestis rusticorum* of Gory (1840, Monogr. Bupr. 4:117) from "Californie," the type of which is believed to be in the Museum National d'Histoire Naturelle, Paris.

WILLIAM F. BARR, *University of Idaho, Moscow, Idaho 83843.*

CERATOPHYLLUS LARI HOLLAND IN EASTERN CANADA

(SIPHONAPTERA: CERATOPHYLLIDAE)

On 15 July 1971, 13 male and 12 female *Ceratophyllus lari* Holland 1951 were collected from the nest of a herring gull (*Larus argentatus smithsonianus* Coues) on Ciboux Island (outer Bird Island) off Cape Breton, Nova Scotia. Numerous larvae were also recovered from the same nest. This represents the first published record of a member of the *niger* species complex (*C. niger* Fox, *C. rauschi* Holland, *C. pelecani* Augustson, and *C. lari*) in eastern North America, except for a dubious record of *C. niger* in New York (Stewart, 1928, Cornell Univer. Agric. Exp. Sta., Mem. 101:1868–1869).

C. lari was first reported from Whaleback Island, Great Slave Lake, Northwest Territories from the nests of either California gulls (*L. californicus* Lawrence) or herring gulls (*L. a. smithsonianus*) (Holland, 1951, Can. Ent. 83:281–289; 1959, Can. Ent. 91:703–709). Clifford, et al. (1970, Jour. Med. Ent. 7:438–445) reported either *C. lari* or *C. pelecani* from the nests of western gulls (*L. occidentalis* Audubon), Brandt's Cormorants (*Phalacrocorax penicillatus* (Brandt)), and tufted puffins (*Lunda cirrhata* (Pallas)) on Goat Island and Hunter's Island off Oregon. A search of the literature failed to reveal any additional records of *C. lari.*

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ANDREW J. MAIN, JR. *and* ROBERT C. WALLIS, *Yale Arbovirus Research Unit, Medical Entomology Section, Department of Epidemiology and Public Health, Yale University School of Medicine, New Haven Connecticut 06510.*

WARREN SAMUEL FISHER
1878–1971

On May 2, 1971, near Fort Lauderdale, Florida, Warren S. Fisher passed away following a brief illness, ending a long and remarkably healthy life of 92 years. As a specialist on forest Coleoptera he served the Bureau of Entomology of the U.S. Department of Agriculture very ably and very productively over a period of 35 years and 9 months. During this period he found the time and the resources to do the taxonomic research that resulted in 135 published papers, a considerable number of which are revisionary studies of large scope. In retirement since 1948, he terminated his entomological work following the death of his wife in November 1953 and concentrated on gardening and his collection of postage stamps at his home on a plot of a few acres near Falls Church, Virginia, and then subsequent to February 1967 near Fort Lauderdale, Florida. His son, Wilbur, lived nearby until 1957 when he passed away suddenly. Subsequently, his daughter, Catherine, and her husband lived with him.

He was born April 4, 1878, at Highspire, Pennsylvania, and with two younger sisters he grew up there in the vicinity of the Susquehanna River and the adjacent forest-covered mountains, 7 miles below Harrisburg. As a boy he became interested in insects and snakes and developed an ambition to be a professional biologist. But almost two decades were to pass before any tangible realization of this dream was to occur.

He attended the public schools of Highspire and was graduated from high school. During his youth, he sold newpapers in the Steelton area near Harrisburg, worked as a clerk in a country store and then as an assemblyman in a typewriter factory. He participated in 100 mile round-trip bicycle excursions, a great sport in the 1890's, and studied at the Harrisburg Business College receiving his diploma in June, 1897. Then he worked for an extended period as a shipping clerk for the steel mill at Steelton. He once recalled that while there he shipped all the steel that went into the 14th Street Bridge which for almost 70 years was to be an important link between Washington, D.C., and Northern Virginia. His friends, tongue in cheek, referred to this imposing landmark as "Fisher's Bridge."

In 1906 he married Bertha V. Wilbar of Harrisburg. Of their two children, Catherine, Mrs. Paul Csikos, survives him at Fort Lauderdale, Florida. Also surviving are his younger sister, grandchildren and great grandchildren.

Of necessity Fisher carried out his studies of natural history in limited spare time. But he continued to develop, and in September 1898 he received a Certificate of Achievement in Popular and Applied Science from the Philadelphia Inquirer. Then, in 1902 there dawned a new era in his career as he was appointed Assistant State Zoologist under Professor H. A. Surface, of the Pennsylvania Department of Agriculture at Harrisburg. In this position he had an opportunity to develop his special interest in the Coleoptera and forest insects. He initiated independent studies in the classification of Coleoptera in 1910 and published his first paper, with his friend H. B. Kirk, on the Cerambycidae from Harrisburg and vicinity which appeared in July 1912. Unlike his many taxonomic papers that followed, this publication gives interesting glimpses into his and Kirk's activities in the field during the period 1906–1911; e.g., use of the right of way of a trans-mountain gas pipe-line as a collecting route and the employment of acetylene lamps for night collecting and observation. Fisher's entomological collections of this early period are preserved in the Pennsylvania Department of Agriculture at Harrisburg.

On August 30, 1912, he was appointed Entomological Assistant with a unit of the U.S. Department of Agriculture, Forest Insect Investigations, which was headed by A. D. Hopkins. Fisher was among that group of gifted entomologists brought together mostly at the East Falls Church Laboratory and included A. G. Boving, Carl Heinrich, C. T. Greene, F. C. Craighead, T. E. Snyder, H. B. Kirk, A. B. Champlain and others. In this position, Fisher was able to continue his taxonomic studies with E. A. Schwarz as his mentor, but he was mostly engaged in the investigation of Coleoptera associated with chestnut tree bark disease as well as with dying oak and other forest trees. During 1914 and 1915 he carried out field work at Linglestown, Shiremanstown, and near Harrisburg, Pennsylvania. His deep interest and keen perception in carrying out field studies are clearly evident in his unpublished notes which are currently filed in the U.S. National Museum. He published two short taxonomic papers in his first position with the U.S. Department of Agriculture.

On July 1, 1915, he was appointed Specialist on Forest Coleoptera initially under E. A. Schwarz. He remained in this position with the U.S. Department of Agriculture until his retirement 33 years later. His office was in the Natural History Building of the Smithsonian Institution, and over most of the years contemporary with him were the coleopterists H. S. Barber, A. G. Boving and somewhat later L. L. Buchanan and E. A. Chapin.

In his assignment, Fisher was responsible for making identifications and providing information on wood-boring Coleoptera as well as a number of diverse small families mostly in the Cucujoidea. In his research, he concentrated on taxonomic studies principally of the Buprestidae, Cerambycidae, Bostrychidae and Anobiidae. Much of his study material was in the extensive collections of the U.S. National Museum including the very important biologically annotated, often reared, forest Coleoptera brought together under the direction of A. D. Hopkins and his successors. In addition, Fisher borrowed many collections for study. Notable among these are those from Southeast Asia assembled by C. F. Baker, H. M. Pendlebury, F. C. Drescher, and L. G. E. Kalshoven. Also, available to him were biologically annotated and reared materials from the Indian Forest Research Institute at Dehra Dun. In addition, he borrowed material from various museums and studied types in those institutions in the Eastern United States, but he never went overseas to study types or to do field work, largely because his wife was in poor health with diabetes.

The assiduousness and taxonomic abilities he brought to this position included long hours of cataloguing of the literature carried out at home in the evenings and resulted in a beautifully arranged U.S. National Museum Collection and a steady stream of taxonomic publications. They added up to 135 in all and included 8 large revisionary studies. His descriptions and keys are models of clarity and organization, his reliance being upon meticulous and detailed description of external characters. By this means he usually attained diagnostic separations. In only two of his works did he use genitalic characters. These, however, were the large and important revisions of North American (north of Mexico) *Agrilus* and the Chrysobothrini. It may be that he would not have utilized genitalia in these had it not been for the urging of his colleagues. Except for figures of the genitalia, his works are virtually without illustration.

Between 1916 and 1928 he made occasional visits to Plummers Island, earlier as a guest of E. A. Schwarz, H. S. Barber and H. L. Viereck and later as a guest of H. S. Barber and R. C. Shannon. He also accompanied H. S. Barber on various trips into the field in later years, as well as G. B. Vogt in still later years. But subsequent to 1915, Fisher almost completely discontinued his field studies of insects in order to concentrate, at least initially, on the duties of his new job and to have time for his family. However, his abilities as a field worker continued to be manifest in an appreciation of biological data such as occurs with museum specimens. As compared with many taxonomists his citation and interpretation of such data in his papers are exceptional for accuracy and insight.

Two of his very few entomological undertakings in the field since 1915 are noteworthy. Much of the spring and summer of 1918 he worked out of Lyme, Connecticut on borers, mostly the two-lined chestnut borer, *Agrilus bilineatus* (Weber) that were killing weakened shade trees in New England and on Long Island, N.Y. During this assignment, he had occasion to make detailed observations on the biology of *Agrilus lateralis* (Say). He worked with a colony boring in the stems of bayberry which had been discovered earlier by A. B. Champlain. Fisher's findings were published in 1922. Then, on April 7, 1923, in company with H. S. Barber and E. A. Schwarz, he collected *Trachykele lecontei* (Gory) from Cypress trees weakened and dying in the face of advancing sand hills at Cape Henry, Virginia. His 3 specimens remain the only addition in the U.S. National Museum Collections to the unique specimen collected at the same locality by A. D. Hopkins on April 5, 1908.

Much of Fisher's love of nature was expressed in his gardening. He maintained a generous vegetable garden with his son, Wilbur; but his interest centered on growing collections of primroses, Hemerocallis, chrysanthemums, iris, and unusual bulbs, particularily the newer varieties of daffodils. Of special interest to him was the phenology of development of exotic bulbs under the climatic conditions of his homeplace.

Fisher corresponded with such notables in his field as Chr. Aurivillius and Jan Obenberger. His letters to friends and associates were done with great care and, if hand written, in an inimitably neat manner. He was always ready to help and encourage the serious student whether he be advanced or just beginning. He lived quietly, simply, thriftily and worked with devotion and with marked effectiveness. Although he lacked an accredited college education, he left a monument of lasting entomological accomplishment.

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R. H. Arnett is re-published from the Coleopterists' Bulletin for March 1954. Registers of the Washington Biologists Field Club were examined for records of his activity on Plummers Island.

Helene G. Cushman
Carl F. W. Muesebeck
George B. Vogt, *Chairman*

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SOCIETY MEETINGS

790th Regular Meeting—October 7, 1971

The 790th regular meeting of the Entomological Society of Washington was called to order by President Edson J. Hambleton on October 7, 1971 in Room 43 USNM. Fifty-eight members and 26 guests were in attendance. Minutes of May and June (banquet) meetings were read and approved.

Dr. Anderson of the membership committee read 3 names for membership. They were Ernest Philip Rouse, Curator, Dept. of Entomology, University of Arkansas, David E. Foster, graduate student, Entomology Dept., University of Idaho and Thomas R. Yorke, Entomology Department, University of Missouri.

President Hambleton introduced the speaker for the evening Dr. Ernest C. Bay, Head of the Entomology Department of the University of Maryland. Dr. Bay subtitled his comments on the "Natural Enemies of Mosquitoes" as "Everyone loves a mosquito—except people." He richly illustrated the development of an experimental pond observatory and the rearing of experimental material. Slides of a large variety of plant and animal predators of the mosquito were shown and comments made on their biology and effectiveness in controlling mosquitoes.

Dr. Gurney presented the first note of the evenieng showing slides of a summer trip to the west. He included shots of research people and scenes from Idaho, Washington, Oregon and California.

Dr. R. I. Sailer, not to disappoint anyone, brought 4 mason jars with stink bugs. These were special bugs (*Euchistus*), however, as two contained single adult males, sole survivors of a brood of brothers and sisters that became adult in August 1970. One of the males was the last survivor of five pairs that were placed together September 19, 1970. These were the progenitors of the F_4 nymphs in the third jar. The second male was the last survivor of 7 females and 7 males of the same original brood that were held with the sexes separate until September 5, 1971. They were the parents of the F_1 nymphs contained in the fourth jar. While these contemporaneous F_1 and F_4 generations were obtained in a laboratory situation there is no apparent reason why the same phenomenon cannot occur in nature. The problem posed in constructing life tables of populations composed of multiple, contemporaneous generations was underscored.

Following introduction of guests, the meeting was adjourned at 9:40. Refreshments were served.

Respectfully submitted, Dewey M. Caron, Recording Secretary.

791st Regular Meeting—November 4, 1971

The 791st regular meeting of the Entomological Society of Washington was called to order by President Edson J. Hambleton on November 4, 1971 in Room 43 USNM. Thirty-seven members and 21 guests were in attendance. The October meeting minutes were read and approved.

Membership chairman Rainwater read the name of one new applicant. It was Mazhar Jabil of the Ohio Department of Health.

Nominating committee chairman Gurney presented the committee's slate of candidates for next year. New president will automatically be the present president-elect C. W. Sabrosky as provided by the Bylaws of the Society. The committee proposed that the present officers be retained for another year and for the office of president-elect they nominated Arthur K. Burditt. The remainder of the slate is as follows: Recording Secretary—Dewey M. Caron; Corresponding Secretary—David R. Smith; Treasurer—Theodore J. Spilman; Editor—Paul M. Marsh; Custodian—Robert D. Gordon; Program Chairman—F. Eugene Wood; Membership Chairman—H. Ivan Rainwater; and Representative to Washington Academy of Sciences—Reese I. Sailer.

Dr. Gurney made a few remarks of past presidents. He indicated an acquaintance with 55 (of 67) past presidents and asked if others could improve this statistic.

President Hambleton introduced the speaker of the evening Lt. Col. Bruce Eldridge, Chief, Department of Entomology, Walter Reed Army Medical Center. An abstract of his talk follows.

The 1971 Surveillance of Mosquitoes for V.E.E. Conducted by the Department of Defense.—The northward movement of Venezuelan equine encephalitis (VEE) through northeastern Mexico into Texas in the early summer of 1971 resulted in the U.S. Secretary of Agriculture declaring a national emergency. Eventually, the U.S. Department of Agriculture by mutual agreement with the U.S. Public Health Service requested that the Department of Defense conduct surveillance of a four state area outside the then-known epidemic area of the southwestern United States. Ten 2-man teams collected mosquitoes from 28 July to 26 August, 1971, in areas of Texas, Oklahoma, Arkansas, and Louisiana. The mosquitoes were identified and pooled at the Fifth U.S. Army Medical Laboratory, Fort Sam Houston, Texas; processing for virus isolation was done at the U.S. Army Medical Research Unit of Infectious Diseases, Fort Detrick, Maryland. A total of 501,992 mosquitoes comprising 52 species were collected, identified, and assembled into 13,192 pools from which 29 virus isolates were obtained. A single isolate of eastern equine encephalitis (EEE) was obtained from a pool of *Culiseta melanura* (Coquillett) collected in Louisiana. Twenty-six isolates of western equine encephalitis (WEE) came from several species of mosquitoes (mostly *Culex tarsalis* Coquillett) collected in areas of western Texas. An isolate of VEE was obtained from a pool of *Psorophora confinnis* (Lynch Arribalzaga) collected in Del Rio, Valverde County, Texas. An isolation was also made from a pool of the same species collected in Evangeline Parish, Louisiana, but this isolate did not kill guinea pigs by peripheral inoculation. The possibility exists, therefore, that the isolate is the vaccine strain (TC-83) of VEE. If so, the mosquitoes would have become infected by feeding on a recently vaccinated horse. This has not been previously demonstrated for VEE.—Lt. Col. Bruce Eldridge.

The first exhibition of the evening was a Dipteran specimen of Dr. Bernard Braun. Identification of the specimen, an ephedrid fly with mantid-like front legs for prey capture, was performed by George Steyskal.

Two members brought a new book, American Entomologists by Arnold Mallis for display. T. J. Spilman gave an interesting account of the book from Rutgers University Press. He indicated that it is a very readable account with pictures of the lives of 205 past entomologists. Technical achievements are discussed, of course, but author Mallis also brings out the interesting personalities and personal association of his subjects resulting in a more lifelike portrait. Reviewer Spilman called it a delightful book. Entomology is so interesting; so are entomologists. The book and a second brought by Ted Bissell were circulated for inspection.

Reese I. Sailer brought a bottle for display. This one contained what is surely the world's largest collection of stink bug eggs, somewhere near an estimated ½ million. The eggs represent the production of captive females for which time and space was not available for rearing of offspring. Several members inquired about the taste of the caviar-like looking mass.

Maynard Ramsey highlighted a meeting he attended and at which he presented an address in Rome, Italy of quarantine officials of several countries. He indicated he also had to work after the meeting by touring marble and stone quarries in northern Italy to discuss the problems of wood infesting species under quarantine.

After introduction of guests the meeting was adjourned at 9:15 P.M. Refreshments were served.

Respectfully submitted, Dewey M. Caron, Recording Secretary.

792nd Regular Meeting—December 9, 1971

The 792nd regular meeting of the Entomological Society of Washington was called to order by President Edson J. Hambleton on December 9, 1971 in Room 43 USNM. Thirty-one members and 17 guests were in attendance. The November meeting minutes were read and approved.

This being the Annual Meeting, several officers presented annual reports of the fiscal year November 1, 1970 to October 31, 1971. Treasurer Spilman began with the finances. He reported a net worth of just over $11,000 of which $5,000 is a certificate and $4,889 is a passbook savings account for Special publications. The checking account containing both the general and Special publication funds had a balance of $1,131. The general fund was actually a minus figure with one bill of over $2,000 for the last issue of the Proceedings still outstanding.

Editor Marsh next presented his report. There were 4 numbers of the Proceedings of 460 pages with 86 scientific papers and notes published. Finances were again mentioned in this report as present page charges have not been sufficient to cover rising costs. The recent executive committee action to raise the page charges to $10 per page was briefly discussed.

President Hambleton summarized the annual reports of the Custodian, Corresponding Secretary and the Recording Secretary. 631 persons attended society meetings last year and a membership of 507 represents an increase of 7. Membership is distributed among 46 states, D.C., 2 territories and 16 foreign countries while the Proceedings go to 49 states, D.C., 2 territories and 42 foreign countries.

President Hambleton spoke briefly about his year as president. He thanked officers for their reports and efforts in the past year. He also thanked the hospitality chairman and committee for their much appreciated efforts.

Nominating committee chairman Gurney presented the committee's slate of officers for the next year. The nominees were as follows: President-elect—Arthur K. Burdett; Recording Secretary—Dewey M. Caron; Corresponding Secretary—David R. Smith; Treasurer—Theodore J. Spilman; Editor—Paul M. Marsh; Custodian—Robert D. Gordon; Program Chairman—F. Eugene Wood; Membership Chairman—H. Ivan Rainwater; and Representative to the Washington Academy of Sciences—Reese I. Sailer. Nominations were called from the floor. There being none Steyskal moved that nominations be closed. After a second by Sollers-Reidel the motion carried. Russell moved that the secretary cast one ballot for the entire slate. After second of Steyskal motion passed. The ballot was cast and confirmed by President Hambleton.

President Hambleton next introduced the speaker of the evening Dr. Norris H. Williams, Department of Botany, Smithsonian Institution, Washington, D.C. An abstract of his talk follows.

Pollination of Orchids by Euglossine Bees.—The specialized structure of the anther in the Orchidaceae necessitates an outside agent for the transport of pollen from one flower to another. A number of mechanisms for attracting pollinators have evolved in the Orchidaceae, the most common being based on the search for food or on one of several types of deceit. About 10% of the Orchidaceae are pollinated by male bees of the tribe Euglossini (Apidae) which are attracted solely to the odor of the flower. Flowers possessing the euglossine syndrome lack food in the form of nectar for the visitors. The male euglossines collect various volatile compounds with their front tarsi and transfer the odoriferous components to their enlarged hind tibiae. Several genera of orchids have evolved pollination systems based on attracting male euglossines and their transferring behavior, so that the bee is forced through various types of falls, chutes, or traps. Such pollination mechanisms were described for several species of *Catasetum*, *Cycnoches*, *Stanhopea*, and *Coryanthes*, as well as for non-orchidaceous plants of the Araceae, Gesneriaceae, and Solanaceae. A number of the components of orchid floral fragrances have been identified by the use of gas-liquid chromatography. The odor components are commonly occurring monoterpenes and aromatic compounds such as alpha-pinene, beta-pinene, cineole, linalool, benzyl acetate, methyl salicylate, methyl cinnamate, and methyl benzoate. Field tests have shown that a given species of bee may be attracted to one or more of these compounds. Some of the compounds do not function as attractants, but serve to modify the attraction potential of other compounds. The combination of compounds in an orchid floral fragrance selectively attracts one or a very few species of bees, so that each species of orchid often has a specific bee as its pollinator. The floral fragrance components therefore serve two purposes: they not only serve as the force in attracting pollinators, but they also serve as isolating mechanisms by selectively attracting one or a very few species of bees as pollinators. Three hypotheses were offered as to why the bees are attracted to, collect, and store the floral fragrance components: 1) the compounds are necessary in the life of the bee and the bee is unable to manufacture the compounds himself, 2) the male bee might modify the compounds to serve as sex attractants in attracting females, or 3) the bee uses the compounds to mark a territory and to attract a male swarm for mating with the female.—Norris H. Williams, Department of Botany, Smithsonian Institution, Washington, D.C. 20560.

The single note for the evening also concerned bees. Dewey Caron noted the recent controversy regarding the Dance Language Hypothesis in honey bees whereby one bee by "dancing" is thought to pass information to other bees about food or home sites. Two new books that cover aspects of the dance language and reassert the validity of the hypothesis were presented. They were the revised edition of "Bees, Their Vision, Chemical Senses and Language" by Karl von Frisch with an introduction by Donald Griffin and "The Insect Societies" by Edward O. Wilson.

Following introduction of several visitors, retiring President Hambleton called upon past presidents Helen Sollers-Reidel and Louise Russell to escort 1972 President Curtis W. Sabrosky to the front of the room. There the gavel was passed to President Sabrosky. Following a brief welcome and acknowledgment of the many activities of retiring President Hambleton the meeting was adjourned at 10 P.M. Refreshments were served.

Respectfully submitted, Dewey M. Caron, Recording Secretary.

Information for Contributors

Publication in the Proceedings is reserved for members only. Publication of papers by non-members may be obtained after acceptance at a cost to the author of $25.00 per printed page. Regular papers are published in approximately the order that they are received. Manuscripts should not exceed 30 typewritten pages including illustrations (approx. 15 printed pages). Excess pages beyond 15 per article will be charged to the author at the rate of $25.00 per page. Papers of less than a printed page may be published as space is available at the end of longer articles.

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THE

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OF WASHINGTON

ORGANIZED MARCH 12, 1884

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Entomological Society of Washington
c/o Department of Entomology
Smithsonian Institution
Washington, D. C. 20560

MEETINGS.—Regular meetings of the Society are held in Room 43, Natural History Building, Smithsonian Institution, on the first Thursday of each month from October to June, inclusive, at 8 P.M. Minutes of meetings are published regularly in the *Proceedings.*

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AEDES GOULDI, A NEW SPECIES OF THE SUBGENUS AEDIMORPHUS THEOBALD FROM WEST PAKISTAN

(DIPTERA: CULICIDAE)[1, 2]

JOHN F. REINERT,[3] *Department of Entomology, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C. 20012*

ABSTRACT—The female of *Aedes* (*Aedimorphus*) **gouldi**, n. sp. from West Pakistan is described and illustrated. The relationship of *gouldi* to closely related species is discussed.

The subgenus *Aedimorphus* Theobald of the genus *Aedes* Meigen is confined primarily to the African, Oriental and Pacific Islands Regions. During the course of work on a revision of the subgenus in Southeast Asia, material of the present new species was encountered in the U.S. National Museum collection. Although West Pakistan lies outside of the area included in the Southeast Asia revisionary study, the new species aids in an understanding of the subgenus within this area.

The nomenclature and chaetotaxy used for the adult follow Belkin (1962) and the terminology of the female genitalia follows Coher (1948).

Aedes (Aedimorphus) gouldi, n. sp.

(Figs. 1, 2)

FEMALE (fig. 1). *Head.* Antenna dark brown, approximately 1.05 length of proboscis, torus brown with several small dark brown scales and a patch of short fine brown hairs mesally, flagellomere 1 with basal 0.45 pale and with a few small dark brown scales; clypeus dark brown, bare; maxillary palpus brown scaled with golden scales intermixed, approximately 0.21 length of proboscis; proboscis golden scaled with apical 0.25 darker, approximately 1.06 length of femur I; vertex with dorsum covered with narrow curved decumbent scales, an anteromedian golden group with a pale brown patch on each side and the re-

[1] This work was supported in part by Research Contract No. DA-49-193-MD-2672 from the U. S. Army Medical Research and Development Command, Office of the Surgeon General, and carried out at the Southeast Asia Mosquito Project, Smithsonian Institution, Washington, D.C.

[2] Immediate publication secured by full payment of page charges—Editor.

[3] Major, Medical Service Corps, U. S. Army.

Fig. 1

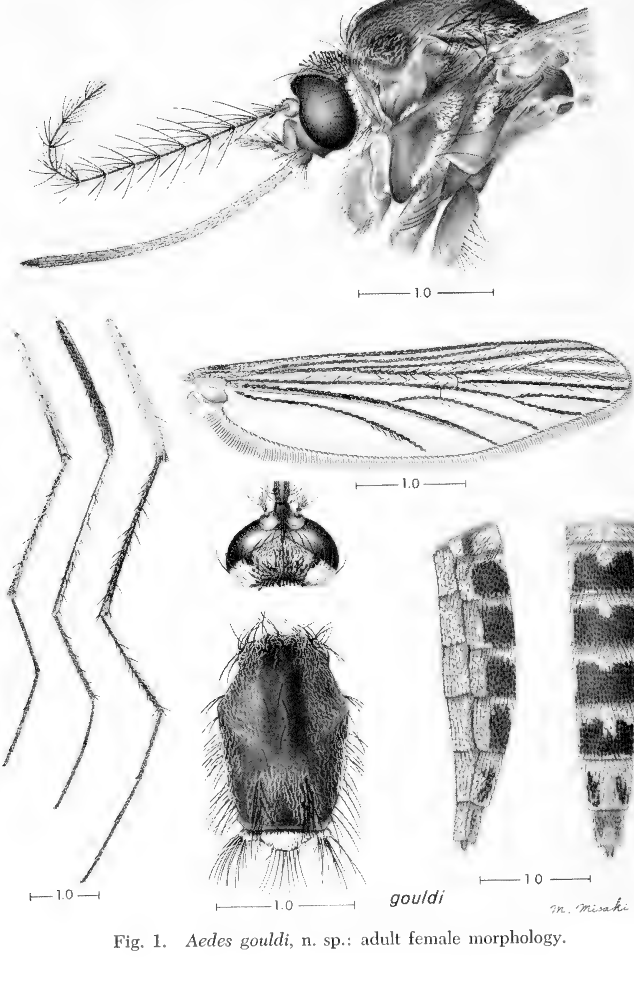

Fig. 1. *Aedes gouldi*, n. sp.: adult female morphology.

mainder white; orbital line with narrow white scales and pale brown bristles; lateral surface covered with broad golden-white scales and a small anterodorsal dark brown patch; numerous brown and golden erect forked scales on occiput and vertex extending to orbital line. *Thorax.* Scutal integument dark reddish-brown; type specimens with scutum partially rubbed dorsally between anterior dorsocentral bristles but remainder covered with narrow curved bronzy scales with narrow curved golden-white scale patches on median anterior promontory area, dorsocentral areas at anterior margin of scutum, large patch on supra-alar area above anterior margin of paratergite extending to posterior of wing base and a patch covering prescutellar space and among posterior dorsocentral bristles; scutellum with a patch of broad and a few narrow curved white scales on each lobe; anterior promontory, acrostichal, dorsocentral (anterior and posterior), humeral, fossal (anterior and posterior), supra-alar, prescutellar and scutellar (lateral and median) bristles golden-brown to reddish-black and well developed; pleural integument brown; anterior pronotal lobe with narrow curved golden scales, several golden bristles; posterior pronotum with narrow curved scales, bronzy ones dorsally and remainder golden, 4–5 dark brown posterior bristles; propleuron with a patch of broad golden scales, several golden-brown bristles; postspiracular area with a patch of narrow curved golden scales, 10–12 golden bristles; subspiracular area with a patch of narrow curved golden scales; sternopleuron with a patch of broad golden scales on upper area and extending ventrally over posterior area, several upper and posterior golden-brown bristles, lower ones shorter and golden; prealar knob with 3–4 broad golden scales, numerous golden bristles; paratergite with narrow curved golden scales; mesepimeron with a patch of broad golden-white scales and several golden bristles on upper area; other pleural areas bare. *Legs.* Coxae I–III each with several golden bristles, I and II with anterior surface covered with broad scales which are golden-brown on I and golden on II, III with a small anteroventral and a posterior patch of broad golden scales; trochanters I–III each with broad golden scales; femora I and III golden-white scaled, I with brown scales intermixed anteriorly mainly on apical 0.50 and a posteroventral longitudinal brown stripe on apical 0.75, III with a few intermixed brown scales anteriorly mainly dorsally and numerous pale brown scales intermixed on posterior 0.40, II with anterior and dorsal surfaces brown with a few golden-white scales intermixed and a golden-white patch on dorsobasal 0.30, posterior surface golden-white with a few pale brown scales intermixed becoming more numerous on apical 0.30, I–III each with an apical white spot; tibia I with anterior surface golden-white scaled with a number of brown scales intermixed, II golden-white scaled with a ventral longitudinal brown stripe from base to apex, stripe extends partially onto anteroventral and posteroventral surfaces, III golden-white scaled with dorsal surface brown scaled and numerous pale brown scales intermixed on anterior surface; tarsi I–III brown, I with tarsomeres 1–4 each with a posterior longitudinal golden-white stripe, II with tarsomeres 1–3 each with a posterior longitudinal golden-white stripe, 1 also with dorsobasal 0.50 golden-white, III with tarsomere 1 and basal 0.50 of 2 with a posterior longitudinal golden-white stripe; tarsal claws I–III each with 2 ungues, I, II with ungues equal each with a tooth, III with ungues equal and simple. *Wing.* Dorsal veins covered with moderately broad brown scales; costa with a few golden-white scales at base and along its posterior margin from just before humeral cross vein to apical 0.60; remigium with golden-white scales along posterior margin; radius and cubitus each

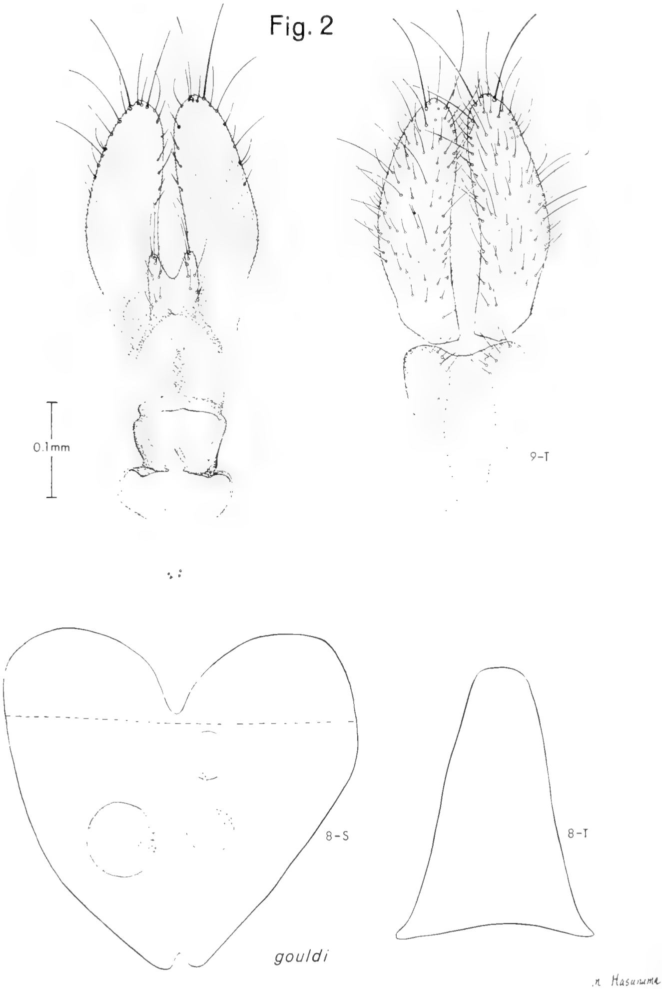

Fig. 2. *Aedes gouldi*, n. sp.: female genitalia.

with a few golden-white scales near base; ventral veins brown scaled with golden-white scales along basal 0.30 of costa and basal 0.25 of subcosta; alula with narrow pale brown scales along fringe; 1–2 remigial bristles. *Halter.* Stem pale, knob golden-white scaled. *Abdomen.* Tergum I golden-white scaled, lateral tergite with a rectangular patch of golden-white scales; terga II–VI each with a broad longitudinal golden-white stripe on lateral surfaces and a basal golden-white band connected with lateral pale stripe, bands broader mesally on II, III and forming an incomplete dorsomedian stripe on IV, V and a complete dorsomedian stripe on VI; II–V with a few golden-white scales along apical margin and VI with a golden-white apical band; VII covered with golden-white scales with 2 indistinct basal triangular-shaped pale brown spots; sterna covered with golden-white scales; terga and sterna with numerous golden bristles, mostly along posterior and lateral margins. *Genitalia* (fig. 2). Segment VIII almost completely retracted into segment VII; tergum VIII broadly rounded apically; sternum VIII with a deep median apical indentation; tergite IX bilobed with 6–8 bristles on each lobe, entire surface covered with minute setae; cerci long, 0.75–0.90 extended and visible dorsally, tergal surface covered with short bristles, apical ones longer, entire tergal and sternal surfaces covered with minute setae; postgenital plate with a deep median apical indentation with 7–9 bristles on each lobe, entire surface covered with minute setae; posterior cowl membranous and covered with tiny setae; anterior cowl, anterior and posterior sigma each moderately pigmented, narrow and covered with minute setae; atrial plate well developed, pigmented; insula tongue-like, membranous, covered with minute setae and with 3–4 tiny tuberculi on anterior 0.25; 3 pigmented, spherical spermathecae, 1 large and 2 slightly smaller ones.

MALE, PUPA AND LARVA. Not known.

TYPE DATA. *Aedes* (*Aedimorphus*) *gouldi*, holotype female, WEST PAKISTAN, *Lahore*, Shah Zada, IX-19-1962, D. J. Gould collector; 3 paratype females with same data as holotype; 2 paratype females with same data as holotype except date, VIII-30-1962; and 2 paratype females with same data as holotype except town and date which are Kahna Kacha, VIII-28-1962. Holotype and 6 paratypes deposited in United States National Museum (Natural History), Washington, D.C., and 1 paratype deposited in the British Museum (Natural History), London, England.

DISTRIBUTION. Known only from Shah Zada and Kahna Kacha, Lahore district, West Pakistan.

BIOLOGY. All specimens were taken while biting cattle.

TAXONOMIC DISCUSSION. *Aedes gouldi* resembles in habitus *pallidostriatus* (Theobald), *mediolineatus* (Theobald) and *pampangensis* (Ludlow). The following features of *gouldi* distinguish it from closely related species: scutellum with broad and a few narrow white scales on each lobe; no apparent pale scaled stripes on scutum; posterior pronotum with 4–5 bristles; postspiracular area with 10–12 bristles; propleuron with broad golden scales; and wing with anterior margin of costa brown scaled. *Aedes pallidostriatus* possesses: scutellum with narrow curved whitish-golden scales on each lobe; scutum with

2 distinct and 1 indistinct longitudinal pale scaled stripes; posterior pronotum with 9–10 bristles; postspiracular area with 7–8 bristles; propleuron with narrow curved golden scales; and wing with anterior margin of costa golden scaled. *Aedes mediolineatus* possesses: scutellum with narrow curved golden scales on each lobe; scutum with 3 distinct longitudinal pale scaled stripes; posterior pronotum with 6–8 bristles; postspiracular area with 7–10 bristles; propleuron with narrow golden-white scales; and wing with anterior margin of costa brown scaled. *Aedes pampangensis* possesses: scutellum with overlapping broad silvery scales on each lobe; scutum without pale scaled stripes; posterior pronotum with 6–7 bristles; postspiracular area with 6–7 bristles; propleuron with broad white scales; and wing with anterior margin of costa brown scaled. *Aedes gouldi* is also similar in habitus to *trimaculatus* (Theobald) and *nigrostriatus* (Barraud) but can be easily separated from these 2 species by the dark reddish-brown scutal integument while the latter species has a pale integument with dark stripes and *trimaculatus* has a dark reddish-brown integument with pale spots. *Aedes trimaculatus* also has the scutellum with narrow curved reddish-brown scales on median lobe and narrow curved golden scales on the lateral lobes while *nigrostriatus* has the scutellum with narrow curved golden scales on each lobe and a few narrow curved reddish-brown scales on laterobasal areas of median lobe.

This species is named for Dr. D. J. Gould, SEATO Medical Research Laboratory, Bangkok, Thailand, in recognition of his valuable support in providing many mosquito specimens to the Southeast Asia Mosquito Project.

Acknowledgments

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THE GENUS HEXACLADIA ASHMEAD
(HYMENOPTERA: ENCYRTIDAE)

B. D. BURKS, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—*Hexacladia* Ashmead is a remarkable genus having males with branched antennae. It should be placed in the tribe Encyrtini, with *Encyrtus* Latreille, but a subtribe Hexacladiina is required for it. All the species of *Hexacladia* occur in North or South America and parasitize Hemiptera-Heteroptera of the families Pentatomidae, Coreidae, or Pyrrhocoridae. Six species are treated, 2 of which are new: *H.* **leptoglossi**, from *Leptoglossus phyllopus* (L.), and *H.* **hilaris**, from *Acrosternum hilare* (Say).

In 1891 Ashmead described *Hexacladia*, which he called a "remarkable" new encyrtid genus from Brazil that had a male with branched antennae (Ashmead, 1891). He ventured no opinion about it relationships with other encyrtid genera because L. O. Howard was just then preparing a paper on the encyrtid genera having males with branched antennae. A few months later, Howard's paper appeared, and he discussed all the known encyrtid genera having this kind of males, including *Hexacladia* (Howard, 1892). His conclusion was that the encyrtids having males with branched antennae "can not be said to form a natural group." That opinion is still held today, for the encyrtid genera with males having branched antennae are scattered throughout the family in current classifications. Howard was, however, rather of the opinion that *Hexacladia* should form a tribe of its own, because he was unable to relate it to any other encyrtid genera.

In his 1900 classification, Ashmead included *Hexacladia* in the tribe Mirini, the huge tribe that included over two-thirds of the encyrtid genera known to him at that time (Ashmead, 1900). His 1904 classification was very little different, leaving *Hexacladia* buried in the Mirini (Ashmead, 1904). Schmiedeknecht's classification, being almost a literal translation of Ashmead's from English into German, made no change in the placement of *Hexacladia* (Schmiedeknecht, 1909).

Two years later Crawford described the genus *Sophencyrtus* from a single female specimen that had been reared from the adult of a pyrrhocorid bug in Peru (Crawford, 1911). He decided that its characteristics would place it "in the Encyrtini rather than in any other group." Later on Girault (1917) recognized *Sophencyrtus* as a synonym of *Hexacladia*. Crawford's opinion, however, that it should be assigned to the Encyrtini was a very illuminating opinion, because it showed for the first time the true relationships of this genus.

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[1] Mail address: c/o U. S. National Museum, Washington, D.C. 20560.

When Hoffer (1955) published his tribal classification of the Encyrtidae, he based it almost entirely on European genera, so he did not consider *Hexacladia.* He included only the genus *Encyrtus* Latreille in the Encyrtini. Crawford had a very good eye for relationships, however, so it is instructive to list the similarities between *Hexacladia* and *Encyrtus.* Those similarities are as follows:

Both have similar blunt, broad mandibles; head broad, with occipital margin sharply carinate; middle and hind tarsi each with basal segment elongate; propodeum elongate, propodeal spiracles round and relatively large; axillae elevated above level of base of scutellum; forewing with a thickened bulla at point of divergence of obsolete vein Rs in submarginal vein and a darkened cross-fascia on wing at this point; marginal vein short and thick, postmarginal and stigmal veins long, equal to or longer than marginal; hindwing with broad costal cell; and female gaster without paratergites.

On the other hand, there are great differences between *Encyrtus* and *Hexacladia.* In *Hexacladia* the female antenna has the first funicular segment greatly lengthened and the club is unsegmented; the male antenna has long branches on the funicular segments; the scutellum is without an apical brush of bristles; and the female apical gastral sternite is strongly plowshare-shaped, with unique modifications at its posterior margin. In *Encyrtus* the male and female antennae are quite unlike those in *Hexacladia*, there is a strong tuft of bristles on the scutellum, and the apical gastral sternite is weakly developed into a plowshare-like structure, and lacks the distinctive modifications of the posterior margin found in *Hexacladia.*

Biologically, also, the two differ. *Encyrtus* parasitizes Hemiptera-Homoptera of the family Coccidae. *Hexacladia* parasitizes free-living Hemiptera-Heteroptera of the families Pentatomidae, Coreidae, and Pyrrhocoridae, emerging from the adult bugs or, occasionally, from the mature nymphs.

If these two genera are to be placed in the same tribe it will be necessary to form subtribes for their logical reception, the genus *Encyrtus* being placed in the Encyrtina and *Hexacladia* in the Hexacladiina.

De Santis (1965) has proposed a subtribe Hexacladii of the Mirini for *Hexacladia*, far removed from any relationship with the Encyrtini.

Genus **Hexacladia** Ashmead

Hexacladia Ashmead, 1891, Ins. Life 3:456.—Howard, 1892, Proc. U. S. Natl. Mus. 15:364.—Dalla Torre, 1898, Cat. Hym. 5:230.—Ashmead, 1900, Proc. U. S. Natl. Mus. 22:377.—Ashmead, 1904, Mem. Carnegie Mus. 1:301, 308, 377.—Schmiedeknecht, 1909, Gen. Ins., fasc. 97:235.—Timberlake, 1926, Proc. U. S. Natl. Mus. 96(3):12.—De Santis, 1965, An. Com. Inv. Cien. Prov. Buenos

Aires 4:114.—De Santis, 1967, Com. Inv. Cien. Prov. Buenos Aires, Cat. Hym. Argentinos Serie Parasitica, p. 154.

Type-species: *Hexacladia smithii* Ashmead. Monotypic.

Sophencyrtus Crawford, 1911, Proc. U. S. Natl. Mus. 41:275.—Girault, 1917, Descr. Stell. Nov., p. 5 (= *Hexacladia*).

Type-species: *Sophencyrtus townsendi* Crawford. Original designation.

Generic description.—Female: Mandible, fig. 2, blunt at apex, without denticles, angularly produced at apicodorsal angle, as in *Encyrtus*; maxillary palpus with 4 segments, labial with 3. Malar furrow absent. Antennae inserted approximately in center of frons, above level of ventral margins of compound eyes, apices of scapes exceeding level of vertex. First funicular segment elongate; antennal club unsegmented. Occipital margin sharply carinate, lateral ocelli located near or touching occipital margin.

Praescutum without traces of notaulices; axillae elevated above level of base of scutellum, as in *Encyrtus*. Scutellum semiglobose in shape. Forewing heavily shaded with dark brown, a narrow cross-fascia at point of divergence of obsolete vein Rs from submarginal vein, as in *Encyrtus*, and disc of wing mostly brown, a hyaline streak along path of obsolete vein Cu_1; venation much as in *Encyrtus*, with marginal vein short and thick and stigmal and postmarginal veins relatively long; submarginal vein with an enlarged bulla at point of divergence of obsolete vein Rs. Hindwing with costal cell broad. Each tarsus of middle and hind pair with basal segment long, subequal in length to segments 2 and 3 combined.

Propodeum long, its median length approximately ½ as great as length of scutellum; propodeal spiracles round, located near anterior propodeal margin. Gaster subequal in length to thorax. Apical gastral sternite produced posteriorly in the form of a plowshare, its posterior margin having a minute median notch, or a minute, projecting point, or a deep median indentation, in all cases a pair of clasperlike projections present lateral to median structures. Ovipositor normally not visible, when extruded, it is elongate and slender. Ovipositor sheaths wide, laterally compressed usually not reaching apex of gaster, but sometimes slightly exceeding it. Paratergites absent.

Male: Very similar to female, but dark shading in forewing less extensive and gaster shorter. Antennal funicle with 6 long branches, and first segment short; club solid or 3-segmented. Genitalia with highly modified sagittae and volsellae in the various species.

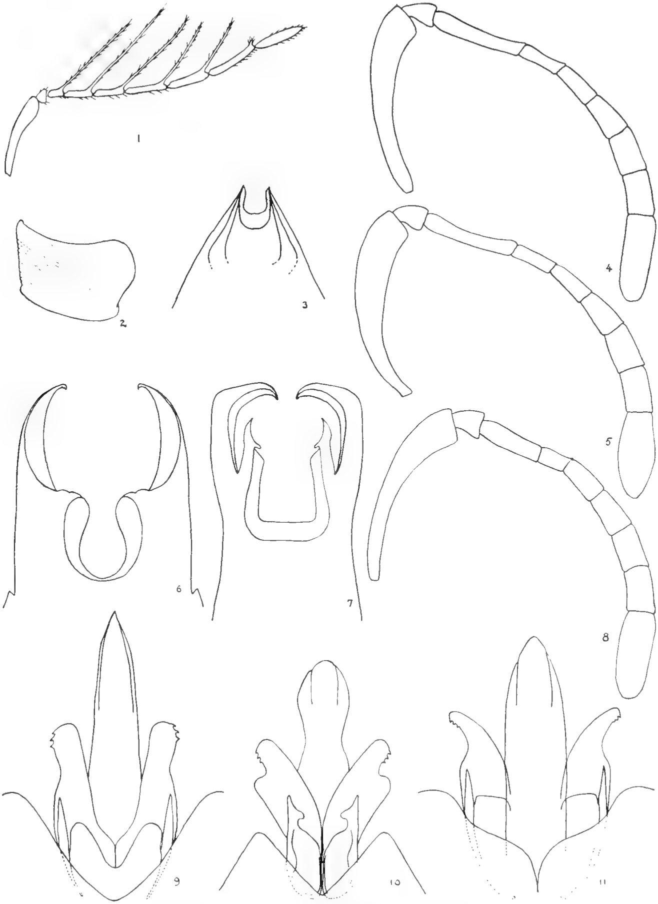
All the species for which hosts are known are parasites of Hemiptera-Heteroptera of various families. The known species occur in North or South America.

Key to Species

1. Female; funicular segments of antenna without branches and first funicular segment long, fig. 4 2

   Male; funicular segments with branches and first funicular segment short, fig. 1 6

2. First funicular segment 1½ times as long as second and less than 4 times as long as wide at widest point, fig. 8; apical gastral sternite bearing a minute, projecting point on meson of posterior margin ..... *leptoglossi*, n. sp.



Figs. 1–11. *Hexacladia* spp.: 1, *blanchardi* De Santis, ♂ antenna (after De Santis, 1965); 2, *hilaris*, n. sp., mandible; 3, *smithii* Ashmead, ♀ apex of terminal gastral sternite; 4, *smithii*, ♀ antenna; 5, *mexicana* Girault, ♀ antenna; 6, *hilaris*, ♀ apex of terminal gastral sternite; 7, *townsendi* (Crawford), ♀ apex of termial gastral sternite; 8, *leptoglossi*, n. sp., ♀ antenna; 9, *smithii*, ♂ genitalia; 10, *leptoglossi*, ♂ genitalia; 11, *hilaris*, ♂ genitalia.

First funicular segment 2 or more times as long as second and 5 or more times as long as wide at its widest point, figs. 4, 5; posterior margin of apical gastral sternite deeply indented or shallowly notched on meson, figs. 3, 6 3

3. Posterior margin of apical gastral sternite deeply indented on meson, figs. 6, 7 4
   Posterior margin of apical gastral sternite shallowly notched on meson, fig. 3 5
4. First and second funicular segments clothed with straight hairs; submedian projections at apex of apical gastral sternite almost straight, fig. 6; North America .... *hilaris*, n. sp.
   First and second funicular segments clothed with hairs having recurved tips; submedian projections at apex of apical gastral sternite strongly incurved at tips, fig. 7; South America .... *townsendi* (Crawford)
5. Antennal club linear, fig. 4; Brazil and Trinidad .... *smithii* Ashmead
   Antennal club expanded in the middle, fig. 5; Mexico .... *mexicana* Girault
6. Lateral branch of sixth funicular segment extremely short, fig. 1 .... *blanchardi* De Santis
   Lateral branch of sixth funicular segment at least as long as segment itself 7
7. Lateral branch of first funicular segment relatively short, only as long as first and second segments combined; sagitta of genitalia shouldered, fig. 10 .... *leptoglossi*, n. sp.
   Lateral branch of first funicular segment longer, as long as first 3 segments; sagitta not shouldered, figs. 9, 11 8
8. Hind tibia broadened and subflattened at apex; sagitta gradually tapering to a narrow apex, fig. 11; North America .... *hilaris*, n. sp.
   Hind tibia narrower at apex than at middle; sagitta stout, apex broad, fig. 9, South America .... *smithii* Ashmead

Hexacladia blanchardi De Santis

Hexacladia blanchardi De Santis, 1965, An. Com. Inv. Cien. Prov. Buenos Aires 4:116. ♂.—De Santis, 1967, Com. Inv. Cien. Prov. Buenos Aires, Cat. Hym. Argentinos Serie Parasitica, p. 154.

Type locality.—Baradero, Province of Buenos Aires, Argentina.

Types.—Two male specimens in La Plata collection.

Host.—Unknown.

Distribution.—Argentina.

The female is unknown.

Species placed from the published description.

Hexacladia hilaris, n. sp.

Female.—Length, 2.5–3.0 mm. Head, thorax, and propodeum dark tan, gaster black; antennae and legs yellowish tan, with antennal club darkened and tarsi pale; dorsum of thorax and hind tibiae may be darkened. Forewing with a dark brown cross-fascia at point of divergence of obsolete vein Rs from submarginal, a large dark brown median cloud across wing from marginal vein and a round cloud in disc of apical third of wing, the latter more or less broadly joined to median cloud. Median cloud interrupted by path of obsolete vein Cu_1. Hindwing hyaline.

Mandible, fig. 2, blunt, without denticles. Height of compound eye 1⅘ width of malar space. Clypeus deeply depressed, labrum visible and projecting straight anteriorly over mouth opening. Antenna, with scape expanded at apex, pedicel short, funiculus clothed with short, straight hairs, first funicular segment as long as segments 2 and 3 combined; club as long as first funicular segment. Lateral ocelli located a short distance anterior to occipital margin; ocellocular line 1⅛ times as long as postocellar line. Surface of frontovertex smooth, unpunctured, with scattered, fine, short hairs.

Praescutum smooth, shining, sparsely clothed with short hairs; axillae minutely reticulated and dull; scutellum with surface minutely and closely striated, the pattern of striations longitudinal in basal half of scutellum and transverse on its apical half. All coxae clothed with dense, silvery, short hair. Forewing with submarginal vein 3½ times as long as marginal, postmarginal and stigmal veins equal in length, each as long as marginal.

Propodeum smooth and shining laterally, an irregular, narrow, median reticulated area present. Gaster smooth and shining, a few setae and bristles present only at posterior end. Ovipositor sheaths heavy, in side view showing a prominent subapical angle, then tapering to slender apices, these apices not reaching apex of gaster. Apex of apical sternite deeply indented on meson, a pair of slender, submedian projections present, fig. 6. Gaster as long as thorax.

Male.—Length, 2.25–2.75 mm. Head dark tan, thorax and propodeum tan with more extensive dark shading than in female; gaster black. Middle and hind legs mostly black, fore legs tan; mid tibiae often light; forewing with only a short cross-fascia at point of divergence of obsolete vein Rs and dark cloud at marginal vein extending only half way across wing; apical spot absent. Antenna with 6 long branches. Gaster ⅗ as long as thorax. Genitalia with sagitta tapering to a narrow point, fig. 11.

Type locality.—Independence, Kansas.

Type.—U.S.N.M. catalog number 71974.

Described from 15♀ and 13♂ specimens. Holotype ♀ and 10♀ paratypes, Independence, Kansas, reared September 8, 1970, from adult *Acrosternum hilare* (Say), by R. I. Sailer; 2♀ paratypes, same data, but September 9, 1970; allotype ♂ and 10♂ paratypes [all F_1 progeny of a female from the above lot that had been reared September 8, 1970], emerged November 2, 1970, from adult *Acrosternum hilare*, R. I. Sailer; 3♀, 1♂ paratypes, Wooster, Ohio, reared August 11, 1959, from adult *Acrosternum hilare* by G. M. Kelly; 1♀, 1♂ paratypes, Wooster, Ohio, reared June 28, 1960, from adult *Acrosternum hilare* by G. M. Kelly.

Biological relationships.—This is a primary parasite of the northern green stink bug, *Acrosternum hilare* (Say), (Pentatomidae), usually emerging from the adults, but sometimes emerging from the mature nymphs.

Hexacladia leptoglossi, n. sp.

Female.—Length, 2.5 mm. Face, antennal scape, and fore legs pale tan; frontovertex, antennal flagellum, thorax, propodeum, and middle and hind legs dark brown; gaster black; forewing with a narrow, dark brown cross-fascia at point of divergence of obsolete vein Rs from submarginal vein, a dark brown cloud extending across wing from marginal and stigmal veins, and a discal cloud in apical third of wing, the apical cloud joined to median cloud; hindwing hyaline. Mandible blunt, without denticles. Height of compound eye 1⅕ times width of malar space. Clypeus deeply depressed, labrum visible, but minute and hardly projecting over mouth opening. Antennae inserted slightly above center of frons; antenna, fig. 8, with first funicular segment relatively short and less slender than in *hilaris*. Lateral ocelli touching occipital margin; ocellocular and postocellar lines equal in length. Surface of frontovertex very faintly sculptured.

Praescutum, axillae, and scutellum minutely reticulated, subshining. Coxae with sparse, short, silvery hair. Forewing with stigmal vein twice as long as marginal, stigmal and postmarginal veins equal in length.

Propodeum smooth. Gaster smooth, subshining, as long as thorax. Ovipositor sheaths straight on ventral margins, their apices just reaching apex of gaster; apical gastral sternite bearing a minute, projecting point on meson of its posterior margin.

Male.—Length, 2.0 mm. Color as in female, except that median cloud of forewing extends only half way across wing and apical cloud is absent. Antenna with branches relatively short. Genitalia, fig. 10, with sagitta prominently shouldered.

Type locality.—Gainesville, Florida.

Type.—U.S.N.M. catalog number 71977.

Described from 1♀, 1♂ specimens. Holotype ♀, allotype ♂, reared April 14, 1955, at Gainesville, Florida, from adult *Leptoglossus phyllopus* (Linnaeus), by C. N. Patton.

Biological relationships.—This is a primary parasite of the leaf-footed bug, *Leptoglossus phyllopus* (Linnaeus) (Coreidae), emerging from the adult.

Hexacladia mexicana Girault

Hexacladia mexicana Girault, 1917, Descr. Stell. Nov., p. 5. ♀.

Type locality.—Oaxaca, Mexico.

Type.—U.S.N.M. catalog number 20085. The original description does not state how many specimens were included in the type series, but the Museum catalog shows that the species was based on 1 female specimen.

Host.—Unknown.

Distribution.—Mexico.

The male is unknown and the female is known from only a single type specimen. It shows that the apical gastral sternite is shallowly notched on the meson of the posterior margin and that there are two slender, submedian projections.

Hexacladia smithii Ashmead

Hexacladia smithii Ashmead, 1891, Ins. Life 3:456. ♀, ♂.—Ashmead, 1900, Proc. U. S. Natl. Mus. 22:377.—Ashmead, 1904, Mem. Carnegie Mus. 1:496.—Costa Lima, 1930, Mem. Inst. Oswaldo Cruz 23:159.—Costa Lima, 1949, Bol. Soc. Bras. Agr. 11(1):6.

Type locality.—Chapada, Brazil.

Types.—U.S.N.M. catalog number 4743. Described from 2 male, 1 female specimens. Lectotype male labeled, "April, Chapada, Hexacladia smithi ♂ Type Ashm." Present designation of lectotype.

Hosts.—*Holymenia clavigera* Herbst (Coreidae), *Pachycoris torridus* Scopoli (Pentatomidae), *Tetyra pinguis* (Germar) (Pentatomidae).

Distribution.—Known from Brazil and the Island of Trinidad.

The female apical gastral sternite has a small median notch on the posterior margin and a pair of slender, submedian projections, fig. 3. The male genitalia, fig. 9, have the sagitta broad at the apex.

Hexacladia townsendi (Crawford)

Sophencyrtus townsendi Crawford, 1911, Proc. U. S. Natl. Mus. 41:276. ♀.
Hexacladia townsendi (Crawford) Girault, 1917, Descr. Stell. Nov., p. 5.—Wille, 1943, Ent. Agr. Peru, Est. Exp. Agr. La Molina, p. 28.

Type locality.—Piura, Peru.

Type.—U.S.N.M. catalog number 13869. Described from 1 female specimen. There are 3 additional female specimens of this species in the U.S.N.M. collection that have the same data as the type, but they were not included in the type series.

Host.—*Stenomacra* sp. (Pyrrhocoridae).

Distribution.—Peru.

The male is unknown. The female apical abdominal sternite is deeply incised on the meson of the apical margin and bears a pair of prominent, recurved submedian projections, fig. 7.

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TAXONOMIC NOTES ON THE GELECHIOIDEA PART I: THE GENUS INGA

(LEPIDOPTERA)

RONALD W. HODGES, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—Eight generic synonyms of the New World genus *Inga* are made, and 77 species are transferred to *Inga*. A list of the known species and recognized synonyms is presented.

In the process of discussing the geographic distribution of the genus *Inga* Busck for a manuscript on the Oecophoridae of North America north of Mexico, I became aware that several genera, proposed by Meyrick for neotropical species, were congeneric with *Inga*. Study of genital characters as well as recognition that some venational characters are variable have led me to this conclusion. The male genitalia are characterized as follows: the aedeagus is a stout to moderately slender cylinder; the vesica may bear a single, stout cornutus or patches of smaller cornuti; the saccular margin of the valva is strongly developed, almost separate, broadly curved; the processus of the sacculus is free and directed toward the costal margin; the distal part of the valva beyond the processus of the sacculus often appears as a lobe; the juxta is well developed, often with a pair of ventrolateral lobes; the gnathos is well developed and does not bear spines; and the uncus is triangular.

Meyrick proposed eight generic names that are junior synonyms of *Inga*. He described 10 neotropical species in the Australian genus *Atelosticha* Meyrick. These are *Inga* species. Clarke (1963) transferred 58 species described by Meyrick in *Machimia* Clemens to *Himmacia* Clarke. Fifty-six of these species are members of the genus *Inga* as determined by the genitalia, particularly the nonspined gnathos.

It is now apparent that *Inga* and allies (*Doliotechna* Meyrick and

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[1] Mail address: c/o U. S. National Museum, Washington, D.C. 20560.

Exosphrantis Meyrick) represent a neotropical group that has a moderate extension into the Nearctic Region. There are 83 species in the genus of which six occur in North America north of Mexico, and only one of the latter, *sparsiciliella* (Clemens), reaches the northern United States in central New York.

The following list of *Inga* species with the required generic synonymies and new combinations is presented to make available the information for *The moths of America north of Mexico* and for other workers. References to the original descriptions can be found in Gaede (1938, 1939) and Clarke (1963).

Genus **Inga** Busck

Inga Busck, 1908: 200.
Type-species: *Anesychia sparsiciliella* Clemens, 1864. Original designation.
Lysigrapha Meyrick, 1914: 184. NEW SYNONYMY.
Type-species: *Lysigrapha capsaria* Meyrick, 1914. Original designation.
Pelomimas Meyrick, 1914: 186. NEW SYNONYMY.
Type-species: *Pelomimas mixadelpha* Meyrick, 1914. Monotypy.
Orsimacha Meyrick, 1914: 186. NEW SYNONYMY.
Type-species: *Orsimacha petasodes* Meyrick, 1914. Original designation.
Siderograptis Meyrick, 1920: 311. NEW SYNONYMY.
Type-species: *Siderograptis leptophragma* Meyrick, 1920. Monotypy.
Phanerodoxa Meyrick, 1921: 393. NEW SYNONYMY.
Type-species: *Phanerodoxa tubicen* Meyrick, 1921. Monotypy.
Epimoryctis Meyrick, 1930: 618. NEW SYNONYMY.
Type-species: *Epimoryctis percnorma* Meyrick, 1930. Monotypy.
Horomeristis Meyrick, 1931: 187. NEW SYNONYMY.
Type-species: *Horomeristis calycocentra* Meyrick, 1931. Monotypy.
Agriotorna Meyrick, 1931: 188. NEW SYNONYMY.
Type-species: *Agriotorna eriocnista* Meyrick, 1931. Monotypy.
callierastis (Meyr.), 1920, *Machimia*. NEW COMBINATION.
calycocentra (Meyr.), 1931, *Horomeristis*, NEW COMBINATION.
camelopis (Meyr.), 1920, *Atelosticha*. NEW COMBINATION.
canariella (Bsk.), 1908, *Cryptolechia*.
cancanodes (Meyr.), 1918, *Machimia*. NEW COMBINATION.
capsaria (Meyr.) 1914, *Lysigrapha*. NEW COMBINATION.
catasticta (Meyr.) 1920, *Atelosticha*. NEW COMBINATION.
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chlorochroa (Meyr.), 1912, *Machimia*. NEW COMBINATION.
ciliella (Bsk.), 1908, *Cryptolechia*.
humata (Meyr.), 1914, *Machimia*.
cnecodes (Meyr.), 1920, *Atelosticha*. NEW COMBINATION.
concinna (Meyr.), 1912, *Machimia*. NEW COMBINATION.
concolorella (Beut.), 1888, *Cryptolechia*.
conserva (Meyr.), 1914, *Machimia*. NEW COMBINATION.
corystes (Meyr.), 1914, *Machimia*. NEW COMBINATION.
cretacea (Zell.), 1873, *Cryptolechia*.

cupidinea (Meyr.), 1914, *Machimia.* NEW COMBINATION.
custodita (Meyr.), 1928, *Machimia.* NEW COMBINATION.
cyclophthalama (Meyr.), 1916, *Atelosticha.* NEW COMBINATION.
deligata (Meyr.), 1914, *Machimia.* NEW COMBINATION.
dilecta (Meyr.), 1920, *Machimia.* NEW COMBINATION.
distorta (Meyr.), 1920, *Machimia.* NEW COMBINATION.
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empyrea (Meyr.), 1920, *Machimia.* NEW COMBINATION.
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fundigera (Meyr.), 1912, *Machimia.* NEW COMBINATION.
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genuina (Meyr.), 1914, *Machimia.* NEW COMBINATION.
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  contrariella (Wlk.), 1864, *Cryptolechia.*
  inscitella (Wlk.), 1864, *Cryptolechia.*
  atropicta (Zell.), 1875, *Cryptolechia.*
speculatrix (Meyr.), 1914, *Machimia.* NEW COMBINATION.
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trailii (Butl.), 1877, *Cryptolechia.* NEW COMBINATION.
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NOTICE TO CONTRIBUTORS

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RECORDS OF ROBBER FLIES FROM NORTHEASTERN ARKANSAS (DIPTERA: ASILIDAE)

AUBREY G. SCARBROUGH, *Department of Biology, Towson State College, Baltimore, Maryland 21204*

ABSTRACT—A list of 23 species of robber flies from Northeastern Arkansas is given, with notes on habitats and occurrence.

In connection with another project on the asilid flies, I became aware that few species had been reported from Arkansas. Only 12 species have been recorded from Arkansas as of this publication: *Leptogaster murina* Loew and *Ceraturgus cruciatus* (Say) (Martin and Wilcox, 1965); *Ommatius gemma* Brimley (Brimley, 1928); *Laphystia bromleyi* Wilcox (Wilcox, 1960); *Efferia aestuans* (L.) and *E. interrupta* (Macquart) (Wilcox, 1966); *Mallophora ornica* (Wiedemann) (Cole and Pritchard, 1964); *Diogmites missouriensis* Bromley and *D. platypterus* Loew (Artigas, 1966); *D. pritchardi* Bromley, *D. neoternatus* (Bromley) and *D. misellus* Loew (Martin, 1965). I collected asilids during the summers of 1963 through the summer of 1970 and during June of 1971 in Craighead County. Specimens taken in other areas of Northeast Arkansas were also recorded. As a result of this collecting, records of some 328 specimens, including 23 species, are listed in this paper. Notes on habitats and occurrence have been added after each species.

The collecting was done mainly in 2 locations, 1 in the fields and wooded areas along Christian Creek and the other in cultivated fields and adjacent areas near Monette. Both of these sites are in Craighead County. The collecting sites along Christian Creek are about 1 mile SW of Jonesboro. Much of this area was recently developed for home sites and was incorporated into the city limits. The cultivated fields are farms owned by William Holland and Omer Reed, located 3 miles NW and 5 miles NE of Monette, respectively. Specimens of most of the species in this list were deposited in the Arkansas State University Collections. The remaining specimens are in the writer's collection. A few specimens were on loan from Dr. Harvey Barton.[1]

I am indebted to the following individuals for their assistance: to Dr. L. V. Knutson (Systematic Entomology Laboratory, USDA) for aid with the USNM asilid collection and review of the manuscript; to Dr. Harvey Barton (Arkansas State University) for the loan of specimens; and to Dr. E. Hanebrink (Arkansas State University) for introducing the asilids to me; and to Mr. Omer Reed and Mr. William Holland for collecting permits.

[1] Specimens on loan are cited as ASUC.

1. *Diogmites misellus* Loew. 3♂♂, Jonesboro, 2–5.VII.1964; 1♂, 3♀♀, Jonesboro, 10–27.VII.1965; 1♂, 2♀♀, Jonesboro, 12.VIII.1967; 2♂♂, 1♀, Jonesboro, 19.VIII.1969; 1♂, Craighead County Forest, 20.VIII.1969; 2♂♂, 2 mi N of Monette, 23.VIII.1969. Common in open dry fields, pastures and along fence rows.

2. *Diogmites missouriensis* Bromley. 1♀, Jonesboro, 20.VII.1963; 1♀, Monette, 21.VII.1963; 2♂♂, 2♀♀, Jonesboro, 20.VIII.1969; 4♂♂, Jonesboro, 23.VIII.1969. Common in dry open fields, cotton fields and gardens; generally associated with sandy soil.

3. *Diogmites platypterus* Loew. 3♂♂, 2♀♀, Jonesboro, 21.VI–19.VIII.1964; 5♂♂, 4♀♀, Jonesboro, 21.VII–1.VIII.1965; 2♂♂, Jonesboro, 22.VII–19.VIII.1966; 2♀♀, Jonesboro, 12.VIII.1967; 3♂♂, 1♀, Craighead Co., 3.VII–5.VIII.1968 (ASUC). A mid to late summer species occurring in the shadows of trees on rank vegetation along Christian Creek. Common and often abundant. It often flies among thick growth when disturbed, alighting on the ground.

4. *Diogmites symmachus* Loew. 1♂, Monette, 28.VII.1964; 1♂, Manila, Mississippi Co., 14.X.1964 (ASUC); 1♂, Jonesboro, 1.VIII.1965; 1♂, 2♀♀, Jonesboro, 15–17.VIII.1966; 1♂, Jonesboro, 13.VIII.1967; 1♂, Craighead Co., 28.VII.1968 (ASUC); 3♂♂, 6♀♀, 3 mi N of Monette, 22.VIII.1969; 1♀, Craighead Co., 24.X.1970 (ASUC). This late summer species is common and often abundant in cotton fields, pastures and gardens near Monette. It is associated with sandy soil.

5. *Psilocurus birdi birdi* Curran. 1♂, 3♀♀, Jonesboro, 14–17.VI.1964; 2♀♀, Jonesboro, 26.VII.1966. In hillside pastures covered with high grass, especially *Andropogon* sp.; uncommon.

6. *Stichopogon trifasciatus* (Say). 1♂, stream 2 mi W of Smithville, Lawrence Co., 1.VII.1964. This specimen was taken from the tip of a dead twig on the bank of a small stream. Several other specimens were observed on the bare, sandy shores.

7. *Atomosia puella* (Wiedemann). 1♀, Jonesboro, 20.VII.1964; 1♂, 3♀♀, Jonesboro, 9–16.VI.1966; 13♂♂, 5♀♀, Jonesboro, 14–16.VI.1971; 6♂♂, 5♀♀, Crowley Ridge State Park, Greene Co., 17.VI.1971; 1♂, 3 mi NW of Monette, 18.VI.1971. One of the most abundant asilids in Craighead County. It occurs in many situations; on fence posts, park benches, buildings, trees, stones and barbecue pits.

8. *Atomosia rufipes* Macquart. 2♀♀, 5 mi NE of Monette, 29.VIII.1969; 1♂, 5 mi NE of Monette, 30.VIII.1970. Several specimens were observed in a garden, but only 2 were taken; uncommon.

9. *Laphria* sp. 1♂, 3 mi NW of Monette, 18.VI.1970. The only 1 seen was perched on a fence post; uncommon.

10. *Asilus rubicundus* Hine. 8♂♂, 8♀♀, 3 mi NW of Jonesboro, 14.VI–21.VII.1964; 1♂, Craighead Co., 5.V.1971 (ASUC); 1♀, Greene Co., 5.V.1971 (ASUC); 1♀, Poinsett Co., 13.V.1971 (ASUC); 4♂♂, 3♀♀, Jonesboro, 14–16.VI.1971. A common late spring–summer species occurring in dry fields with low herbaceous vegetation. It is difficult to see at rest on bare ground or on a twig. Several specimens were taken by sweeping.

11. *Efferia aestuans* (L.). 3♂♂, 2♀♀, 3 mi NW of Monette, 2.IX.1963; 1♀, Marion Co., 14.VII.1963 (ASUC); 1♂, 9♀♀, 1 mi SW of Jonesboro, 5.VI–16.VII.1964; 1♂, 2♀♀, Jonesboro, 2–15.VII.1965; 1♂, Craighead Co., 27.VII.

1968 (ASUC), 2♂♂, Craighead County Forest, 4 mi S of Jonesboro, 20.VIII. 1969; 1♀, Craighead Co., 19.V.1970 (ASUC); 1♀, Greene Co., 26.IX.1970 (ASUC). One of the most common species in mid and late summer. It is usually found in dry situations on fence posts, buildings, trees, flower heads and on bare ground. Commonly feeds on flies and small beetles.

12. *Efferia albibarbis* (Macquart). 1♀, Jonesboro, 12.VI.1964; 1♂, 1♀, 1 mi W of Smithville, Lawrence Co., 1.VII.1964; 2♂♂, 2♀♀, Blancherd Springs, Izard Co., 14.VII.1964; 13♂♂, 7♀♀, 3 mi NW of Monette, 18.VI.1971; 6♂♂, 4♀♀, 3 mi N of Monette, 19.VI.1971. These active flies were found in areas with sandy loam. Common in cotton, soybean and wheat fields, pastures, on rank vegetation in fence rows, garden plots and along streams; feeds on Homoptera and Diptera, especially calliphorids and muscids.

13. *Efferia nemoralis* (Hine). 7♂♂, 2♀♀, 1 mi SW of Jonesboro, 5–28.VI. 1964; 3♂♂, 2♀♀, Jonesboro, 4–16.VI.1966; 13♂♂, 11♀♀, 2 mi SW of Jonesboro, 14–16.VI.1971. An early summer species, occurring for a short period in June. This active species is generally abundant in open fields near Christian Creek.

14. *Triorla interrupta* (Macquart). 1♀, Des Arc, Prairie Co., 29.VIII.1963 (ASUC); 1♂, Jonesboro, 24.IX.1963 (ASUC); 4♂♂, 3♀♀, Jonesboro, 20.VI–5.VII.1964; 1♀, Smithville, Lawrence Co., 1.VII.1964; 1♀, Walnut Ridge, Lawrence Co., 9.VII.1964 (ASUC); 1♂, 1 mi N of Jonesboro, 9.VII.1965; 1♂, Jonesboro, 23.VIII.1966; 1♂, Paragould, Greene Co., 8.VII.1968 (ASUC). A common species found in most States throughout the South. Although common in NE Arkansas, specimens were rarely found or observed in abundance. Individuals were often found perched on the tips of twigs and on bare ground such as on turn rows of cultivated fields, along paths in woods, roadsides and near streams.

15. *Ommatius gemma* Brimley. 1♀, 3 mi SW of Jonesboro, 14.VI.1971. Found in the same habitat as the previous species; uncommon.

16. *Ommatius tibialis* Say. 3♀♀, Jonesboro, 10–22.VII.1965; 1♂, 2♀♀, Christian Creek, 26.VII–11.VIII.1966. Found on the tips of twigs and dead weed stalks along the borders of woods or in small clumps of trees in open fields; uncommon.

17. *Philonicus rufipennis* Hine. 2♂♂, 2♀♀, Jonesboro, 26.VI.1969; 2♀♀, 3 mi NW of Monette, 18.VI.1971. Occurs in shady thickets along Christian Creek, perching on dead twigs and bare embankments. Also, it occurs in shadows of trees along fence rows and cultivated fields, perching on dead weeds and branches of fallen trees. It is difficult to see in shadows, and may be more common than is expected.

18. *Proctacanthus hinei* Bromley. 1♀, 3 mi NW of Monette, 10.VI.1964. This reddish species occurs in sandy areas, especially on the banks of sloughs and ditches and adjacent fields. It is difficult to approach. Several specimens were observed in a field of sweet clover; uncommon.

19. *Proctacanthus milbertii* Macquart. 3♂♂, 2♀♀, Jonesboro, 23.VIII–22. IX.1963; 2♂♂, Monette, 31.VIII–5.IX.1963; 1♀, 3 mi N of Monette, 15.IX.1964; 1♂, 3 mi N of Monette, 20.IX.1965; 1♀, 3 mi N of Monette, 1.X.1966; 3♀♀, Greene Co., 10–25.IX.1970 (ASUC); 1♂, Craighead Co., 3.X.1970 (ASUC). Occurs in dry fields, pastures and cultivated fields in late summer and early fall; common in cotton fields but seldom abundant. Females oviposit in soil. It typically

flies just above the surface of a substrate, alighting on bare ground such as dirt roads, turn rows in fields, paths and embankments.

20. *Promachus bastardii* (Macquart). 1♀, Craighead Co., 16.V.1963 (ASUC); 1♀, 1 mi SW of Jonesboro, 30.VI.1963; 1♀, Rector, Clay Co., 11.XI.1963 (ASUC); 4♂♂, 8♀♀, 1 mi W of Jonesboro, 5.VI–10.VIII.1964; 1♂, Walnut Ridge, Lawrence Co., 19.VI.1964 (ASUC); 1♂, 1♀, Craighead Co., 20.VII–3.VIII.1968; 9♂♂, 1 mi W of Jonesboro, 14–16.VI.1971; 1♀, Crowley Ridge State Park, Greene Co., 17.VI.1971; 1♂, 3 mi NW of Monette, 18.VI.1971. This species is similar to the preceding. It is very common in dry fields near Jonesboro, but can be found in other areas of the County. Several specimens were observed in a garden near Monette feeding on Diptera and Coleoptera, especially muscids and adults of the southern corn rootworm, *Diabrotica undecimpunctata howardi* Barker. This species typically forage above low vegetation, occasionally taking momentary halts on a leaf or on the ground. It often takes a perch in the margins of fence rows or in the shadow of a tree or buildings waiting for some unsuspecting prey; abundant in mid-summer.

21. *Promachus fitchii* Osten Sacken. 1♀, 1 mi SW of Jonesboro, 20.VI.1963; 3♂♂, 3♀♀, Jonesboro, 25.VI–16.VII.1964; 4♂♂, 1♀, 1 mi SW of Jonesboro, 26.VII–17.VIII.1966; 1♂, Jonesboro, 14.VI.1971. Occurs in semi-open and open dry fields with low growing vegetation, mostly *Andropogon* sp., and small scattered trees and shrubs. It often aggregrates around wild sweet clover, *Trifolium* sp., feeding on honey bees; common in the Jonesboro area in mid-summer.

22. *Promachus rufipes* (F.). 1♀, Poinsett Co., 20.X.1968 (ASUC); 1♂, 3 mi N of Monette, 22.VIII.1970; 1♂, 3 mi W of Monette, 22.VIII.1970; 1♂, Craighead Co., 3.X.1970. Common in sandy areas during late summer and early fall. Few specimens were captured but several were observed in cotton fields and gardens near Monette.

23. *Tolmerus notatus* (Wiedemann). 2♂♂, 2♀♀, Crowley Ridge State Park, Greene Co., 17.VI.1971. Two mating pairs found along the margin of paths in a wooded area.

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AN ANOMALOUS OCCURRENCE OF THE SPRUCE APHID, ELATOBIUM ABIETINUM (WALKER), IN WESTERN NORTH CAROLINA

(HOMOPTERA: APHIDIDAE)

GERHARD F. FEDDE, *USDA Forest Service, Southeastern Forest Experiment Station, Forestry Sciences Laboratory, P.O. Box 12254, Research Triangle Park, N. C. 27709*

ABSTRACT—Collections of female apterae of the spruce aphid, *Elatobium abietinum* (Walker), were made in December 1967 from two ornamental white spruce, *Picea glauca* (Moench) Voss, trees near Asheville, North Carolina. These aphids represent the first record of this species in the United States east of the Rocky Mountains. Previously, the only other instance of this aphid occurring in Eastern North America was reported from the Province of Quebec, Canada.

The spruce aphid, *Elatobium abietinum* (Walker), is a serious pest of *Picea* spp. in many parts of the world (Dumbleton, 1932; Keen, 1952, p. 56; Kloft et al., 1961). Epidemics are usually associated with maritime climates and the development of anholocyclic generations by the aphid during mild winters. Injury is caused by feeding of the 1- to 1½-mm-long insects on old needles of the host trees. The resulting needle cast may be readily overlooked in light attacks or attributed to other causes. In areas where high populations occur, feeding results in complete defoliation and death of trees following two or more years of successive attack (Pillsbury, 1960). Recent studies by Kloft et al. (1964) strongly suggest that *E. abietinum* is of Palearctic origin. As a possible introduced pest, it constitutes a definite hazard to the spruce forests of North America. The distributional patterns of this aphid are thus an important consideration in assessing trends in damage that may occur on this continent in the future.

Most species of spruce appear to be at least nominally susceptible to attack by *E. abietinum*. However, Sitka spruce, *Picea sitchensis* (Bong.) Carr., is unquestionably its most vulnerable host, not only in North America but also in many other areas of the world where this species is extensively planted. Understandably, most records of damage by the spruce aphid are found within the natural range of this valuable timber species, particularly along the coast line and larger river basins of Washington, Oregon, and British Columbia. Additionally, *E. abietinum* has occasionally become an important pest of nursery stock in the Far West. Records of its occurrence beyond the southernmost range of Sitka spruce are limited to areas where host species have been planted for ornamental purposes and include such places as the San Francisco Bay area and Ventura County in southern California (USDA Agricultural Research Service, 1960; Dr. Tokuwo Kono, personal communication, 1970). Even though susceptible species such as

Engelmann spruce, *P. engelmannii* Parry, and white spruce, *P. glauca* (Moench) Voss, have broad ranges contiguous with that of Sitka spruce, some observers have wondered why the distribution of *E. abietinum* does not extend further inland. To date, reports of inland collections of this aphid have either proved to be in error or have remained unconfirmed (USDA Agricultural Research Service, 1960). Records for Eastern North America are also scarce and authenticated findings appear to be confined to a single collection made on white spruce near Sillery on the St. Lawrence River just south of Quebec City (Kloft et al., 1964).

On December 7, 1967, specimens consisting entirely of wingless females were collected from two 20-foot ornamental white spruce trees at the Bent Creek Experimental Forest near Asheville, North Carolina. These were subsequently identified as *E. abietinum*[1] by Louise M. Russell (Entomology Research Division, Agricultural Research Service, Washington, D.C.). The aphids were collected at an elevation of 2100 ft (640 m) and lat. 35° 30′ N. Moderate populations were observed on needles of the preceding year's growth along the periphery of the basal portions of the crown. Actively reproducing aphids persisted throughout December but disappeared with the onset of colder weather in January. Climatological data for this site revealed that the average temperature for December 1967 was 42.1° F, which was also the warmest for that month since 1956.

The discovery of *E. abietinum* in western North Carolina marks the first time this aphid has been collected in the Eastern United States. Its appearance here is also noteworthy in that it was not associated with a coastal environment or major river drainage; the Atlantic Ocean is more than 240 statute miles from Bent Creek at its nearest point. Should the spruce aphid become a permanent resident of this region, its presence might someday extend to the upland stands of native red spruce, *P. rubens* Sarg., in the Southern Appalachians.

The principal significance of this collection is that it provides some tangible evidence that inland barriers to the extension of the range of *E. abietinum* beyond the coastal margins of the United States are more apparent than real. Low endemic numbers, the small size of the insect, and damage symptoms that resemble those of other agents all suggest that this species may be more widely distributed than presently realized.

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I wish to thank the following for their assistance in locating records of *E. abietinum* and verifying certain collection data for this aphid: Dr. Tokuwo Kono,

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Systematic Entomologist, California Department of Agriculture; Mr. Ray Pratt, Assistant State Entomologist, Montana; and Dr. Robert L. Williamson, Acting Chief Staff Officer, Economic Insect Survey and Detection Staff, U. S. Department of Agriculture.

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THE REDESCRIPTION OF TIPHIA FENESTRATA (KLUG)

(Hymenoptera: Tiphiidae)

Harry W. Allen, *Research Associate, Academy of Natural Sciences, Philadelphia, and Collaborator, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—The species *Tiphia fenestrata* described by Klug in 1810 is, for the first time, redescribed.

This paper defines the status of Klug's species, *Tiphia fenestrata*, described by him more than 160 years ago from American Georgia.

Tiphia (Tiphia) fenestrata (Klug)

Bethylus fenestratus Klug, 1810, Beit. Naturk. 2:193.—Dalla Torre, 1898, Cat. Hymen. 5:556.

Tiphia fenestrata (Klug): Hedicke, 1936, Hymen. Cat. Pars I, Tiphiidae p. 12.—Allen, 1966, Trans. Amer. Ent. Soc. 92:350.

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[1] Mail address: P. O. Box 150, Moorestown, New Jersey 08057.

Tiphia confusa Allen, 1934, Trans. Amer. Ent. Soc. 60:302.—Allen, 1961, Trans. Amer. Ent. Soc. 87:7—Allen, 1966, Trans. Amer. Ent. Soc. 92:253. NEW SYNONYMY.

Description, female.—Front not shagreened; punctures coarse and of first-degree density except for a small spot in front of middle ocellus and a narrow irregular area between lowest ocellus and eye orbit. Antennal flagellum robust, first 3 joints 2.6 times as long as wide. Clypeal extension broadly arcuate.

Dorsal pronotum without transverse carina; punctures of nearly uniform size and of first-degree density except on small lateral areas. Lateral pronotum with a straight escarpment across middle of disc from which originate several faint, parallel aciculations. Mesopleuron everywhere with coarse, deep punctures of first-degree density. Scutum with anteromedian escarpment widely separated from notaulices. Metanotum entirely coarse punctate with a median crease. Legs black. Hind femur with upper margin nearly straight; inner face without well-developed carina; sensorium large, piceous, flush with surrounding area. Hind basitarsus without groove, basal half on inner face nearly naked. Tegula cockle-shell shaped, without shagreening or groove on outer margin. Forewing with trace of inwardly directed spur on first section of radius; with a short but distinct inwardly directed spur a short distance before apex of second cubital cell; second cubital cell 2.1 times as long as wide (2 measured were 2.1, 2.0).

Dorsal propodeum with its areola having slightly convex sides, its length nearly 3 times apical width. Lateral propodeum with rugulae intermediate between coarse, and fine and closely spaced; vestiture of lower part sparse and inconspicuous. Tergum 1 on anterior face with broad patch of micropunctures mixed with small primaries and not extending to lateral edges; preapical band of small punctures, 2 to 3 wide and not impressed. Pygidium closely elongate punctate on basal half, terminating on a straight transverse line; impunctate part wrinkled and obscurely shagreened near punctate area.

Length, 18.8 mm.

The holotype of the species is a female which showed up unexpectedly in a collection of Tiphiinae sent to the author for identification from the Zoologisches Museum of the Humboldt-Universität of Berlin. It is an unusually large specimen in excellent condition, having the following labels: "6080" "Georg i.t." "T. fenestrata/B. fen m./ Georgia" "Zool. Mus./Berlin" "Typus." To these I have appended a lectotype label. Klug's original description was entirely inadequate for any species of Tiphiinae. It does not define the sex, the size, or the number of specimens seen by the describer. It seems not even to have been recognized as a *Tiphia* until the publication of Hedicke's catalogue in 1936.

It is obvious that *fenestrata* belongs to the *micropunctata* group of eastern North America. It lacks the cusped mandible of the female of *berbereti* Allen, the pinched-in apex of the areola of *micropunctata* Allen, and the short second cubital cell of *indistincta*. It differs from *infossata* most distinctly in having a minute inwardly directed spur near the apex of the second cubital cell, not found in that species.

Both the holotype specimens of *confusa* and *fenestrata* have this inwardly directed spur.

Tiphia confusa was originally described from a holotype female from Tampa, Florida in the National Museum and a paratype female from North Carolina in the Academy of Natural Sciences of Philadelphia. It has since been identified from a few localities from New Jersey to Illinois and southward to eastern Texas and Florida.

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MISCELLANEOUS PREY RECORDS OF SOLITARY WASPS. VI. NOTES ON SOME SPECIES FROM GREECE

(Hymenoptera: Aculeata)

Karl V. Krombein, *Department of Entomology, Smithsonian Institution, Washington, D.C. 20560*

ABSTRACT—Prey records and brief biological notes are presented for six species of Sphecidae from Greece.

The following prey records and brief biological notes were made during two short visits to Greece in 1965 and 1971 during which a limited amount of field work was accomplished. I am indebted to W. J. Pulawski, Zoological Institute, Wroclaw, Poland for identifying some of the sphecoid wasps, and to S. Zimmerman, Wien, Austria for naming the chrysidid wasp. Determinations of the prey of the wasps were kindly made by: P. H. van Doesburg, Netherlands; P. D. Hurd, Jr., Department of Entomology, Smithsonian Institution; and A. B.

Gurney and D. M. Weisman of the Systematic Entomology Laboratory, U. S. Department of Agriculture.

Astata boops graeca de Beaumont

J. van der Vecht and I found a large aggregation of this wasp on 20 May 1971 at Lerna, Argolis, nesting in the hard-packed soil beneath a roofed area sheltering the archaeological excavations of the American School of Classical Studies at Athens. Numerous females were nesting in a small area of some 50 square feet and several were observed carrying hemipterous prey to their burrows. One female 9 mm long (52071 A) [det WJP] was captured while carrying a paralyzed nymph of *Lygaeus pandurus* (Scop.) [det. PHvD]. Males were also present in abundance, alighting periodically on the soil in the nesting area, but we observed no mating.

Also present and alighting occasionally on the soil near the *Astata* nests were both sexes of a chrysidid, *Hedychridium roseum* (Rossi) [det SZ], which almost certainly has this *Astata* as one of its hosts. It has been recorded previously as parasitizing other ground-nesting wasps (*Tachysphex pectinipes* (L.), *Harpactes tumidus* (Panz.), *Astata boops* Schrank, *A. minor* Kohl, *Cerceris arenaria* (L.)) and bees (*Osmia papaveris* Latr., *Halictus fulvocinctus* K.).

Tachysphex helveticus Kohl

One female (53165 A) 10 mm long [det WJP] was collected at 1530 on 31 May 1965, on a sandy beach 11 km east of Iraklion, Crete. She was carrying her paralyzed prey, a nymphal grasshopper 8 mm long, probably a specimen of *Calliptamus italicus* (L.) [det ABG].

Ammophila heydeni (Dahlbom)

I captured a female (6165 A) 20 mm long, 1 June 1965, on a rocky hillside along the coastal road 7 km north of Legrena, Attica. She was walking on the ground, carrying beneath her a paralyzed slender geometrid caterpillar 20 mm long [det DMW].

Sphecius syriacus creticus de Beaumont

One female 15 mm long was collected at Malia Palace, Crete, during the period 14–16 May 1971. Its presumptive prey is the cicada *Cicadetta* sp. [det RCF] of which I captured several specimens with a body length of 12–13 mm at the same time and locality.

Hoplisoides punctatus (Kirschbaum)

Numerous individuals of both sexes were flying low over vegetation on the sandy beach at Tolon, Argolis, on 19 May 1971. I observed neither precopulatory nor nesting behavior. However, one pair was captured in copula on the ground end to end, forming a straight line with their heads facing away from each other. Evans (1966, p. 97) records this same mating posture for the Nearctic *Sphecius speciosus* (Drury), the only other gorytine wasp for which the mating posture has been recorded.

Philanthus venustus (Rossi)

A few individuals of both sexes were captured 19 May 1971 as they flew low over vegetation on the sandy beach at Tolon, Argolis. One female (51971 A) 9 mm long was carrying her paralyzed prey, a female halictid bee *Evylaeus interruptus opacus* Perez 8 mm long [det PDH].

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OBSERVATIONS ON THE NESTING BEHAVIOR OF DIPLOPLECTRON PEGLOWI KROMBEIN

(Hymenoptera: Sphecidae)

Frank E. Kurczewski, *Department of Forest Entomology, State University College of Forestry, Syracuse, New York 13210*

ABSTRACT—Components of the nesting behavior of *Diploplectron peglowi* Krombein are described. Burrow construction, hunting, prey transport, nature and dimensions of nest, cell provisions, and attachment of egg are analyzed and discussed in relation to other Sphecidae, particularly species of the subfamily Astatinae. *D. peglowi* constructed a 3- or 4-celled nest in sand. The cells were provisioned with from 3 to 6 small, nymphal *Sphaerobius insignis* (Uhler) and *Lygaeus* sp. (Lygaeidae). The egg was affixed to a bug in the middle or at the back end of the cell in a position typical of the subfamily Astatinae. The prey in the cells were placed head-inward but either venter-up, dorsum-up, or on the side.

In 1939 Krombein described *Diploplectron peglowi* from a series of specimens collected in late August and early September 1936 in Oswego Co., N. Y. In this paper he defined the habitat, presented data on times of activities of males and females, and mentioned that the females burrowed in sand. To my knowledge the species has not been collected since Krombein's collection of the type series. In 1971 I

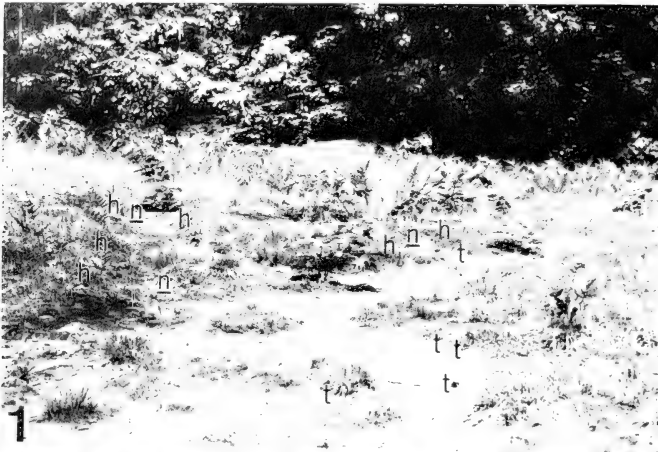


Fig. 1. Nesting habitat of *Diploplectron peglowi* Krombein—a senescent sand blowout in Selkirk Shores St. Pk., Oswego Co., N. Y. Sites of female activity are indicated as follows: (t), trial digging; (n) active nest; (h), hunting locale. Fig. 2. Close-up of female nest-sites of *D. peglowi* in a sand slope. Three nest entrances and tumuli are indicated by arrows.

had the opportunity to observe various facets of the nesting behavior of *D. peglowi* and should like to place these observations on record as part of the comparative ethology of digger wasps, particularly of the subfamily Astatinae. Virtually nothing is known about the nesting behaviors of species of *Diploplectron*, except for a note by Williams (1946). My observations on *D. peglowi* (Ethology Note No. DI-1) were made on 16–18 June in a senescent sand blowout, 2 mi. s. of Lake Ontario, in Selkirk Shores St. Pk., Oswego Co., N. Y. (fig. 1). The females were observed on bright, sunny and moderately overcast days between the hours of 1015 and 1520 (E.D.T.), although they were active earlier and later in the day than this.

Burrow Construction. Two females were observed searching for places to dig. One wasp walked on the ground, holding her body low to the substrate and her head bowed somewhat downward, and tapped her antennae on the sand. She made three false starts in rapid succession, digging each time beneath overhanging blades of grass. The wasp moved onto bare flat sand at 1125 hours and began her fourth excavation. She broke the sand crust with the mandibles and then used the forelegs in unison to rake the sand backward. (Females of *D. peglowi* have a series of rather long spines on the foretarsi adapted for sand removal). Upon removing the sand loads from the burrow the wasp backed out from 1 to 3 cm, mostly in one direction (to her right), synchronously raised the abdomen as the forelegs were in the backstroke, and exhibited pronounced, jerked upward and downward movements of the body. She utilized the mid- and hindlegs only for walking backward and then forward into the burrow. Sand loads were removed from the entrance less frequently as burrow construction progressed. After several minutes of sand removal, the female "rebacked" every minute or so (see Kurczewski, 1968). At 1140 hours the wasp appeared head first in the entrance, threw some sand backward into the burrow with the forelegs, cleaned the antennae with the legs, and flew away, thus abandoning the excavation.

The second female began digging at 1335 hours in a sand slope beneath a pile of dried leaves. She was visible only every few minutes as she backed out of the entrance with a sand load. Her digging components resembled those of the first wasp. Like the first female, she "rebacked" many times but unlike the first she removed sand to both the left and right sides of the entrance. Thirty-eight minutes after beginning the female exited head first, walked in circles and figure 8's on the sand in front of the entrance, turned directly toward the opening four times at interspersed intervals, and then re-entered the nest. She exited several seconds later, made an 11 second, low orientation flight, always facing the entrance, landed, and ran inside.

She exited again, made a 6 second orientation flight, landed, flew a short distance, and began hunting in the grasses nearby.

Hunting. Several other wasps were observed hunting for prey in the vegetation and litter surrounding the bare sand. Two such females searched in frond and leaf litter and on grasses in the shade at an air temperature of 68° F. They were hard to see because of their mostly black coloration and slow movements. The females held their antennae away from the face and tapped them rapidly on the substrate, while keeping the wings flat on the dorsum. In certain areas the wasps paused, circled repeatedly, and increased their walking and antennal tapping. They interspersedly made quick low flights, 10–15 cm long. Both wasps hunted on top of the litter, never beneath it, during the 2-hour observation period. Neither female was successful in capturing prey during this time. The following day, three wasps were observed hunting in clumps of grasses and on and in piles of debris, .5–2 meters from their nests. They hunted in sunshine at an ambient temperature of 82° F and their movements were much faster than the females observed the previous day at lower temperatures. Their flights were quick, long, and difficult to follow. Two of the wasps flushed prey from the litter but were unsuccessful in pursuit. The third female caught prey only 30 cm from the entrance but details of capture could not be discerned because of the rapidity of the activities and the small sizes of the individuals. Two other females, hunting in a different area, grappled when they approached to within a few centimeters of one another.

Prey Transport. Two wasps were observed transporting prey to their nests during a period of about three hours. One of the provisioning females entered at intervals of 41, 73, and 27 minutes; the other returned at intervals of 31, 21, 94, and 39 minutes. In each case the nest entrance was left open during the provisioning trip and the wasp, upon her return, simply dove in, holding the prey underneath. One of the females returned with a large prey, paused, and circled before entering, apparently disturbed by my presence.

During transport, the bug was clasped beneath the wasp's body in a ventral-side-upward and head-forward position. The female grasped the bug's antennae with the mandibles and held its body with the legs. The relative sizes of the wasps and prey influenced the manner of transport. Small bugs were brought to the nest in long, sustained flights and larger ones, either in a series of short flights, 8–15 cm long, and/or on the ground. In either case the speed of transport was rapid. After entering with a prey, the female stayed inside her nest from ¼ to 3 minutes; then, she appeared inside her entrance for only a frac-tion of a second before flying away. A brief orientation flight followed an exit in only one out of seven examples.

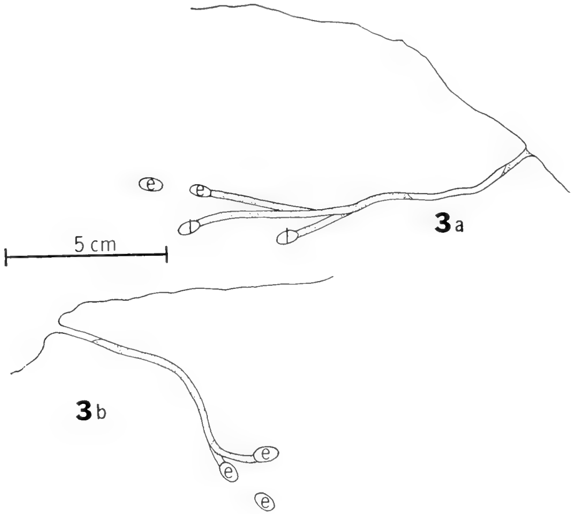
The Nest. Two nests of *D. peglowi* which had been completed were excavated and the cell contents analyzed. Both nests were situated in a sand slope between clumps of grass, the entrances being 27 cm apart (fig. 2). The sand in which these nests were dug was dry and loose and contained numerous rootlets, twigs, and other debris. A third nest, situated 21 cm from the first nest, was never finished by the female.

The first nest (fig. 3a) entered the 45° slope perpendicularly and turned left at a depth of 4 cm. It was 3 mm wide at the entrance, but varied from 2.5 to 3 mm in diameter farther down the burrow. Although the entrance and proximal 1 cm of the burrow were filled with sand, the nest was left open for the next 3 cm. From this point, side burrows filled with loose sand were traceable to three of the four cells. The ovoidal cells were located at distances of from 8.5 to 12.5 cm from the entrance, and were positioned 6–7 cm beneath the top of the slope. The distances between adjacent cells varied from 1.5 to 3 cm, and two of the cells could have been built in series. The two cells nearest the cliff face contained recently-hatched larvae and the two farther inward, eggs (fig. 3a). Cells containing eggs measured 3–3.5 × 6 mm, whereas those holding larvae were 3 × 7 mm.

The second nest (fig. 3b) also entered the sand slope rather perpendicularly. The burrow went almost straight in for 4 cm and then bent abruptly to the right. The entrance, 3 mm wide, and the proximal 1.5 cm of the burrow were open, but the remainder of the burrow and side burrows leading to the cells were filled with sand. The distances from the cells to the entrance were 8.5, 9, and 10 cm, with only 0.7 and 1.5 cm of sand between neighboring cells. Two of the cells could have been built in series. The cells were unearthed at depths of 5.5, 6, and 7 cm from the top of the slope. All three chambers contained prey and an egg. Two of the cells measured 4 × 8 mm, the other, 4 × 7 mm.

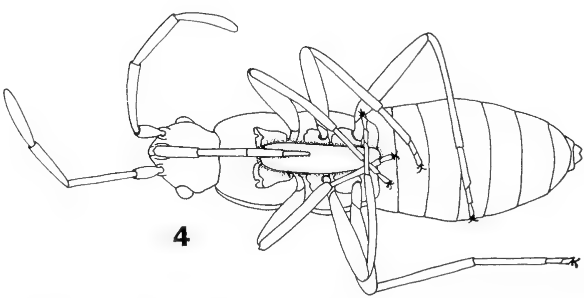
Provisions. Thirty-one fourth and fifth instar nymphs of *Sphaerobius insignis* (Uhler) and three early instar nymphs of *Lygaeus* sp. (Lygaeidae) were recovered from the cells and provisioning wasps. The bugs were moving their appendages, indicating a partial paralysis.

The number of bugs stored in the fully-provisioned cells ranged from four to six in the first nest, and from three to four in the second nest. Prey individuals weighed from 1.5 to 6.0 mg; the wasps each weighed 5.5 mg. The egg-bearing bugs were either the largest, second, or third largest bugs in the cell, averaging 4.9 (range, 4–6) mg. The total weight of all individuals in a cell ranged from 12 to 18 (mean, 15.1) mg. In general, cells with more bugs contained the larger biomass.



3a

3b



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Figs. 3a, b. Structure of two nests of *Diploplectron peglowi* Krombein, as seen from the side. Cell contents are indicated as follows: (e), egg; (l), larva. Portions of burrows filled with sand are stippled. Burrows leading to one cell in each nest were untraceable. Fig. 4. Nymph of *Sphaerobius insignis* (Uhler), showing position of *D. peglowi* egg. Note overlapping beak and forelegs of bug.

The bugs were placed in the cells in a head-inward position. A sample of 30 prey in seven cells indicated that they were almost equally placed either ventral-side-upward (10), on the side with the venter facing inward (8), or dorsal-side-upward (12). The ventral- and dorsal-side-upward individuals were at opposite ends in five of the cells. Most of the bugs placed on the side were toward the middle of the cell. The bug bearing the wasp's egg or larva was positioned either venter-up (4) or on the side (3), never dorsum-up. This individual was placed either at the back end of the cell (4) or near the middle (3), never at the front end.

The Egg. The egg of *D. peglowi* is elongate yet stout, curved throughout its length, and is white or turns cream-color prior to hatching. Four such eggs measured 1.3 to 1.5 mm long, and were 0.4 to 0.5 mm wide at the larger cephalic end. This end was glued to the prosternum of the bug at the midline, with the beak and usually one foreleg protecting it (fig. 4). The narrower distal end was raised free from the body and extended backward along the midline or slightly obliquely to one side. As viewed from the side the eggs formed angles of from 10° to nearly 60° with the body axis, although some of them might have been accidentally repositioned during the removal of the bug from the cell.

Enemies. This species of wasp seems to have a number of potential enemies. Hunting and provisioning females were unsuccessfully attacked by several species of ants (Formicidae), jumping-spiders (Salticidae), larval antlions (Myrmelionidae), and robber flies (Asilidae). Only their quick flight prevented their capture. One of the nests contained several small ants in the burrow and its seems likely that they would have invaded the *D. peglowi* cells had I not excavated the nest shortly after it was finished. Flies of the tribe Miltogrammini (Sarcophagidae) lurked near but did not enter the wasp nests. Several small cuckoo-wasps, *Hedychridium* sp., were observed entering the *D. peglowi* burrows and two of them were collected as they left. The chrysidids which were not collected lurked near the nest entrances for extended periods of time, suggesting that they might be awaiting the appropriate oviposition moment. However, no chrysidid egg was found inside a *D. peglowi* cell.

Discussion

Although my collections and observations were made in an area different from those of Krombein (1939), his description of the habitat of *D. peglowi*—"sandy knolls sparsely covered with grass"—is appropriate for this species. Rohwer (1909) observed species in the genus in Colorado flying above sand and Williams (1946) found an unidentified species of *Diploplectron* nesting in sand in California and, as Evans (1957) pointed out, the habitat of this genus appears to differ from that of the related genus *Astata*, of which most species nest in hard-packed, less friable soil.

The method of burrow construction employed by *D. peglowi* is similar to that described for *Dryudella immigrans* (Williams) by Williams (1946) and for *Astata occidentalis* Cresson by Evans (1957), but is unlike that noted for *A. unicolor* Say by Peckham and Peckham (1898). The latter uses the end of the abdomen and the hind legs, instead of the forelegs, for pushing the sand backward. *D. peglowi* rarely pushes soil out of the burrow with the abdomen and I never observed females utilizing the hind legs for soil removal. In my opinion, burrow construction in *D. peglowi* most resembles that of *Plenoculus davisi* Fox of the subfamily Larrinae (Sphecidae), notably in the pronounced upward and downward movements of the body during sand removal and in the frequency of rebacking (see Kurczewski, 1968).

Females of *D. peglowi* are similar to many species of Larrinae, especially *Nitelopterus* spp. (Krombein and Kurczewski, 1963; Powell, 1967; Kurczewski, 1969) and *Tachysphex tarsatus* (Say) (unpublished data), in their hunting behavior. They search for prey on foot on and in the vegetation near their nests. Williams (1946), likewise, described *Diploplectron* hunting "close to the ground" in debris. Species of *Astata*, on the other hand, apparently range some distance in order to obtain prey. Evans (1957) noted *A. unicolor* hunting in fields and meadows, away from the nesting site, and provisioning females of *A. occidentalis*, approaching the nesting area "from various directions . . . at a considerable height." The fact that *D. peglowi* hunts near its nest is evidently not related to alleviating difficulty in transporting a large prey because the bug is often small and is carried readily in flight. However, the behavior pattern does exist in the genus because Williams (1946) noted an unidentified species with a "heavy" prey.

Despite the fact that prey are numerous near the nest-sites, *D. peglowi* is not an "efficient" hunter. Rather, the species is quite inefficient in procuring prey as evidenced by the relatively long periods of time spent between provisions. In this respect, *D. peglowi* resembles species of *Astata* (see Evans, 1957). Perhaps, at another time of the year, i.e., mid- or late summer, and, under different environmental conditions, *D. peglowi* would obtain prey more rapidly and, consequently, complete cells faster.

In its method of transport and manner of grasping the prey, *D. peglowi* resembles other Astatinae. The prey is usually carried in flight and is grasped ventral-side-upward and head-forward by the antennae and body with the mandibles and legs. This is precisely the manner figured by Evans (1957, p. 173) for *A. occidentalis* and described by

Williams (1946) for *Diploplectron* sp. and *Dryudella immigrans.* The similarity in manner of transport between the genera *Astata, Dryudella*, and *Diploplectron* is obviously related to their close phylogeny as well as to their utilization of hemipterous prey. *Plenoculus davisi, Bicyrtes quadrifasciata* (Say), and *Anacrabro ocellatus* Packard belong to different subfamilies of Sphecidae, but all prey upon Hemiptera and employ a rather similar method of transport, i.e., fly with the prey and grasp it head-forward and ventral-side-upward with the legs or, in the first species, legs and mandibles (see Evans, 1961; Kurczewski, 1968; Rau and Rau, 1918; Krombein, 1955; Barth, 1908; Kurczewski and Peckham, 1970).

In leaving the nest entrance open during the provisioning trips, *D. peglowi* resembles certain species of *Astata* and *Dryudella*, e.g., *Astata unicolor*, *A. occidentalis*, *A. bicolor* Say, and *Dryudella immigrans* (see Evans, 1957; Peckham and Peckham, 1898; Williams, 1946). On the other hand, *Astata boops* (Schrank), *A. minor* Kohl, *A. nubecula* Cresson, and *Dryudella montana* (Cresson) invariably close the entrance with soil during trips for prey (Piel, 1936; Tsuneki, 1947; Minkiewicz, 1933; Olberg, 1959; Evans, 1963, 1970). Thus, in this subfamily as in many other groups of Sphecidae the absence or presence of a temporary nest closure is not a reliable diagnostic character.

The nest of *D. peglowi* is more like that of *Plenoculus davisi*, a larrine, than like that of the related genus *Astata* in basic structure, burrow relationships, and number and placement of cells. This is probably related to the fact that the two species utilize sand as a nesting medium, whereas species of *Astata* nest in compact soil. The nests of *D. peglowi* and *P. davisi* comprise a moderately short, sloping main burrow, with a few side burrows, each usually leading to a cell. Two nests of *D. peglowi* each could have contained two cells in series but this was not ascertained. The nest of species of *Astata*, on the other hand, often contains a rather vertical main burrow and may be complex, containing numerous cells with many of them in series (Tsuneki, 1947; Evans, 1957). As Evans (1957) indicated, building cells in series "is an efficient way of exploiting very hard soil."

D. peglowi is one of many Nearctic sphecids which prey upon species of Hemiptera. Other Hemiptera-hunting genera include *Astata* and *Dryudella* in the Astatinae, *Plenoculus* and *Solierella* in the Larrinae, *Bicyrtes* in the Gorytinae, and *Anacrabro*, *Belomicrus*, *Lindenius*, *Moniaecera*, and *Crossocerus* in the Crabroninae (summary in Muesebeck, et al., 1951; Krombein, 1958; Krombein and Burks, 1967; Evans, 1969). However, among the North American fauna, only two unidentified species of *Diploplectron*, *Astata bakeri* Parker, *Dryudella immigrans*, and *Solierella peckhami* (Ashmead) have been reported capturing Lygaeidae (Williams, 1946, 1950; Peckham and Peckham, 1905; Bridwell, 1920). In Europe, several species of *Astata* prey upon Lygaeidae (Ferton, 1901, 1908; Minkiewicz, 1933; Verhoeff, 1951). The fact that *D. peglowi* takes only immature lygaeids possibly reflects the season of study. Adults of the species being preyed upon may be utilized later in the summer if the nymphs are uncommon or unavailable.

D. peglowi resembles other species of Astatinae in storing several relatively small bugs per cell. Similar prey storage has been reported for *Diploplectron* sp., *Dryudella immigrans*, *Astata unicolor*, *A. occidentalis*, *A. leuthstromi* Ashmead, *A. boops*, *A. minor*, and *A. nubecula* (Williams, 1946; Evans, 1957, 1970; Tsuneki, 1947; Minkiewicz, 1933). All of these species prey upon nymphal bugs, except *A. occidentalis* (Evans, 1957). Evans (1970) indicated that the sizes of the nymphs in the cells of *A. nubecula* increased from early to late summer and, consequently, fewer bugs were stored per cell later in the season. Although *D. peglowi* was not studied in late summer, the same probably holds true for this species unless the bugs are bivoltine.

Species of *Astata* place the prey in the cell in a head-inward and ventral-side-downward position with the egg beneath the bottom bug, the larva thus feeding in an inverted position after hatching (summary in Evans, 1957). This behavior is unique among digger-wasps and apparently is a diagnostic character for most Astatinae. Before placement in the cell the prey are stored in the burrow, as described for *Astata unicolor* and *Dryudella montana* (Evans, 1957, 1963). *D. peglowi* may be an exception within the subfamily. Although burrow storage could not be demonstrated in this species because the nests were already completed when excavated, bugs in the cells were placed in a variety of positions and the egg-bearer was never put ventral-side-downward.

The egg of species of Astatinae, including *D. peglowi*, is relatively stout. It is attached to the prosternum of the bug and extends backward along the midline or slightly obliquely to one side or the other (see fig. 7, p. 173 in Evans, 1957). Iwata (1942) termed this type of placement a modified Sphex-type, although, as Evans (1957) pointed out, it is not typical of most Sphecinae or Larrinae.

In summary, *Diploplectron peglowi* is similar to many species of Astatinae in the genera *Dryudella* and *Astata* in its method of burrow construction, manner of grasping and transporting the prey, kind of prey (Hemiptera, including Lygaeidae, although most *Astata* use Pentatomidae), number of prey per cell, size and stage of prey, and egg profile and position of attachment. *D. peglowi* differs from certain species of *Dryudella* and *Astata* in habitat preference, hunting locale, absence of a temporary nest closure, nest structure and dimensions, and placement of prey in the cell, especially the egg-bearer. Because of certain ethological characters such as the manner of grasping the prey during transport, kind of prey (Hemiptera), and position of attachment and orientation of the egg, *Diploplectron* obviously belongs in the Astatinae. Such a placement supports Krombein (1939) and Parker (1962), who put the genus in the Astatinae on the basis of external adult morphology. The mature larva of *Diploplectron* remains unstudied.

Addendum

After the completion of my study and preparation of the manuscript, A. S. Menke called my attention to the fact that F. D. Parker had recently prepared a manuscript on the systematics of the genus *Diploplectron.* Dr. Parker kindly permitted me to examine the sections pertaining to *D. peglowi* Krombein. The species is much more widely distributed than indicated by Krombein (1939) and me, occurring throughout the western U. S., Canada, and Mexico, as well as in New York. Parker indicated that Williams' (1946) observations on *Diploplectron* sp. actually pertain to *peglowi,* and he noted a nesting female provisioning with nymphal rhopalids in California.

Acknowledgments

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NEW NORTH AMERICAN PHILANTHUS

(HYMENOPTERA: SPHECIDAE)

R. M. BOHART, *Department of Entomology, University of California, Davis, California 95616*

ABSTRACT—Five new species of *Philanthus* are described: **arizonicus** from Arizona, **levini** and **nasalis** from California, **michelbacheri** from Baja California, and **schusteri** from southern California and Arizona.

During preparation of a treatise on *Philanthus* of California, several unnamed species were found and these are described below. Types are placed in the Entomology Museum at the University of California, Davis, except for *P. michelbacheri* which will go to the California Academy of Sciences. Paratypes have been distributed to various museums but particularly the following: California Insect Survey, University of California, Berkeley; University of California, Riverside, Los Angeles County Museum; Arizona State University, Tempe; University of Idaho, Moscow; and U. S. National Museum.

Philanthus arizonicus R. Bohart, n. sp.

Male. Length 11.5 mm, forewing 9.0 mm. Black, marked with yellow as follows: mandible mostly, clypeus and most of frons below midocellus (fig. 1), a pair of postocellar dots, 4 large postocular spots, pronotal ridge, pronotal lobe and associated mesopleural spot, other mesopleural dots, lateral scutal spots, scutellum centrally, band across metanotum, lateral propodeal spot, coxal spots, femora distally, tibiae and tarsi mostly, broad band across middle of tergum I, other terga almost wholly, sterna I–VI extensively; clypeal brush tawny; wing veins and stigma red as well as spots on malar space, vertex, scape, pedicel, flagellomere I entirely, coxae and femora mostly, trochanters and tibiae partly, sterna I–II partly, other sterna slightly; wing membrane extensively dusky. Pubescence whitish to pale yellowish. Setigerous punctures of clypeus separated by 1 to 2 puncture diameters, becoming sparse near top margin, polished between; upper frons not substriate, punctures 1 to 2 diameters apart; vertex and scutum with moderately small and irregularly spaced punctures, leaving large polished areas; mesopleural punctures moderate-sized, about a diameter apart, propodeum similar but punctation closer on some areas, enclosure with posterior smooth spot; tergum I with small to medium punctures, contiguous to 2 diameters apart; tergum II similar but punctures 1 to 2 diameters apart, terga III–IV with well spaced punctures smaller than those on scutum; other terga with fine, well spaced punctures. Malar space at middle 2.1 times length of pedicel; clypeal brushes touching at middle of clypeal rim; least interocular distance 7/8 clypeal breadth; ocellocular distance 3.0 lateral ocellus diameters; pronotal ridge moderately thin and smoothly rounded.

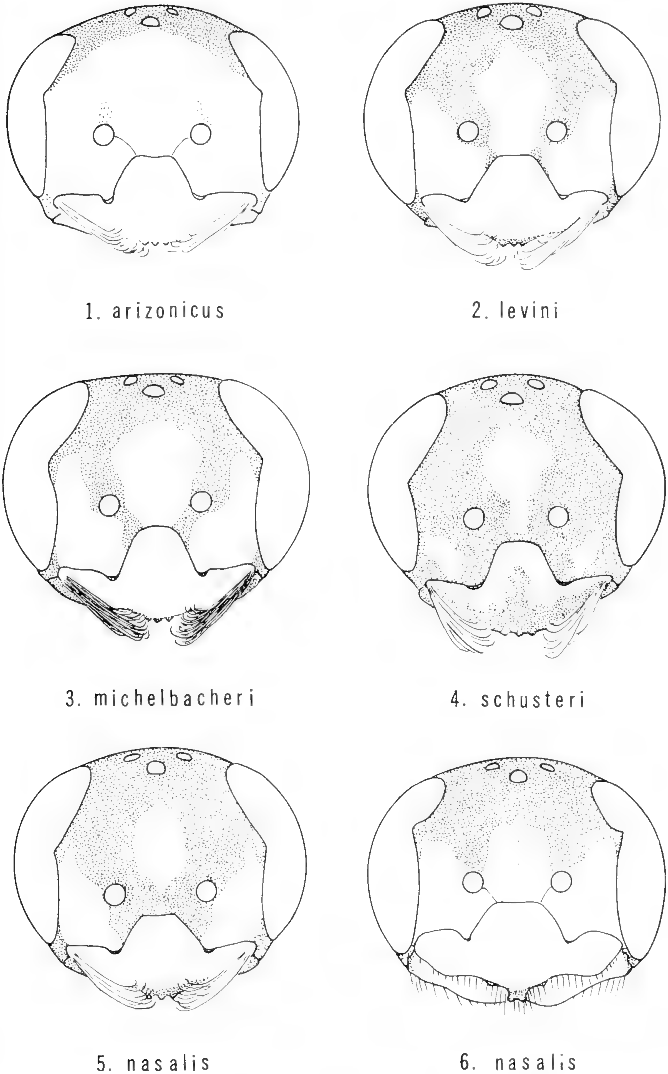
Holotype male (UCD), 18 mi. s. Gila Bend, Maricopa Co., Arizona, May 8, 1965, on *Prosopis juliflora* (M. A. Mortensen *et al.*). Paratype male (Ariz. State Univ.), same data as holotype.

This species is related to *multimaculatus* Cameron and agrees with it in having (1) the punctation of tergum III not coarser than that of the scutum; (2) the malar space in the male relatively long; and (3) the scutal punctures very unevenly distributed. However, *arizonicus* is a larger species, more extensively red, and the ocellocular distance is about three lateral ocellus diameters rather than two (fig. 1).

Philanthus levini R. Bohart, n. sp.

Male. Length 9 mm, forewing 7 mm. Black, marked with sulfur yellow as follows: clypeus and lower frons except for antennal emarginations, central yellow area pointed above and nearly reaching midocellus (fig. 2), scape and flagellomeres I–II within, postocular spot, pronotal ridge, pronotal lobe, associated mesopleural spot, 2 other mesopleural dots, tegula, a pair of dots on scutellum, band across metanotum, coxal spots, femora distally, tibiae and tarsi mostly, bands across terga, that on I broken medially, on II with deep anteromedial emargination, III and following somewhat bi-emarginate anteriorly, broad bands across sterna II–IV; clypeal brush tawny, wing veins and stigma reddish, wing membrane nearly clear, a little stained toward apex. Pubescence white to faintly fulvous, mostly sparse. Setigerous punctures on clypeus well spaced, polished between, upper frons becoming closely punctate and substriate, vertex and notum polished with fine sparse punctures, mesopleuron similar, terga with small to moderate well spaced and shallow punctures, those of I–III much larger than on scutum. Malar space at middle 1.2 times length of pedicel; clypeal brushes touching medially; least interocular distance about 5/6 clypeal breadth, ocellocular distance 2 lateral ocellus diameters, pronotal ridge narrowly but smoothly rounded.

Female. Length 11.0–12.5 mm. Markings, pubescence and punctation about as in male except as follows: mandible extensively yellow, flagellomere II dark, propodeum often with spots, body venter more extensively yellow, all terga sometimes with complete yellow bands, wing membrane dusky. Clypeal apex projecting and somewhat up-tilted, width slightly more than that of pedicel; lines drawn from apex of angle of eye emargination to outer edge of clypeus essentially parallel; flagellomere I about 2.2 times as long as broad; front basitarsus with 3 well developed setae before apex.



Figs. 1–6. Facial views of *Philanthus*: 1–5, male holotype; 6, female paratype.

Holotype male (UCD), dry wash, 3 miles sw. of Pearblossom, Los Angeles Co., California, 3500 ft. elev., September 28, 1970, on *Lepidospartum squamatum* (D. P. Levin). Paratypes, 33 males, 2 females, same data as holotype except some collected October 14–16, 1970 (C. Henne). Other paratypes, California, 21 males, 12 females, Ventura Co.: 22 mi. nnw. Ojai (J. Powell); Los Angeles Co.: Big Rock Creek (R. Snelling), Little Rock (A. Hardy), Palmdale; Riverside Co.: Coahuila Creek (T. Craig), Whitewater Canyon (P. Timberlake); San Bernardino Co.: 5 mi. se. Pinon Hills (R. Rude), Cajon Canyon (E. Schlinger, A. Melander, P. Timberlake), Deep Creek (P. Timberlake), Morongo Valley (P. Timberlake). Paratypes were collected from August 21 to October 16. A single female (Palmdale) was taken on June 14.

P. levini is a member of the *pacificus* Cresson group which is characterized by having the pale band of terga IV and or V anteriorly bi-emarginate. Within this group it is distinguished in the male by having (1) the punctation of tergum III more coarse than that of the scutum, (2) the scutal punctures very unevenly spaced, and (3) by having both terga and sterna with yellow bands. The female has the punctation of the scutum quite irregular and finer than that on tergum II, the mesopleuron is spotted, the propodeal enclosure is not ridged, the tergal punctation is unusually shallow, and the markings are yellow. The species is named for D. P. Levin who collected much of the type series.

Philanthus michelbacheri R. Bohart, n. sp.

Male. Length 10 mm, forewing 8 mm. Black, marked with whitish to whitish yellow as follows: clypeus and lower two thirds of frons except for antennal emarginations which reach clypeus (fig. 3), mandible mostly, dots on scape and flagellomere II, postocular spot, pronotal ridge, pronotal lobe and 2 following spots on mesopleuron, tegula, dots on scutellum, band across metanotum, large lateral propodeal spot, small coxal spots, femora distally, tibiae and tarsi mostly, large separated spots on terga I–II, those of II emarginate posteriorly, broadly concave apical band on III, anteriorly bi-emarginate bands on IV–VI, large lateral spots on sterna II–III, small ones on IV–V, clypeal brush blackish; costa pale near base, other wing veins and stigma reddish, wing membrane a little stained near apex. Pubescence whitish. Setigerous punctures on clypeus sparse, polished between; upper frons closely punctate and substriate; punctures moderately small and averaging a little more or less than a diameter apart on vertex, scutum, mesopleuron, and terga I–II, close over most of propodeal enclosure (which is polished laterally), punctures progressively finer on terga III–VI, punctation of tergum II about as coarse as on scutum. Malar space at middle 1.2 times length of pedicel; clypeal brushes occupying $\frac{7}{8}$ of apical clypeal rim; least interocular distance $\frac{5}{6}$ clypeal breadth; ocellocular distance 2.0 lateral ocellus diameters; pronotal ridge moderately thin and smoothly rounded.

Female. Length 13 mm. Markings, pubescence and punctation about as in male except as follows: markings yellow, anterior and posterior lateral scutal spots, mesopleuron and thoracic venter extensively yellow, a complete but posteriorly bi-emarginate band on tergum II, those on III and following with broadly concave anterior margins, sterna II–V with broad yellow bands. Clypeal apex projecting slightly, width about 1.6 times that of pedicel; lines drawn from apex of angle of eye emargination to outer edge of clypeus essentially parallel; flagellomere I nearly 3 times as long as broad; front basitarsus with 3 fully developed setae before apex.

Holotype male (CAS), Rancho Santa Margarita, 28 miles s. El Arco, Baja California, Mexico, July 3, 1960 (A. E. Michelbacher). Paratypes, 24 males, 1 female, same data as holotype. Other paratypes, Baja California: 1 male, Boca de Santa Maria, August 12, 1954 (J. Powell); 1 male, Colonia Guerrero, August 13, 1954 (J. Powell); 1 female, Santa Maria Valley, August 11, 1954 (J. Powell); 1 female, Las Animas Bay, May 8, 1921 (E. P. Van Duzee).

P. michelbacheri is one of the few North American species in which the male clypeal brush is black (fig. 3). Others are *crotoniphilus* Viereck and Cockerell, *gibbosus* (Fabricius), *barbatus* F. Smith, *banabacoa* Alayo, and some *neomexicanus* Strandtmann. From all of these except the last, *michelbacheri* differs by having the punctation of tergum III not more coarse than that on the scutum. The rather short malar space in *michelbacheri* is a separational feature in the male (fig. 3). In the female the punctation of tergum II is more coarse than that of the scutum. Also, the costa is pale toward the base rather than rust-red as in *neomexicanus*. The species is named for A. E. Michelbacher, who has collected extensively in the Hymenoptera.

Philanthus nasalis R. Bohart, n. sp.

Male. Length 8.0 mm, forewing 6.5 mm. Black, marked with ivory white as follows: clypeus, adjacent large triangular lateral frontal spot, interantennal dot below large oval frontal spot which is pointed above and below (fig. 5), postocular spot, inner side of flagellomeres I–III, spot on scape, pronotal ridge, apex of pronotal lobe, adjacent mesopleural spot, tegula, forewing costa extensively, other wing veins toward base, metanotal band, femora distally, tibiae and tarsi mostly, latter darkened distally, large lateral spots on terga I–II, a pair of apicomedial spots on II, narrow and bilaterally emarginate apical bands on terga III–V, a pair of dots on VI, lateral dots on sterna III–IV; clypeal brush pale tawny; wing membrane nearly clear, stigma light brown. Pubescence whitish, mostly sparse. Setigerous punctures on clypeus sparse, polished between; upper frons closely punctate and substriate, a moderate shiny spot in front of midocellus, vertex and notum polished with small sparse punctures, mesopleuron similar but punctures a little larger, terga I–III polished with medium large but well separated punctures, those of IV–VI progressively smaller. Malar space at middle 1.6 times length of pedicel; clypeal brushes practically touching medially; least interocular distance about 5/6 clypeal breadth; ocellocular distance 2 lateral ocellus diameters; pronotal ridge narrowly but smoothly rounded.

Female. Length 11.5 mm. Markings, pubescence and punctation about as in male except as follows: mandible mostly pale, flagellomere II unspotted, flagellum dull red beneath, lower frons all whitish except for antennal emarginations (fig. 6), wing veins and tarsi reddish brown, tergum V with a deeply bi-emarginate pale band. Clypeal apex strongly projecting forward and upturned (fig. 6), width of apex about equal to that of pedicel, lines drawn from apex of angle of eye emargination to outer edge of clypeus essentially parallel; flagellomere I about 2.5 times as long as broad; front basitarsus with 3 well developed setae before apex.

Holotype male (UCD), Antioch, Contra Costa Co., California, October 14, 1954 (M. Wasbauer). Paratypes, 4 males, 15 females, Antioch, California, September 25 to October 25, on *Eriogonum* (P. D. Hurd, A. M. Barnes, G. I. Stage, M. Wasbauer, E. E. Lindquist, D. Burdick).

Philanthus schusteri R. Bohart, n. sp.

Male. Length 8.0 mm, forewing 6.5 mm. Black, marked with ivory white as follows: undulating basal band on clypeus, irregular lower frontal spots, irregular and somewhat longitudinal upper frontal spot (fig. 4), inner surface of flagellomeres II–III and apex of I, pronotal ridge except narrowly at middle, dot on pronotal lobe, tegula, dot on metanotum, costa basally, extreme distal end of femora, outer surface of tibiae, complete irregular bands across terga I–II, 3 apical spots on III, bi-emarginate apical bands on IV–V, lateral dots on sterna III–IV; clypeal brush off-white; wing membrane clear, stigma light reddish; flagellum fulvous beneath beyond flagellomere I; tarsi reddish, as well as insides of tibiae and apex of hind femur. Pubescence whitish, mostly sparse. Setigerous punctures on clypeus sparse, polished between; upper frons and vertex with sparse fine punctures; scutum and mesopleuron with small but rather well spaced punctures, fewer on scutellum and more irregular on propodeal enclosure; terga with small and well spaced punctures which become progressively finer posteriorly. Malar space at middle 1.6 times length of pedicel; clypeal brushes nearly touching medially; least interocular distance about $^5/_6$ clypeal breadth; ocellocular distance 1.8 lateral ocellus diameters; pronotal ridge forming a thin, slightly rounded edge.

Female. Length 9.5 mm. Markings, pubescence and punctation about as in male except as follows: mandible mostly pale, scape and flagellomere I whitish inside, flagellum extensively light reddish beneath, clypeus and lower frons pale except for antennal emarginations, postocular spot present, metanotum banded, femora mostly red, tergum I with 3 whitish spots, II–V with bi-emarginate bands which on II may tend to enclose a pair of black spots, sterna II–V with variable whitish markings. Clypeal apex not unusually projecting, width about twice that of pedicel; lines drawn from apex of angle of eye emargination to outer edge of clypeus essentially parallel; flagellomere I about twice as long as broad. Front basitarsus with 3 well developed setae before apex.

Holotype male (UCD), Palo Verde, Imperial Co., California, April 3, 1966 (R. O. Schuster). Paratypes, California, 4 males, 28 females, Imperial Co.: Palo Verde (R. Schuster, R. Bohart, P. Hurd, D. Bright); Riverside Co.: 18 mi. w. Blythe (R. Schuster, R. Bohart, J. Hall, P. Timberlake, R. Brumley, C. Kovacic); Hopkins Well (E. Linsley, P.

Hurd); San Bernardino Co.: Carsons Well (R. Bohart). Other paratypes, 1 male, 15 females, Arizona: 12 mi. n. Quartzite (S. Davidson, M. Cazier), Ligurta (F. Parker, J. Davidson, M. Cazier), 18 mi. s. Gila Bend (J. Davidson, M. Cazier, S. Gorodenski), San Luis (J. Davidson, M. Cazier). Dates of collection were from March 22 to April 23.

P. schusteri is the only member of the *pacificus* group in which the mesopleuron is all dark. Also, the femora are partly reddish and the forewing costa is whitish toward the base. Together with the fine scutal punctation, these characters will separate it from all other North American *Philanthus*. Facial markings in the male (fig. 4) are variable but the lower frons is unusually dark and there is always a large black apical spot on the clypeus. The species is named for R. O. Schuster who collected much of the type series.

A PRELIMINARY KEY TO THE SPECIES OF THE NEOTROPICAL GENUS TETREUARESTA HENDEL

(DIPTERA: TEPHRITIDAE)

GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—The 17 known species of *Tetreuaresta* are keyed, including 8 species for the first time.

The genus *Tetreuaresta* was established by Hendel in 1928, as a segregate of *Euaresta* Loew and distinguished by the following characters: 3 pairs of lower fronto-orbital bristles; 2 pairs of scutellars; 3rd vein with setae on nearly entire length; dark brown background color of wing even, not mottled, hyaline spots discrete. As shown by Foote (1967: 4), the genus is one of 16 genera left by Aczél in a residual group of Tephritini, the generic limits of which are still in need of study. The catalogue of neotropical Tephritidae (Foote, 1967: 43) lists 17 species of *Tetreuaresta*. In Hendel's monograph of South American Tephritidae (1914: 70) nine of those species are keyed under *Euaresta*, and Hering (1941: 154) gave a key to five of those nine that were known to occur in Peru. It is hoped that the key here

[1] Mail address: c/o U. S. National Museum, Washington, D.C. 20560.

presented, drawn up as a means of determining material sent in from neotropical areas, will make that task easier and the results more accurate. Citations to all pertinent literature may be found in Foote (1967).

Key to Species of **Tetreuaresta** Hendel

1 (2) Basal half of posterior border of wing hyaline, including nearly all of area posterad of anal vein; hyaline spot immediately apicad of tip of 2nd vein very small .... *T. scitula* (Wulp)

2 (1) Area posterad of anal vein with considerable amount of brown coloration; hyaline spot immediately apicad of tip of 2nd vein usually of considerable size.

3 (4) Wing with 3 large, narrowly separated anteromedian incisions (hyaline areas in marginal cell directly apicad of tip of 1st vein); small black bulla present in 1st posterior cell .... *T. crenulata* (Wulp)

4 (3) Only 2 anteromedian incisions on wing; bulla absent.

5(14) Thorax and abdomen largely of yellowish ground color; only 1 hyaline spot in base of 1st posterior cell between *ta* and *tp* (anterior and posterior crossveins).

6 (7) Tip of wing without typical radiate markings, apical spot running into L-shaped hyaline spot in submarginal cell, forming with it a continuous sinuate band .... *T. rufula* Hering

7 (6) Tip of wing with the usual radiate markings, apical spot isolated from hyaline incision at either side of it.

8 (9) At least basal one of 2 anteromedian incisions extending into submarginal cell .... *T. spectabilis* (Loew)

9 (8) Neither of 2 anteromedian incisions extending into submarginal cell.

10(11) 1st posterior cell with 5 hyaline spots, including one at mid-length; anteromedian incisions arcuate, apically concave .. *T. plaumanni* Hering

11(10) 1st posterior cell without median hyaline spot, only 3 apical ones and 1 subbasal; both anteromedian incisions cuneate, basal one much the larger.

12(13) Discal cell with 2 hyaline spots; hyaline spots basad and apicad of *ta* nearly equal in size (Mexico to Panama) .... *T. timida* (Loew)

13(12) Discal cell with 1 hyaline spot; hyaline spot basad of *ta* much larger than one apicad of *ta* (Venezuela) .... *T. platypteryx* Hering

14 (5) Thorax and abdomen largely blackish in ground color; 1st posterior cell sometimes with several small hyaline spots.

15(18) 1st posterior cell with 4 or more small hyaline spots basad of *tp* and 1 or more at mid-length; basal anteromedian incision subtended by small hyaline spot.

16(17) 1st posterior cell with apical spot double, divided lengthwise of cell, and with more than 1 spot at mid-length of cell ...... *T. copiosa* Hering

17(16) 1st posterior cell with single apical spot and only 1 spot at mid-length .... *T. punctipennata* Hering

18(15) Only 1 hyaline spot in 1st posterior cell basad of *tp*, none or only 1 at mid-length.

19(20) 1st posterior cell with apical spot small and round, basad of which are only 1 preapical (anterior), 1 median, and 1 subbasal spot; both anteromedian incisions large, triangular, and virtually attaining 3rd vein; in tip of submarginal cell only 1 minute hyaline spot just apicad of tip of 2nd vein .... *T. bartica* Bates

20(19) Apical spot in 1st posterior cell at least half as wide as cell and flanked on each side by preapical spots; otherwise differing.

21(22) Apical spot in 1st posterior cell round and narrowly separated from costa; both anteromedian incisions extending into submarginal cell .... *T. phthonera* (Hendel)

22(21) Apical spot longer than broad, contiguous to costa; anteromedian incisions extending into submarginal cell or not.

23(24) 1st posterior cell with apical spot cuneate, half as wide as cell; both anteromedian incisions large, extending into submarginal cell, and nearly fused on 2nd vein .... *T. myrtis* (Hendel)

24(23) Apical spot at least ⅔ as wide as cell, triangular or parabolic; subbasal spot of 1st posterior cell not over ⅔ as wide as cell (if broader, then anteromedian incisions squarish); anteromedian incisions extending into submarginal cell or not.

25(28) Neither of anteromedian incisions extending into submarginal cell or subtended by spot in that cell.

26(27) Discal cell with 2 hyaline spots; 1st basal cell with hyaline spot above discal cell a little basad of *ta* .... *T. obscuriventris* (Loew)

27(26) Discal cell with 1 hyaline spot; 1st basal cell without hyaline spot above discal cell .... *T. deleta* Hering

28(25) At least basal one of anteromedian incisions extending into submarginal cell or subtended by small spot in that cell.

29(30) Both anteromedian incisions squarish and subtended by large round spots in submarginal cell; both preapical spots of 1st posterior cell narrowly separated from adjacent spots in neighboring cells .... *T. angustipennis* (Wulp)

30(29) At least 1 of anteromedian incisions either tapering, not attaining 2nd vein, or not subtended by spot in submarginal cell.

31(32) Discal cell with 1 hyaline spot; basal of 2 anteromedian incisions attaining 2nd vein, but both subtended by small round spot in submarginal cell .... *T. lata* Hering

32(31) Discal cell with about 7 small spots; both anteromedian incisions attaining 2nd vein, but only basal one subtended by spot in submarginal cell .... *T. ellipa* (Hendel)
(not spelled '*ellipta*')

Reference

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THE EFFECT OF DESICCATION ON SOME ORIBATID MITES[1]

M. JALIL,[2] *School of Agriculture, University of Nottingham, Sutton Bonington, Loughborough, Leics., England*

ABSTRACT—Using the bio-assay technique, a study was made on the desiccation period of some oribatid mites, *Tectocepheus velatus* (Mich.), *T. sarakensis* Tragardh, *Humerobates rostrolamellatus* Grandjean and *Platynothrus peltifer* (Koch) obtained from contrasting habitats. No consistent or significant difference was observed in adults of these species. The immature stages of these mites showed a trend of increased resistence in successive stages from larva to adult. Observations were also made on the reaction of these mites to desiccation.

Most oribatid mites require a place where the atmosphere is saturated with water vapor, or nearly so, for most of the time. They are to be found mostly associated with damp soil or vegetation. They will not remain alive after having lost a substantial portion of water from their bodies. Apart from the studies of Riha (1951) and Madge (1964), few laboratory experiments are available on the desiccation period of oribatid mites. This work deals with *Tectocepheus velatus* (Mich.), *T. sarakensis* Trägårdh, *Humerobates restrolamellatus* Grandjean and *Platynothrus peltifer* (Koch).

The comparative distribution records of these mites suggest the *H. rostrolamellatus* (length 777 μ; width 554 μ) is a xerophyl, *Tectocepheus* species (length 335 μ; width 202 μ) mesophils and *P. peltifer* (length 923 μ; width 493 μ) a meso-hygrophyl. *P. peltifer* may be fairly considered as a hygrophyl form, though the records of distribution give a confusing picture of its relationship to moisture condition. A possible explanation for the somewhat contradictory evidence for a species such as *P. peltifer* and the ubiquitous occurrence of *Tectocepheus* species might be the presence of ecological races adapted to particular moisture conditions. To test the hypothesis it was decided to carry out a series of desiccation experiments using a bio-assay technique. The weak link in the cycle of survival might well be related to the conditions required by the immature stages and it was considered essential to obtain information on the effect of desiccation on the immature stages as well. The latter information should have a value in its own right, as there is such little comparative data available on the ability of immature stages to withstand dry conditions.

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[1] This paper represents part of a thesis submitted for a M.Sc. degree in the University of Nottingham, England.

[2] Present address: Ohio Department of Health, 1571 Perry St., P.O. Box 2568, Columbus, Ohio 43216.

Materials and Methods

All the oribatid mites were cultured successfully in the laboratory (Murphy and Jalil, 1964; Jalil, 1969; Jalil, 1972). *Tectocpheus* species and *P. peltifer* were extracted from woodland soil, grassland soil, moss cushion and sphagnum by a Berlese type extraction funnel while *H. rostrolamellatus* was collected mainly from apple trees. They were kept in moist plaster of Paris culture cells at a constant temperature ($15 \pm 2°$ C); food was not supplied. The experiment was conducted within 24 hours after extraction or collection. A fine brush(oo) and low-power binocular microscope were used in picking up the mites.

The experiments were carried out in micro-desiccators (Madge, 1964). The micro-desiccators were Gooch filter crucibles with sinstered dish as bases, of porosity 100–200 μ (Gallenkemp & Co. Ltd., London) with matching rubber bungs, square cover glasses (4.5×4.5 cm) and small petri dishes (depth 3.5; height 1.4 cm). The small petri dishes were filled with a desiccant (Phosphorous pentoxide) and were fitted into the large chambers of inverted crucibles, resting on the narrow end of rubber bungs. The top of the inverted crucibles provided shallow chambers (area 26 mm $\times$ 2 mm) for keeping mites and was covered by the square glasses and sealed with Silicone stopcock grease (Dow Co., Michigan). These desiccators were put in a water-bath and weighted down with small pieces of iron so that they could be completely submerged in water.

Twenty to 50 mites were used in each of six desiccators. Five desiccators were exposed to five different concentrations/hours, which ranged from 2 to 6 hours for *Tectocepheus*, 4 to 20 hours for *P. peltifer*, and 5 to 25 hours for *H. rostrolamellatus*, to give high, medium and low mortality and one desiccator was kept as control by putting water instead of desiccant in the petri dish. The experimental mites were transferred to standard culture cells and examined after 6 hours. Any movement of any part of the body was classed as 'alive' and any mite that showed no movement at all, as 'dead.' No other intermediate classes were made. These experiments were repeated twice. Using probit analysis as modelled by Finney (1947), the time required to kill 50% of population was determined. When the difference is said to be significant, it refers to the 5% level of probability.

Results

The desiccation period (hr) as L.D. 50 for these oribatid mites is given in Table 1.

Tectocepheus. The probit lines of the mixed *Tectocepheus* from woodland, moss cushion and grassland differ in slope but not significantly. The median lethal exposure falls within 5% fiducial limits, indicating that adults of *Tectocepheus* species from three habitats did

TABLE 1. The desiccation period (hr) as L.D. 50 for the adult and immature stages of some oribatid mites.

	Tectocepheus (Mixed)				T. velatus			T. sarakensis		
			Fiducial limits			Fiducial limits			Fiducial limits	
Stage	Habitat	L.D.50	Lower	Upper	L.D.50	Lower	Upper	L.D.50	Lower	Upper
Adult	Woodland	4.3	2.8	5.8	3.8	3.1	4.5	4.2	2.8	5.6
Adult	Moss cushion	3.7	2.7	4.7	4.0	2.6	5.4	4.2	3.6	4.8
Adult	Grassland	3.0	1.9	4.1	3.0	1.8	4.2	3.4	1.8	5.0
Larva	—	2.7	2.1	3.3	—	—	—	—	—	—
Protonymph	—	3.4	2.0	4.8	—	—	—	—	—	—
Deutonymph	—	3.5	2.8	4.3	—	—	—	—	—	—
Tritonymph	—	4.5	3.7	5.3	—	—	—	—	—	—

	P. peltifer				H. rostrolamellatus			
			Fiducial limits				Fiducial limits	
Stage	Habitat	L.D.50	Lower	Upper	Habitat	L.D.50	Lower	Upper
Adult	Woodland	16.6	16.4	16.8	Branches of apple tree	21.0	18.4	25.3
Adult	Moss cushion	16.4	16.2	16.6	Below bark of apple tree	22.1	17.0	27.2
Adult	Sphagnum	15.8	15.6	16.0	Orchard soil	22.5	20.4	24.6
Larva	—	5.2	4.4	6.0	—	6.4	5.5	7.3
Protonymph	—	10.3	9.3	11.3	—	13.4	13.3	13.5
Deutonymph	—	13.1	12.9	13.3	—	16.1	14.0	18.2
Tritonymph	—	15.2	15.1	15.3	—	20.0	18.6	21.4

not differ significantly in resistance to desiccation. In most cases *T. sarakensis* appeared to be slightly more resistant than *T. velatus* but the differences were not significant.

The slope of probit lines of immature stages did not differ significantly. L.D. 50 increased slightly in each successive stage from larva to tritonymph, but these differences were not statistically significant. The larva, however, was significantly less resistant than the tritonymph.

H. rostrolamellatus. The probit lines of adults of *H. rostrolamellatus* obtained from apple tree branches, below bark of apple tree and orchard soil did not differ significantly in slope or L.D. 50.

The probit lines increase in slope from larva to tritonymph. The differences in L.D. 50 between successive stages were statistically significant with the possible exception of that between protonymph and deutonymph. The L.D. 50 of the tritonymph was approximately the same as that of the adult.

P. peltifer. The probit lines of *P. peltifer* from woodland, moss cushion and sphagnum did not differ in slope. Adults from woodland and moss cushion were equally resistant to desiccation, but significantly more resistant than those from sphagnum.

The probit lines of the immature stages of *P. peltifer* did not differ significantly in slope. The median lethal exposures increased significantly in each successive stage from larva to tritonymph. The L.D. 50 of the tritonymph was lower than that of the adult from woodland but not significantly so.

Reaction of mites to desiccation. 'Sham death' reaction was very common in *Tectocepheus.* They were found in the corner or in the pores of the sinstered glass of the desiccator lying in a natural position (dorsal side up). Thread-like structures were frequently ejected as indicated by the large number found on the surface of desiccator cell, and in standard culture cells in which they were held following desiccation. *H. rostrolamellatus* performed exaggerated movement and usually died with their legs retracted. Thread-like structures were ejected as in *Tectocepheus* species. A light reddish spongy mass of tissue was found attached to anal plates in two mites. *P. peltifer* died with legs partly retracted and were sometimes found on their backs. During desiccation an oily substance was secreted which left a light stain on the sinstered glass of the desiccator. The substance may have been produced by postero-lateral glands.

Discussion

No consistent or significant difference in resistance to desiccation was observed in adult *Tectocepheus* species, *H. rostrolamellatus* and *P. peltifer* from three contrasting habitats. As far as desiccation is concerned, there is no evidence that eco-types of these oribatid mites exist. *P. peltifer* from woodland and moss cushion were slightly more resistant to desiccation than those from sphagnum. This may indicate phenotypic adaptation to the moist environment of sphagnum since there is no evidence from other sources that this species exist in separate forms.

The immature stages of these mites show a trend of increased resistance in successive stages from larva to adult. Although they are not always statistically significant, the trends have a reasonable basis in so far as they correspond with increasing sclerotization and volume/surface area ratio.

The order of resistance to desiccation with these species was *H. rostrolamellatus, P. peltifer* and *Tectocepheus* species. This corresponds with order of size. Other characters relatable to desiccation are degree of sclerotization and behavior. *Tectocepheus* species are less sclerotized than *P. peltifer* and *H. rostrolamellatus.* This may contribute to the lower resistance of the former. The fact that *H. rostrolamellatus* is more mobile would tend to decrease its resistance in relation to other species.

An estimate of ecological valency for these mites in terms of desiccation has proved inconclusive. "This may be because of the method used here is too crude a measure to assess the effect of moisture conditions in the natural environment or the effect of desiccation *per se* is small importance. The role of moisture in the soil may be extremely complex, and interaction with other environmental components and indeed with the physiological state of mite may further increase the complexity of the relationship." (Murphy and Jalil, 1964).

ACKNOWLEDGMENTS

I am greatly indebted to Dr. P. W. Murphy for his advice and encouragement. Grateful acknowledgment is also made of generous assistance of Mr. J. Y. Ritchie. I am also thankful to Dr. D. E. Johnston, Acarology Laboratory, Ohio State University, Columbus, Ohio for his suggestions.

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THE PUPAE OF SPECIES OF MALAYA LEICESTER FROM ASIA AND AUSTRALASIA

(DIPTERA: CULICIDAE)

JOHN LANE, *London School of Hygiene and Tropical Medicine, Department of Entomology, Keppel Street (Gower Street), London W.C.1, England*

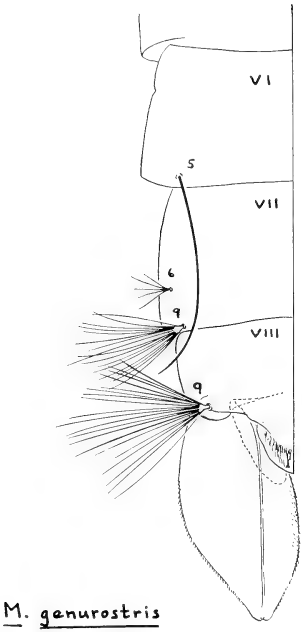
ABSTRACT—The pupae of species of the mosquito genus *Malaya* occurring in Southeast Asia and Australasia have hitherto not been separated in literature. Differentiating characters are here presented together with a key to the known species involved.

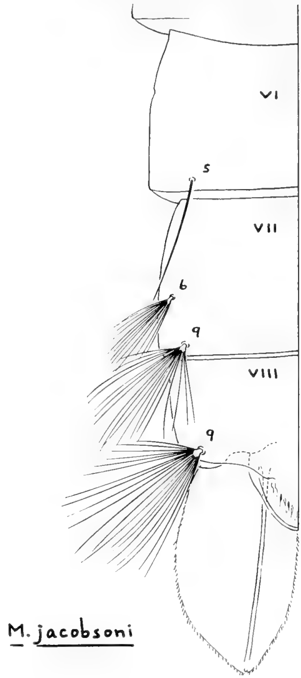
When examining specimens of *Malaya genurostris* Leicester and *Malaya jacobsoni* (Edwards) an obvious character was noticed to separate the pupa of these species, hitherto not mentioned in descriptive works on members of the genus *Malaya.* The pupa of *jacobsoni* has not been described as far as I can find in literature (Barraud, 1934; Thurman, 1959; Wharton, 1947) nor does Stone et al., 1959, in the Synoptic Catalog of the Mosquitoes of the World and Stone in the supplements to the Catalog, 1961, 1963, 1967 and 1970 give reference to any further information on the pupae of these species.

Abdominal segments VII and VIII have a prominent tufted hair 9 on both species, with hair 6-VII similar on *jacobsoni* but not on *genurostris.* Hair 6-VII is usually less than half the size of 9-VII with *genurostris* and always at least half the size of 9-VII with *jacobsoni.* Hair 6-VII never appears as a prominent tuft on specimens of *genurostris* that I have seen, which is the case with *jacobsoni.* Iyengar and Menon (1948), in their paper concerning the biology and behaviour of *M. genurostris,* figure the pupa in situ, showing the prominent hairs 9-VII and 9-VIII. With *jacobsoni* 6-VII would also show as a similar though smaller prominent tuft.

The branches of hairs 9-VII and 9-VIII are tapered to a fine point, sometimes divided into two fine points, and show considerable fraying in both species (high magnification). The branches of 6-VII are tapered to a fine point in both species, invariably frayed and often divided into two or more points on *jacobsoni* but not frayed and rarely divided on *genurostris.* These differences in hair 6-VII seem absolutely characteristic. The frayed and divided 6-VII is particularly outstanding on a series of *jacobsoni* from Viet Nam.

An analysis was made of all pupal skins of these species that are present at the U.S. National Museum (usually with associated adults and larval skins with which the original determination was made) with regard to abdominal segment VII hairs 6 and 9, and segment VIII hair 9 (6-VIII is absent on both species). The branches of each of these hairs were counted on every specimen and notes made of "usual" and "unusual" characteristics. The average numbers are given below.





Malaya genurostris pupa

Hair 6-VII
average 5.4 branches per hair
(280 hairs examined)

Hair 9-VII
average 18.7 branches per hair
(269 hairs examined)

Hair 9-VIII
average 22.2 branches per hair
(271 hairs examined)

Specimens examined:

76 Thailand pupal skins
59 Philippine pupal skins
2 Malaya pupil skins
4 Indonesia pupal skins

Malaya jacobsoni pupa

Hair 6-VII
average 9.1 branches per hair
(97 hairs examined)

Hair 9-VII
average 20.0 branches per hair
(98 hairs examined)

Hair 9-VIII
average 21.5 branches per hair
(89 hairs examined)

Specimens examined:

39 Thailand pupal skins
10 Viet Nam pupal skins

Twelve New Guinea specimens of *Malaya leei* (Wharton) skins were examined. This pupa is similar to that of *genurostris* with regard to hairs 6-VII, 9-VII and 9-VIII. Hair 6-VII is usually less than half the size of 9-VII with rarely any fraying on the branches. The branches of 9-VII and 9-VIII are considerably frayed, perhaps more so than on *genurostris* and *jacobsoni* and appear rather coarser than the branches of those species. A character was sought to separate the *leei* pupa from *genurostris* and *jacobsoni* and abdominal hair 5-VI shows an obvious difference. Hair 5-VI of *leei* is very long, usually reaching the hind margin of VIII. With *jacobsoni* 5-VI is short, usually reaching the base of 6-VII and rarely extending further. Hair 5-VI of *genurostris* varies in length from near the hind margin of VII to the middle of VIII. See illustration showing these differentiating characters of *genurostris* and *jacobsoni.*

No specimens of *Malaya solomonis* (Wharton) were available for examination but this was described and illustrated by Belkin, 1962. Characters on abdominal segments VI to VIII are very similar to those of *leei.* The pupae therefore, of *M. genurostris* and *M. jacobsoni* can be distinguished from each other and from *M. leei* and *M. solomonis* by the characters given in the following key.

Key to the pupae of Southeast Asia and Australasian species of **Malaya**

Five species of *Malaya* are known from these regions, with the pupa of *M. splendens* (Meijere) unknown. At present the pupae of *M. leei* and *M. solomonis* cannot be separated (no specimens of *solomonis* were available at the USNM).

1. Abdominal hair 5-VI very long, reaching the hind margin of VIII or further .... *leei* and *solomonis*
   Hair 5-VI not reaching the hind margin of VIII 2
2. Hair 5-VI short, rarely extending beyond base of 6-VII; 6-VII a prominent tuft at least half the size of 9-VII .... *jacobsoni*
   Hair 5-VI longer, extending from near hind margin of VII to the middle of VIII; 6-VII not a prominent tuft, usually less than half the size of 9-VII .... *genurostris*

Malaya genurostris is known from India, Ceylon, much of Southeast Asia and Australasian areas (see Stone et al., 1959); *M. jacobsoni* is known from India, Thailand, Sumatra, Taiwan and Viet Nam; *M. solomonis* from the Solomon Islands; *M. splendens* from Java and Borneo and *M. leei* from New Guinea and the Philippines (see following note).

Three adult specimens of *Malaya leei* were recently found among *genurostris* specimens from the Philippines at the USNM. This is the first record of *M. leei* from outside of New Guinea.

This work was carried out at the U.S. National Museum, Smithsonian Institution, Washington, D.C. 20560. My thanks to Dr. Alan Stone of the Systematic Entomology Laboratory, U.S. Department of Agriculture for reading the manuscript and for advice on the completion of this paper.

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Note added in proof.—The manuscript for this paper was sent to press before that of Ramalingam and Pillai (page 451) and, due to lack of time and space, the author was unable to comment on where the new species of *Malaya* fits into his key to pupae. Editor.

A PRELIMINARY KEY TO THE SPECIES OF NEOTEPHRITIS HENDEL (DIPTERA: TEPHRITIDAE)

GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—A key is presented for the identification of the 11 species in the genus *Neotephritis* Hendel.

The three North American species of *Neotephritis* were revised by Foote (1960) and the remaining species catalogued by the same author (Foote, 1967). There are a total of 11 species presently recognized, but only the 3 North American species have been brought together in a key. The following key was constructed from descriptions and on basis of material in the U. S. National Museum for the purpose

[1] Mail address: c/o U. S. National Museum, Washington, D.C. 20560.

of determining material received from neotropical areas. Citations of all pertinent taxonomic references will be found in the 2 abovementioned works by Foote.

Key to Species of **Neotephritis** Hendel

1 (2) Pterostigma dark brown with 2 small hyaline spots next to costa and narrow basal hyaline stripe; disc of wing largely dark brown; 1st posterior cell with apical Y-shaped mark .... *N. rufula* (Wulp)

2 (1) Pterostigma dark brown with complete basal hyaline mark narrow or occupying up to ⅗ of length of cell; disc of wing with broad oblique dark band from pterostigma through crossveins to posterior margin of wing or largely reticulate; 1st posterior cell apically dark brown or largely hyaline, without distinct Y mark.

3(12) Wing with dark brown band from pterostigma through crossveins to posterior margin of wing, at least narrowly continued between crossveins.

4 (5) Oblique dark band of wing enclosing 2 small and faint hyaline spots only at and close to posterior margin; wing virtually 3 times as long as wide (Jamaica) .... *N. bruesi* (Bates)

5 (4) Oblique wing band strongly narrowed by hyaline spots in apical part of discal cell; wing not more than 2.6 times as long as wide (mainland species).

6 (7) Wing pattern light brown, not sharply contrasting, many small hyaline spots in dark part of submarginal and 1st posterior cells apicad of *tp*, a row of which lies in middle of submarginal cell; body virtually wholly reddish in ground color; ovipositor sheath not longer than wide at base (Arizona) .... *N. rava* Foote

7 (6) Wing pattern sharply contrasting between dark brown and hyaline; middle of submarginal cell apicad of *tp* without row of small hyaline spots; body more or less blackish in ground color; ovipositor sheath (not known for *N. staminea*) longer than wide at base.

8 (9) 1st posterior cell with round hyaline spot close to apex; discal cell with small round hyaline spot close to posteroapical corner; scutellum with hindmargin rufous .... *N. staminea* (Wulp)

9 (8) 1st posterior cell broadly dark brown at tip; discal cell with or without small hyaline spot close to posteroapical corner; scutellum sometimes largely yellowish.

10(11) Discal cell without hyaline spot close to postero-apical corner; usually with 3 or more small hyaline spots close to last section of 4th vein in 1st posterior cell; scutellum with hindmargin rufous .... *N. inornata* (Coquillett)

11(10) Discal cell usually with distinct hyaline spot close to postero-apical corner; usually only 2 moderately large hyaline spots close to last section of 4th vein in 1st posterior cell; scutellum largely rufous medially .... *N. finalis* (Loew)

Note: The hyaline spot crossing 2nd vein near its tip in Foote's figure of the wing (1960: 147, fig. 1) is quite abnormal. Specimens cited under *N. inornata* from Arizona in Foote (1960: 150) will run here.

12 (3) Wing without oblique dark band from pterostigma to posterior margin, area of wing between crossveins predominantly hyaline or at least with hyaline spots large enough that 2 adjacent ones are contiguous on opposite sides of 4th vein (*N. thaumasta*).

13(14) Wing tip dark brown and ovipositor shining blackish (Venezuela, Colombia) .... *N. aberrans* (Schiner)

Note: Figure of wing not available; description inadequate.

14(13) Wing tip hyaline, or if dark brown (*N. thaumasta*), ovipositor rufous.

15(16) Wing tip dark brown, wing pattern in general much like that of *N. finalis*, but a pair of hyaline spots on either side of 4th vein virtually separates dark brown area including *ta* from that including *tp* .... *N. thaumasta* (Hering)

16(15) Wing tip hyaline.

17(18) Hyaline tip of wing oval, not touching either 3rd or 4th veins; *tp* in broad, distinct brown seam; somewhat less than apical half of pterostigma brown .... *N. cancellata* (Wulp)

18(17) Hyaline tip of wing filling tip of 1st posterior cell for some distance from apex of wing; *tp* very narrowly brown-seamed; pterostigma with basal hyaline spot transverse and usually with tip also more or less hyaline.

19(20) Mesoscutum pale grayish yellow; wing with conspicuous irregularly V-shaped mark about and beyond extension of anal cell .... *N. mundelli* (Lima)

Note: See also Hering (1942: 15) for differences between *N. mundelli* and the following species; the spelling *mundellii* is erroneous.

20(19) Mesoscutum fuscous, densely pale-gray dusted, humeri and scutellum apically yellowish; mark about and beyond extension of anal cell pale, not conspicuous .... *N. quadrata* (Malloch)

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THE SOUTH AMERICAN SAWFLY GENUS ACIDIOPHORA KONOW
(HYMENOPTERA: TENTHREDINIDAE)

DAVID R. SMITH, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture*[1]

ABSTRACT—The genus *Acidiophora* Konow is known only from South America. The genus is redescribed and a key and descriptions are given for the six known species: *A. decora* Konow (= *A. nebulosa* Jörgensen, n. syn.) from Argentina and Brazil; *A.* **bokama**, n. sp. from Brazil; *A.* **konowi**, n. sp. from Peru; *A.* **manni**, n. sp. from Bolivia; *A.* **gecera**, n. sp. from Brazil; and *A.* **larira**, n. sp. from Brazil.

The genus *Acidiophora* Konow is restricted to South America, and its members are easily recognized by their long, fasciate wings with a contrasting black and hyaline pattern and their shining, impunctate black and red bodies. So remarkable are their other characters such as the narrow elongated stigma of the forewing, trifid tarsal claws, and reduced apical five antennal segments, that Benson (1938) established a new tribe, the Acidiophorini (misspelled Acideophorini), in the Allantinae solely for this genus.

Only two species have been described, *A. decora* Konow in 1899 from Rio Grande do Sul, Brazil and *A. nebulosa* Jörgensen in 1913 from Misiones, Argentina. My examination of the types of both species showed them to be identical. I have found an additional five species, three from Brazil and one each from Peru and Bolivia. Hosts are not known, but, judging from the fragile, nearly membranous lancets, the eggs must be deposited in very soft-tissued plants.

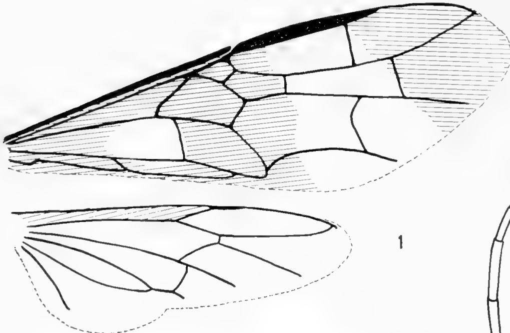
The cooperation of the following has made this review of *Acidiophora* possible: Dr. J. Oehlke, Institut für Pflanzenschutzforschung, Eberswalde, Germany and Ing. Agr. Dr. Luis de Santis, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, Argentina.

Acidiophora Konow

Acidiophora Konow, 1899, p. 361; Konow, 1905, p. 100; Benson, 1938, p. 366 (*Acideophora*). Type-species: *Acidiophora decora* Konow. Monotypic.

Description.—Antenna long, slender, first and second segments each longer than broad, third segment subequal in length to fourth segment, apical five segments reduced, together subequal in length to third and fourth segments combined (fig. 2). Clypeus truncate to slightly rounded; malar space linear; no genal carina; each mandible tridentate with inner tooth small; eyes large, distance between eyes at base less than length of an eye; postocellar area as long as broad; head smooth and shining, practically devoid of ridges. No prepectus; cenchri closer

[1] Mail address: c/o U. S. National Museum, Washington, D.C. 20560.



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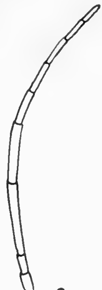

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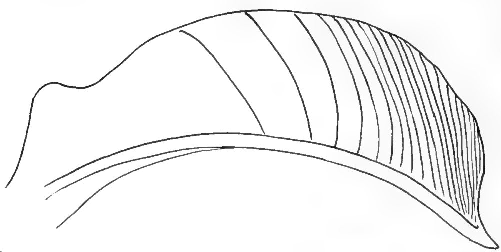

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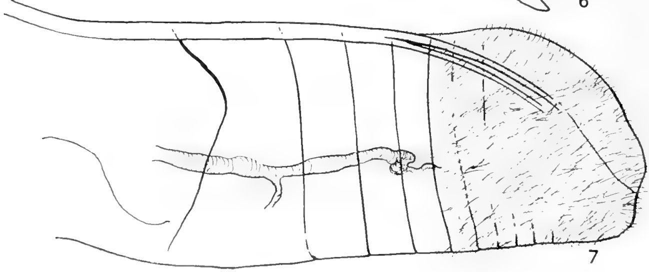

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together than breadth of a cenchrus; mesepimeron with oval membranous area. All tarsal claws trifid, without basal lobe (fig. 3); hindbasitarsus longer than remaining tarsal segments combined. Forewing (fig. 1) with anal crossvein oblique; stigma long and narrow, more than half length of radial cell; radial crossvein straight, nearly perpendicular to stigma. Hindwing (fig. 1) without cell M; anal cell sessile or with short petiole; apex of radial cell close to apical margin of wing, with short spurious vein. Male without peripheral vein in hindwing.

Discussion.—Four genera of Allantinae are found in South America: *Acidiophora*, *Antholcus* Konow, *Probleta* Konow, and *Protoprobleta* Malaise. *Acidiophora* is separated from all of these by the trifid tarsal claws, elongate stigma and straight radial crossvein of the forewing, truncate to rounded clypeus, and reduced apical five antennal segments (other genera may have the apical four segments reduced).

The species of *Acidiophora* are all similar in general appearance, but can be separated by color of the thorax and genital characters. These characters given in the generic description are not repeated for each species. The female lance and lancet are distinctive for the genus. The lance is short and acute at the apex and the lancet is short and broad with the basal portion lightly sclerotized and black, and the apical portion membranous and white.

Key to Species

1. Thorax, front coxae and femora entirely orange .... *A. konowi*, n. sp.
   Thorax and front legs mostly black, or at least with black on pectus and mesoprescutum 2
2. Mesopleuron entirely black; mesonotum entirely or mostly black, at most with lateral half of each lateral lobe orange 3
   At least upper quarter of mesopleuron orange; mesonotum mostly orange 5
3. Forewing basal to stigma uniformly infuscated; pronotum black and mesonotum black .... *A. bokama*, n. sp.
   Forewing basal to stigma infuscated, but with a central hyaline spot; at least lower half of pronotum and usually lateral half of each lateral lobe orange 4
4. Anal cell of hindwing with short petiole; mesonotum mostly black; pronotum, except for lower half, black .... *A. larira*, n. sp.
   Anal cell of hindwing sessile; lateral half of each lateral lobe of mesonotum orange, the black on the mesonotum appearing as a broad, longitudinal stripe; pronotum orange .... *A. decora* Konow
5. Upper half of mesopleuron and all of mesoscutellum orange; anal cell of hindwing sessile .... *A. manni*, n. sp.
   Only upper corner of mesopleuron orange; mesoscutellum black; anal cell of hindwing with short petiole .... *A. gecera*, n. sp.

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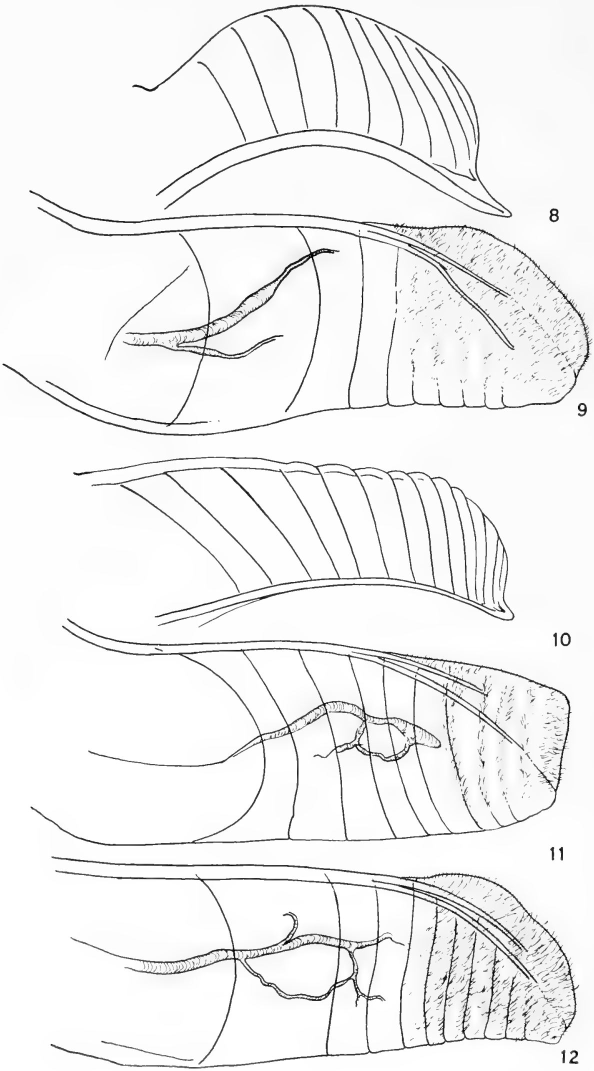
Figs. 1–3, 5. *Acidiophora gecera*, n. sp.: 1, fore- and hindwings; 2, antenna; 3, tarsal claw; 5, sheath. Figs. 4, 6, 7. *A. bokama*, n. sp. 4, sheath; 6, lance; 7, lancet.



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Acidiophora bokama, n. sp.

Female.—Average length, 9.7 mm; average forewing length, 11.8 mm. Antenna and head black. Thorax black with tegula, extreme basal portion of veins of forewing, upper portion of mesepimeron, upper portion of metapleuron at base of hindwing, and narrow line on anterior margin of pronotum red; posterior angles of pronotum sometimes brownish. Legs and abdomen black. Forewing uniformly infuscated from base to stigma, hyaline band below stigma, and apex beyond stigma infuscated; hindwing infuscated only on margin.

Anal cell of hindwing sessile. Sheath short, broad, truncated (fig. 4). Lance with basal four annuli far apart, annuli beyond fourth close together (fig. 6); lancet with apex rounded, slightly truncated on ventroapical margin, first annulus sinuate and remaining annuli parallel (fig. 7).

Male.—Length, 9.0 mm; forewing length, 9.9 mm. Color and structure similar to female. Harpe and parapenis as in fig. 15; apex of penis valve broad, with one dorsal projection (fig. 16); valve shorter and broader than that of *larira* (fig. 18).

Holotype.—Female, labeled "Brasilien, Nova Teutonia, 27° 11′ B., 52° 23′ L., 300–500 m., XI-17-1964, Fritz Plaumann." U.S.N.M. type no. 72058.

Paratypes.—Same locality as for holotype with following dates: 20-III-1948 (1♀); IX-1968 (1♂); II-1969 (1♀); XII-1970 (2♀♀).

Discussion.—This is the only species that lacks a hyaline spot in the basal infuscated portion of the forewing. This, in combination with the black mesopleuron, mesonotum, and pronotum, should distinguish this species.

The species name is an arbitrary combination of letters and should be treated as a noun.

Acidiophora decora Konow

Acidiophora decora Konow, 1899, p. 361. ♂.

Acidiophora nebulosa Jörgensen, 1913, p. 276. ♂. NEW SYNONYMY.

Female.—Average length, 9.4 mm; average forewing length, 10.7 mm. Antenna and head black. Thorax black with cervical sclerites, except for anterior margin, pronotum, tegula, upper portions of mesepimeron and metapleuron, and lateral half of each lateral lobe of mesonotum red. Legs black, sometimes base of front coxa and outer surface of front femur whitish. Abdomen black. Forewing from base to stigma infuscated, with central hyaline spot; band below stigma hyaline; apex beyond stigma infuscated; hindwing infuscated only on apical margin.

Anal cell of hindwing sessile. Sheath short, broad, truncated, as in fig. 4. Lance with fewer annuli and annuli farther apart than in *bokama* (figs. 8, 6); apex of lancet rounded, first and second annuli sinuate, parallel, far apart, annuli beyond second parallel (fig. 9).

Male.—Average length, 8.2 mm; average forewing length, 8.8 mm. Color and

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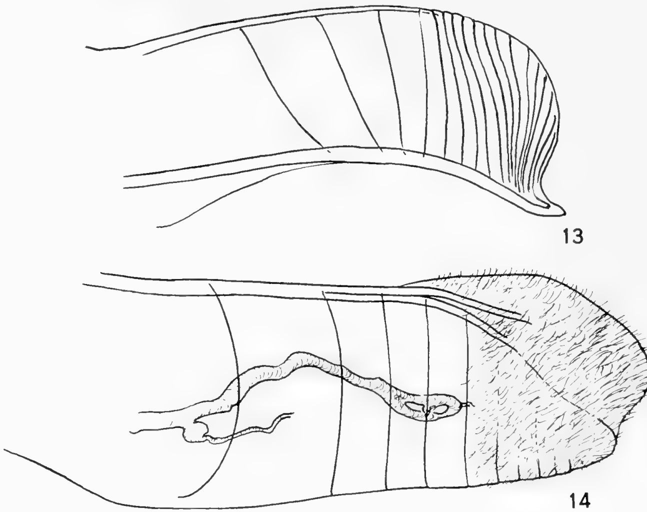
Figs. 8, 9. *Acidiophora decora* Konow: 8, lance; 9, lancet. Figs. 10, 11. *A. gecera*, n. sp.: 10, lance; 11, lancet. Fig. 12. *A. manni*, n. sp.: lancet.



Figs. 13, 14. *Acidiophora konowi*, n. sp.: 13, lance; 14, lancet.

structure as for female except for front tibia and femur which are sometimes more whitish. Harpe and parapenis as in fig. 15, similar to that of *bokama*; penis valve broad, with two dorsal projections (fig. 17).

Types.—Konow's type is at the Institut für Pflanzenschutzforschung, Eberswalde, Germany, a male labeled "R. Grande do Sul," "Coll. Konow," "Typus," [red label], and the name label "Acidiophora decora Konow, Brasil" in Konow's handwriting. Jörgensen's type is at the Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, Argentina, a male labeled "25-IX-10, Misiones, Bompland, Jörgensen," and with a name label in Jörgensen's handwriting "Acidiophora nebulosa, n. sp."; the left forewing is missing.

Records.—ARGENTINA: Misiones, Bompland, 25-IX-10. BRAZIL: Rio Grande do Sul; Espirito Santo, X-1920 – II-1921; Guanabara, Rio de Janeiro, XI-1963, M. Alvarenaga, coll.; Santa Catarina, Nova Teutonia, X-1969, X-1967, IX-1969, F. Plaumann.

Discussion.—This species is recognized by the entirely black mesopleuron, the broad black longitudinal stripe on the mesonotum, the red pronotum, the hyaline spot in the basal infuscated portion of the forewing, the sessile anal cell of the hindwing, and characters of the genitalia as illustrated. The single female from Guanabara, Brazil, has the tegula black; otherwise, this specimen fits this species.

Acidiophora gecera, n. sp.

Female.—Average length, 8.5 mm; average forewing length, 10.7 mm. Antenna and head black. Thorax black with cervical sclerites, upper corner or not more than upper one-third of mesopleuron, upper half of metapleuron, pronotum, tegula, lateral margins of mesoprescutum, and lateral lobes of mesonotum, except for posterior margins, red. Legs black with front coxa, front femur, and extreme base of front tibia whitish or orange, these parts mostly black in some specimens. Abdomen black. Forewing infuscated from base to stigma, with central hyaline spot; band below stigma hyaline; apex beyond stigma infuscated; hindwing infuscated only on margin.

Anal cell of hindwing petiolate with petiole length equal to about half width of cell. Sheath short, rounded (fig. 5). Lance with dorsal margin slightly crenulate; distance between annuli gradually decreasing toward apex (fig. 10); lancet with apex truncate, each annulus about the same distance apart, and annuli three and four slightly divergent (fig. 11).

Male.—Average length, 8.0 mm; average forewing length, 8.9 mm. Color and structure similar to female. Harpe and parapenis as in fig. 19; penis valve narrow, curved at apex (fig. 20).

Holotype.—Female, labeled "Brasilien, Nova Teutonia, 27° 11′ B., 52° 23′ L., 300–500 m., 16-III-1966, Fritz Plaumann." U.S.N.M. type no. 72059.

Paratypes.—All from the type locality with the following dates: 22-III-1947 (1♀); 14-III-1966 (2♀♀, 5♂♂); 13-IV-1966 (1♀, 2♂♂); III-1968 (2♂♂); IV-1968 (1♀); II-1969 (1♂); III-1969 (6♀♀, 26♂♂); III-1971 (2♀♀). At the U. S. National Museum.

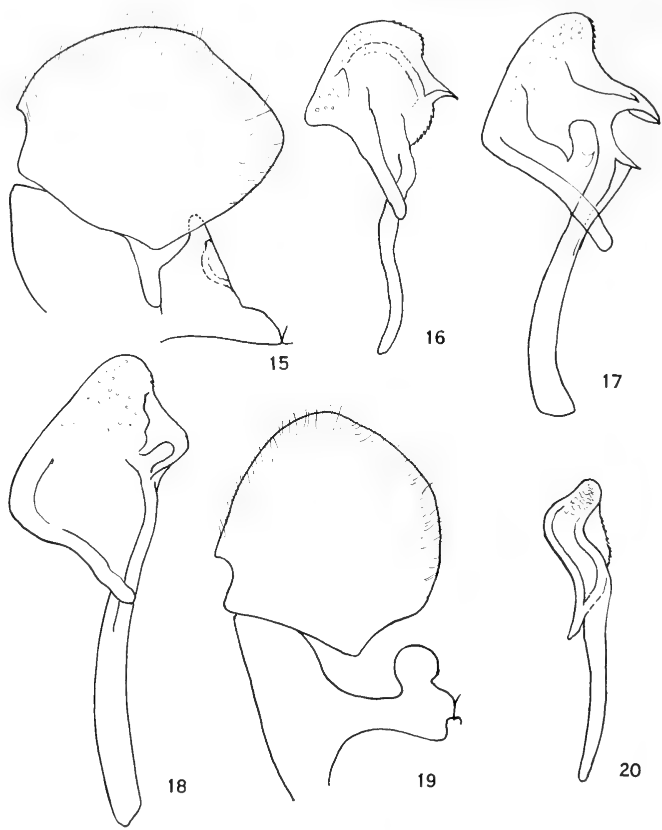
Discussion.—This species and *larira* are the only ones with a petiolate anal cell in the hindwing; however, *larira* has the mesopleuron and mesonotum black. Other diagnostic characters are the red mesonotum with the prescutum and scutellum black, red upper portion of the mesopleuron, truncated apex of the female lancet, and slender penis valve of the male genitalia.

The species name is an arbitrary combination of letters and is to be treated as a noun.

Acidiophora konowi, n. sp.

Female.—Length, 7.2 mm; forewing length, 10.7 mm. Antenna and head black. Thorax entirely orange. Legs black with front coxa and front femur orange. Abdomen black. Forewing infuscated from base to stigma with central hyaline spot; hyaline band below stigma; apex beyond stigma infuscated; hindwing infuscated only on margin.

Anal cell of hindwing sessile. Sheath short, broad, truncated at apex (as in fig. 4). Lance with basal four annuli far apart, remaining annuli much closer together



Figs. 15, 16. *Acidiophora bokama,* n. sp.: 15, harpe and parapenis; 16, penis valve. Fig. 17. *A. decora* Konow: penis valve. Fig. 18. *A. larira,* n. sp.: penis valve. Figs. 19, 20. *A. gecera,* n. sp.: 19, harpe and parapenis; 20, penis valve. (Figs. 15–20 drawn to same scale.)

(fig. 13); lancet with dorsoapical margin protuberant, first and second annuli far apart, second and remaining annuli parallel (fig. 14).

Male.—Unknown.

Holotype.—Female, labeled "Vilcanota, Peru," "Coll. Konow." At the Institut für Pflanzenschutzforschung, Eberswalde, Germany.

Discussion.—This distinctive species is separated by the entirely orange thorax, front coxae, and front femora. The apical membranous portion of the lancet is also more protuberant than in other species of *Acidiophora.* It is named for the German sawfly worker Friedrich Wilhelm Konow, 1842–1908.

Acidiophora larira, n. sp.

Female.—Unknown.

Male.—Length, 9.4 mm; forewing length, 10.6 mm. Antenna and head black. Thorax black with extreme posterior corner of cervical sclerites, lower half of pronotum, tegula, small spot on lateral side of each lateral lobe of mesonotum, upper margin of mesepimeron, and upper portion of metapleuron orange. Legs and abdomen black. Forewing infuscated from base to stigma with central hyaline area; hyaline band below stigma; apex beyond stigma infuscated; hindwing infuscated only on apical margin.

Anal cell of hindwing petiolate, with petiole length about half width of cell. Harpe and parapenis similar to *bokama* (fig. 15); penis valve broad, but longer and narrower than *bokama*, and with single dorsal lobe which is shorter than that of *bokama* (fig. 18).

Holotype.—Male, labeled "Rio de Janeiro, Dist. Federal, Brasil," "Setembro, 1938," "Servico Febro, Amarela, M.E.S., Bras.," "R. C. Shannon, coll." U.S.N.M. type no. 72060.

Discussion.—The color of this species is very similar to the color of *bokama*, but the presence of a hyaline spot in the basal infuscated portion of the forewing, petiolate anal cell of the hindwing, and the differences in the structure of the penis valve, as illustrated, will separate *larira.*

The species name is an arbitrary combination of letters and should be treated as a noun.

Acidiophora manni, n. sp.

Female.—Length, 7.2 mm; forewing length, 8.8 mm. Antenna and head black; labrum brownish. Thorax orange with pectus, lower half of mesopleuron, and triangular spot on mesoprescutum black. Legs black with base of front coxa and front femur entirely orange. Abdomen black. Forewing infuscated from base to stigma with central hyaline spot; hyaline band below stigma; apex beyond stigma infuscated; hindwing infuscated only on margin.

Anal cell of hindwing sessile. Sheath short, broad, slightly emarginated on truncated apex (similar to fig. 4). Lance lost; lancet with apex rounded, first and second annuli far apart, annulus 2 and remaining annuli closer together and parallel (fig. 12).

Male.—Unknown.

Holotype.—Female, labeled "Huachi, Beni, Bolivia, Wm. M. Mann," "September," "Mulford Bio. Expl. 1921–1922." U.S.N.M. type no. 72061.

Discussion.—Other than lancet characters as illustrated, this species may be separated by the orange upper half of the mesopleuron, orange front femora and coxae, orange mesoscutellum, and sessile anal cell of the hindwing. It is named for the collector, Dr. William M. Mann.

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A NEW GENUS AND TWO NEW SPECIES OF LISTROPHORID FUR MITES FROM NORTH AMERICAN SHREWS

(ACARINA: LISTROPHORIDAE)[1]

B. McDANIEL, *Entomology–Zoology Department, South Dakota State University, Brookings, South Dakota 57006*

and

JOHN O. WHITAKER, JR., *Department of Life Science, Indiana State University, Terre Haute, Indiana 47809*

ABSTRACT—A new genus and two new species are described, **Olistrophorus**, n.g. (type species *O. cryptotae*), **O. cryptotae** (type-host, *Cryptotis parva parva*), **O. blarina** (type-host, *Blarina brevicauda* are described as new. All of these are ectoparasites on members of the order Insectivora (shrews) from the United States.

The only record of a listrophorid fur mite recorded from the order Insectivora is the species *Asiochirus suncus* (Radford) collected from the musk shrew, *Suncus caeruleus giganteus* Geoffrey, in Colombo, Ceylon, May 20, 1944.

Material collected by the authors from two species of shrews, *Cryptotis parva parva* (Say), from Texas and *Blarina brevicauda kirtlandi* Bole and Moulthrop from Indiana extends the host range of listrophorid species parasitizing shrews to include the Nearctic realm of the Western Hemisphere.

The species collected from *S. caeruleus giganteus* has recently been placed in a new genus by Fain (1970). In the newly established genus

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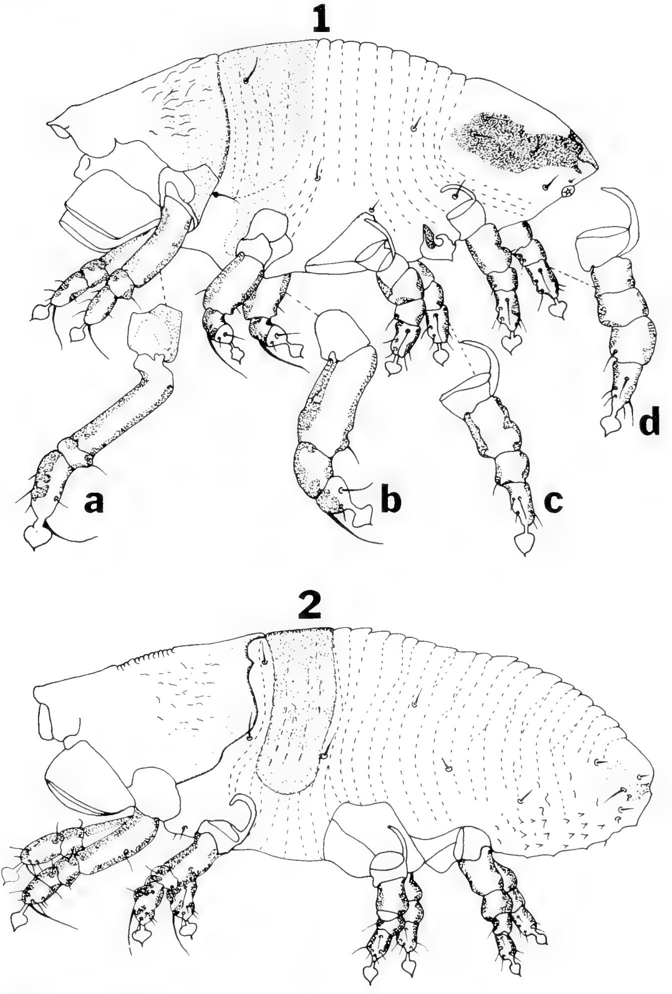
[1] Approved by the Director of the South Dakota Agricultural Experiment Station as Journal Series No. 1057.



Figs. 1, 2. *Olistrophorus cryptotae*, n. gen., n. sp.: 1, holotype male; 1a–d, enlargement of legs I–IV, respectively; 2, allotype female.

Asiochirus two other species, *A. platacanthomys* collected from *Platacanthomys lasiurus* (the spiny Dormice from India) and *Myospalax psilurus* (a mole-rat from China) were collected from hosts quite different from that of a shrew. The species *A. suncus* does not fit within the newly erected genus in this paper. Due to its close morphological association with listrophorids that have been taken from the order Rodentia it is believed that the possibility exists that the host *S. caeruleus giganteus* may be an accidental host of *A. suncus* and its true host is a member of the order Rodentia and was on the shrew due to the feeding habits of this large shrew.

Genus **Olistrophorus**, n. gen.

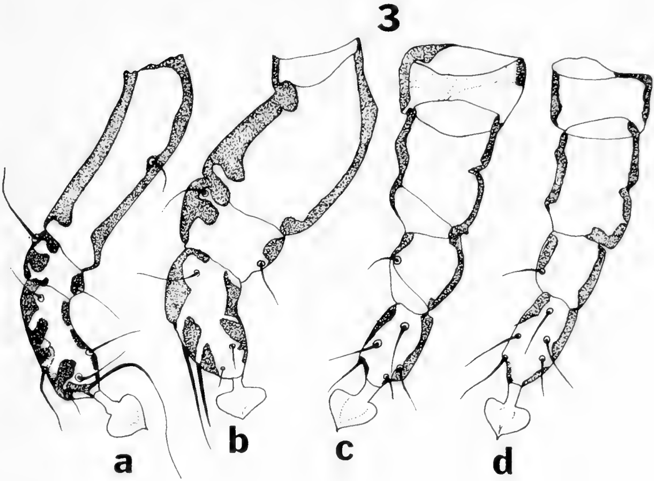
Type-species: *Olistrophorus cryptotae*, n. sp.

Body egg-shaped with pointed anterior head plate, males with large flattened aedeagus. Females with angle-like annulations on opistosomal region. Legs with numerous simple setae, flap-like region large extending to gnathosomal region. Propodosomal plate well developed with characteristic sclerotization and associated setae. Opistosomal plates of males either heavily or lightly sclerotized, anal suckers small associated with small setae.

Olistrophorus cryptotae, n. sp.

Male: Body laterally compressed, egg-shaped, numerous fine annulations posterior of propodosomal plate. Legs well-developed. Coxae I highly modified, of usual listrophorid type, that is with flap-like plates to clasp hairs of host (fig. 1). Dorsum with well-developed head, propodosomal and opistosomal plates. Head plate narrowing to a point at the anterior end, enclosing coxa of first pair of legs, beset with a pair of simple setae. Propodosomal plate extending to coxal region of second pair of legs, beset with two pairs of simple setae, one located on the dosal section of the plate, the other located on the lateral section of plate near coxa of second pair of legs. Opistosomal plate divided extending from coxal region of leg four to posterior end of body beset with four pairs of simple setae on each section. Ventrally the gnathosomal with prominent head plate covering mouthparts, not clearly delineated in mounted specimens. Coxae I well developed, flap-like, setae absent. A pair of simple setae placed between coxae of legs I. Extension of propodosomal plate extending to ventral region between coxa of legs I and II. Coxal apodemes of legs III and IV open. Two pairs of microsetae placed near apodemes of genitalia. Genitalia shaped as shown in fig. 1. A pair of anal suckers associated with a pair of microsetae. All legs with canicals, legs I longest, II shortest. Legs II and III subequal in length, III thicker than IV. Chaetotaxy of legs as shown in figs. 1a, 1b, 1c, 1d. Length .344 mm, width .149 mm, (taken between legs III and IV).

Female: Body laterally compressed as in male, numerous fine annulations. Legs well developed, similar in structure as male. Propodosomal plate similar to male. Opistosomal region without anal plates and anal suckers. Chaetotaxy of podosoma consisting of six pairs arranged as shown in fig. 2. Opistosoma and portions of metapodosoma with two types of annulations, dorsal region with typical line-like annulations, ventrally replaced by small angled-like humps. Chaetotaxy of opisto-



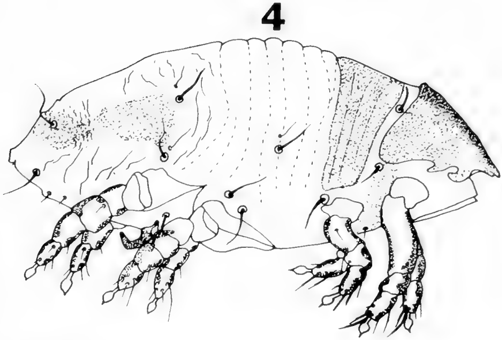


Fig. 3. *Olistrophorus cryptotae*, n. gen., n. sp.: 3a–d, enlargement of legs I–IV, respectively, of female. Fig. 4. *O. blarinae*, n. sp.: holotype male.

soma with six pairs of microsetae. Ventrally with Coxae I modified as male, genital area open not enclosed by leg apodemes. A pair of microsetae located between coxal apodemes of legs I and II. All legs with conicals. Chaetotaxy of legs as shown in figs. 3a, 3b, 3c, and 3d. Length .419 mm, width 1.67 mm (taken between legs II and III).

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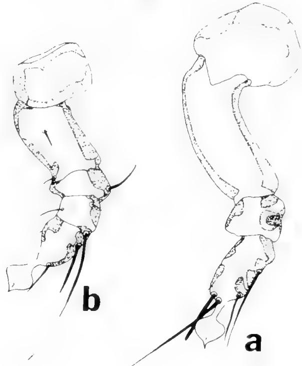

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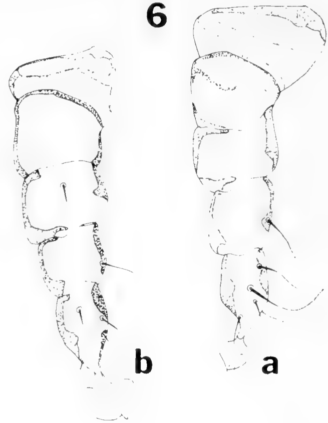

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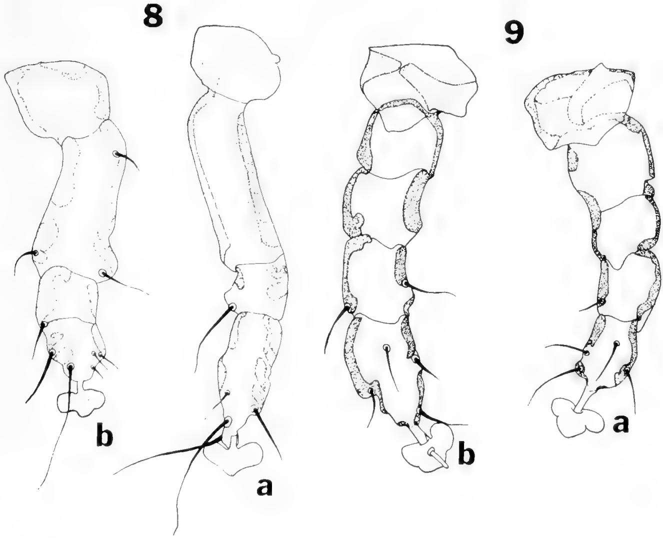
Figs. 5–7. *Olistrophorus blarinae*, n. gen., n. sp.: 5a–b, enlargement of legs I and II, respectively, of male; 6a–b, enlargement of legs III and IV, respectively, of male; 7, allotype female.

Type Material: Holotype male (colln. no. BMD 554), collected by B. McDaniel and H. D. Burnett, from the least shrew, *Cryptotis parva parva* (Say), 14 miles S.E. Kingsville, Kleberg Co., Texas, 6 February 1966, Host-male, (discarded). Allotype female (colln. no. BMD 555), with same collection data as holotype, Host-male, (discarded). Other paratypes include three males (colln. nos. BMD 556–8), all with same collection data as holotype, Host-BMD 556 female, BMD 557–8 male. Three females (colln. nos. BMD 559–11) collected in same locality as



Figs. 8, 9. *Olistrophorus blarinae*, n. gen., n. sp.: 8a–b, enlargement of legs I and II, respectively, of female; 9a–b, enlargement of legs III and IV, respectively, of female.

holotype, on 7 April 1963 by B. McDaniel and S. Casto. Holotype, allotype in United States Natural Museum; remaining material in the collection of the author.

Olistrophorus cryptotae, n. sp. is most closely related to *O. blarinae*, but differs from it by very distinctive shape of the male aedeagus, overall size of the female, *O. cryptotae* being larger than *O. blarinae*, the absence of the enlarged setae between the coxal apodemes of leg IV of the female and shape of the propodosomal shield of both male and female extending to ventor.

Olistrophorus blarinae, n. sp.

Male: Body laterally compressed, egg-shaped, numerous fine annulations posterior of propodosomal plate. Legs well-developed. Coxae I modified of usual listrophorid type, that is with flap-like plates to clasp hair of host (fig. 4). Dorsum with well-developed head, propodosomal and opistosomal plates. Head plate narrowing to a point at anterior end, with rounded lateral margins and associated with flap-like plates of coxae I. Propodosomal plate as shown in fig. 4 with two pairs of simple setae located near margin of head plate. Opistosomal plate lightly sclerotized, located near posterior region of the opistosomal region. Anal suckers present. Dorsal setae arranged as shown in fig. 4. Ventrally the gnathosoma with prominent head plate covering mouth parts, not clearly delineated in mounted specimens. Genitalia well-developed associated with a pair of small setae, shape as shown in fig. 4. All legs with conicals, legs I longest, II shortest. Legs II and IV subequal in length and width. Chaetotaxy of venter and legs as shown in figs. 5a, b, 6a, b. Length .326 mm, width .140 mm (taken between legs II and IV).

Female: Body shaped as in male, except opistosomal region narrowing at most posterior region into a more blunted terminal ending. Propodosomal plate similar to male. Chaetotaxy of dorsum as shown in fig. 7. Opistosomal and portions of metapodosoma with two types of annulations, region anterior to legs IV with typical line-like annulations, region behind legs IV with angled-like annulations. Ventrally with two pairs of genital suckers between legs II and III. A large pair of club-like setae located between apodemes of legs IV. All legs with conicals. Chaetotaxy of legs and venter as shown in figs. 8a, b, 9a, b. Length .400 mm, width .167 mm (taken between legs II and III).

Type Material: Holotype male (JOW-5176-a) together with three male paratypes (JOW 5176b, c, d), collected by J. O. Whitaker, Jr., from *Blarina brevicauda*, Willow Slough, Newton County, Indiana, 16 August 1969. Allotype female (JOW 517e), with same data as type. Other paratypes include two females, JOW 5263, 5264, from *Blarina brevicauda*, Turkey Run, Parke County, Indiana, 8 October 1969. Holotype, allotype, in United States Natural Museum, remaining material in collection of authors.

Olistrophorus blarinae, n. sp. is most closely related to *O. cryptotae*, but differs from it by the difference in the shape of the male aedeagus, the smaller size of the female, and the presence of the enlarged setae between the coxal apodemes of leg IV of the female.

Reference

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ADDITIONAL NOTES ON THE TAXONOMY OF THE GENUS ZENORIA (COLEOPTERA: COCCINELLIDAE)

ROBERT D. GORDON, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture*[1]

ABSTRACT—In this paper four new species are described, *Zenoria* **formosa,** Z. **purpurea**, Z. **peruviana**, and Z. **dozieri**. The types of 3 species of *Zenoria* not previously examined are discussed, *Ladoria rudepunctata* Crotch is placed in synonymy with *Zenoria revestita* Mulsant, and data from the specimens of *Zenoria* in the Paris Museum are listed.

Since my revision of *Zenoria* (Gordon, 1971) I have been able to examine additional type material in the Sicard Collection (Paris) and the Dejean Collection (Lyon). Three of the 4 types not previously examined have been located and 57 specimens of *Zenoria* in the Sicard Collection, are included herein. Nine specimens of *Zenoria* from Peru, collected by B. K. Dozier, were examined and 3 new species are herein described from this material.

I am indebted to Mme. Bons of the Museum National d'Histoire Naturelle, Paris, for her assistance during a recent visit there, to M. David of the Museum d'Histoire Naturelle, Lyon, for allowing me to examine material in the Dejean Collection of Coccinellidae, and to H. H. Dozier for the Peruvian specimens. The habitus view of *Zenoria ratzeburgi* Mulsant presented here was prepared by Mr. Arthur Cushman.

Zenoria subcostalis Mulsant

In addition to the specimens of *subcostalis* previously recorded (Gordon, 1971), 2 undetermined specimens labeled "Guyane, Saint Laurent du Maroni" and "Bogota" were found in the Sicard Collection. This species was previously recorded only from Colombia.

Zenoria ratzeburgi Mulsant
(Fig. 1)

Mulsant's type material of *ratzeburgi* was not located previously; but a single female specimen, found in the Paris Museum general collection is almost certainly an unmarked type. This specimen, bearing the following labels, is here designated as the lectotype of *ratzeburgi*: "Museum Paris, Bresil, Minas-Geraes a Goyaz, de Castelnau 19–47"; "242"; "Zenoria ratzeburgi Muls., auct. det."

It was previously thought that *ratzeburgi* might be synonymous with

[1] Mail address: c/o U. S. National Museum, Washington, D.C. 20560.

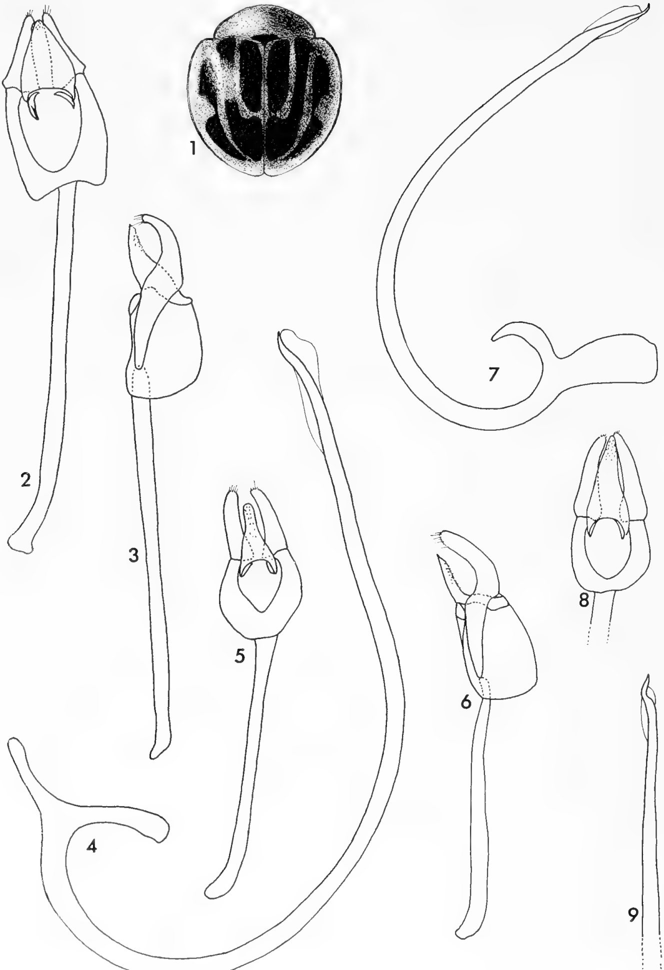


Fig. 1, *Zenoria ratzeburgi* Mulsant (habitus). Figs. 2–9, male genitalia. *Z. rodolioides* Crotch: 2, phallobase, ventral; 3, phallobase, lateral; 4, sipho. *Z. formosa*, n. sp.: 5, phallobase, ventral; 6, phallobase, lateral; 7, sipho. *Z. linteolata* Mulsant: 8, phallobase, ventral; 9, sipho.

subcostalis but examination of the type of *ratzeburgi* indicates that it is a distinct species. The vittate color pattern (fig. 1) is not at all like that of any presently known species of *Zenoria.*

Zenoria pilosula Mulsant

The single female specimen with the label "Carthagena, Lebas," standing in the Dejean Collection, is here designated as the lectotype of *pilosula.* Mulsant (1850) listed the Dejean Collection as the only collection in which he had found this species. The specimen previously described as *pilosula* (Gordon, 1971) from the Crotch Collection is apparently the same species as the lectotype and agrees with it in all respects. One additional female specimen was found in the Sicard Collection, under the name "*pilosula,*" bearing the label "Cayenne."

Zenoria pallida Gordon

A single male specimen of *pallida* is present in the Paris Museum material. It is labeled "Santarem" and may be considered topotypical.

Zenoria rodolioides Crotch
(Figs. 2, 3, 4)

A second specimen of this species, a male, was found in the Sicard Collection, named as *rodolioides* and bearing the label "Brasil." This is an extremely distinctive species with the elytra red and the pronotum yellow. The colors on the specimen in the Sicard Collection are considerably brighter than those on the type in the Crotch Collection. The male genitalia (figs. 2, 3, 4) are somewhat like those of *Z. variabilis* Gordon, but the basal lobe is broader in ventral view and much thicker in lateral view.

Zenoria delicatula Weise

A single female specimen in the Sicard Collection is apparently this species and matches Weise's description exactly. Weise did not state where his specimens were collected but he received them from the Museum Paulista in São Paulo. The specimen in the Sicard Collection bears the label "S. Paulo." Males are needed here to establish the relationship of *delicatula* to the other species of *Zenoria,* but I believe it may safely be assumed that *delicatula* is a valid species.

Zenoria crotchi Gordon

A single female specimen in the Sicard Collection, labeled "Itaituba, Amazonas" is this species. Another specimen, a female labeled "Guyane, Maroni," may belong here but has the discal spot nearly black rather than green as in typical *crotchi.* Males from the latter locality are needed for positive identification.

Zenoria annularis Gordon

Two specimens in the Sicard Collection are definitely this species; and a female from French Guiana, St. Laurent du Maroni may also belong here. The specimen from French Guiana has the dark green elytral spot reduced, occupying the central fourth of the elytra, but agrees well with *annularis* in all other respects. One of the 2 specimens of *annularis* bears no data, and the other is labeled "Itaituba, Amazonas."

Zenoria discoidalis (Kirsch)

Three specimens of *discoidalis* are in the Sicard Collection, one labeled simply "Peru," the others labeled "Pachitea, Perou."

Zenoria formosa, n. sp.
(Figs. 5, 6, 7)

Holotype Male.—Length 3.50 mm, width 2.98 mm. Form round, slightly elongate. Color mainly black; head, propleuron and legs yellow; pronotum black with anterior and lateral margins broadly yellow; elytron dark metallic green with apical tenth yellow. Pronotum with yellowish white, semi-decumbent pubescence, average length of hairs 0.15 mm; punctures fine, separated by their diameter or less; width to length ratio of pronotum 2.00 to 0.81 mm. Elytron with pubescence nearly completely absent; punctures coarse, deep, separated by their diameter or less, becoming shallow and separated by twice their diameter on disc, interspersed fine punctures separated by 1 to 4 times their diameter; margin of elytron moderately explanate; epipleuron with inner carina reaching outer margin. Postcoxal line extending caudad to hind margin of first abdominal sternum, outer end curved, extending cephalad. Genitalia with basal lobe shorter than paramere, broad at base, narrowed medially, parallel-sided to apex, apex bluntly rounded; parameres slightly narrowed apically, curved toward each other (figs. 5, 6); sipho with tip pointed, curved upward (fig. 7).

Female.—Similar to male except pronotum with anterior margin narrowly yellow, lateral margin yellow only in apical half.

Variation.—The pronotal color in the male varies from that described above to a form in which the pronotum is entirely yellow except a small black area on the basal projection. The apex of the elytron may have the apical eighth yellow. The pubescence on the elytron, badly rubbed on the holotype, is distinctly present on the paratypes.

Holotype.—Colombia: Cali, IX-X-1.94(1894), W. Rosenberg (Paris Museum).

Paratypes.—Total 5. 3, Colombia, R. Dagua, W. Rosenberg; 2, Colombia, Chimbo, 1000′, VIII-97. (Paris Museum and U. S. National Museum).

Discussion.—In both external appearance and male genitalia *formosa* resembles *schwarzi* Gordon. It also resembles *linteolata* Mulsant in external appearance but the male genitalia are quite different. *Z. formosa* will key to couplet 28 in the key to species of *Zenoria* (Gordon, 1971). The male genitalia must be used to distinguish *formosa* from *linteolata* (now *nigricollis*, n. sp.) and *flavicollis* Gordon, but the distribution pattern is of some importance here as neither *flavicollis* or *nigricollis* are known to occur in Colombia. The lack of a pale lateral border on the elytron will separate *formosa* from *schwarzi.* Also, *schwarzi* is known only from Panama and *formosa* is known only from southern Colombia.

Zenoria variabilis Gordon

Prior to my examination of the Paris Museum material, *variabilis* was known only from Peru. There are 4 specimens of *variabilis* in the Paris Museum material, all from Bolivia, bearing the following data: "Salinas, Beni R., VII-95, M. Stuart"; "Chaco, Bolivie"; "Guanay, Mapiri R., 1300 ft., VIII-95, Stuart." Two of these specimens are immaculate dorsally, the other 2 have an elytral pattern not previously described for this species. There are 3 brown areas on the elytron; a large, irregular area near the lateral border just anterior to the middle, a small, round area on the disc not touching the suture, and an irregular, transverse area on the apical third which touches the suture.

Zenoria emarginata Gordon

A single male of *emarginata* labeled "Cayenne" is present in the Paris Museum material. The color pattern is like that of a form of *subcostalis* Mulsant (fig. 13, Gordon, 1971) except that the black border on the elytron extends to the suture at base, but the male genitalia are those of *emarginata*. *Z. emarginata* was previously known only from Trinidad.

Zenoria revestita Mulsant

Zenoria revestita Mulsant, 1850, p. 900.

Ladoria rudepunctata Crotch, 1874, p. 280.—Korschefsky, 1931, p. 231.—Blackwelder, 1945, p. 451. NEW SYNONYM.

Examination of the type specimen of *Ladoria rudepunctata* in the Crotch Collection, Cambridge University, indicates that it is a synonym of *Zenoria revestita.*

There are 6 specimens of *revestita* in the Paris Museum collection, 1 labeled "Bresil," the others labeled "Tijuca (Rio), Bresil, E. Gounelle, 12-1884."

Zenoria similaris Gordon

There are 3 specimens of *similaris* in the Paris Museum collection labeled "Oazaca, Mexico, Hoege"; "Teapa, Tabasco, Feb., H. H. S."; "Bugaba, Panama, Champion." None of these localities was previously recorded.

Zenoria patula Gordon

The female of this species was not previously known but 1 of the 3 specimens in the Paris Museum material is a female. The female is similar to the male except that the head is entirely black and the pronotum is also black except for a narrow, yellow, anterolateral border. All 3 specimens are labeled "Tijuca (Rio), Bresil, E. Gounelle, 12-1884."

Zenoria linteolata Mulsant
(Figs. 8, 9)

It was previously assumed (Gordon, 1971) that 2 female specimens in the Crotch collection from Brazil and 1 male from British Guiana in the USNM collection were this species. At that time the location of the type or types of *linteolata* was unknown. Since then a specimen in the Sicard Collection, was found which is almost certainly a type. Mulsant (1850) stated that the material he saw was in the Mocquerys Collection. In the Sicard Collection are a number of specimens labeled "Mocquerys," usually corresponding to those species Mulsant had from Mocquerys. Apparently Sicard acquired some or all of the Mocquerys Coccinellidae. A single male bearing the following labels and a black disc and a green disc, standing under the name "*Z. linteolata*" in the Sicard Collection, is here designated as lectotype: "a Mocquerys"; "*Zenoria linteolata.*"

Lectotype Male.—Length 3.33 mm, width 2.85 mm. Form round, slightly elongate. Color mainly black; head, propleuron, entire anterior leg, apex of femur and entire tibia and tarsus of middle and hind legs, and abdomen yellow; pronotum black with anterior and lateral margins bordered with yellow, yellow not extending to hind margin of pronotum; elytron dark metallic green. All dorsal pubescence rubbed off. Pronotal punctures fine, separated by their diameter or less; width to length ratio of pronotum 1.87 to 0.85 mm. Coarse punctures on elytron deep, separated by less than their diameter, not present on disc, interspersed fine punctures separated by 1 to 4 times their diameter; lateral margin of elytron feebly explanate, sinuate; epipleuron with inner carina extending half the distance to outer margin. Postcoxal line extending caudad to hind margin of first abdominal sternum, outer end abruptly curved cephalad. Male genitalia with basal lobe subequal in length to paramere, tapering gradually, evenly, from base to bluntly pointed apex (fig. 8); sipho with apex slightly curved upward, pointed, all except apical third lost (fig. 9).

Female.—Not known.

Type locality.—Brazil (Mocquerys).

Type depository.—Paris Museum (lectotype here designated).

Discussion.—*Z. linteolata* runs to couplet 28 in the key to *Zenoria* (Gordon, 1971). Male genitalia are needed to separate this group of species.

Zenoria nigricollis, n. sp.

This is the species previously described as *Zenoria linteolata* Mulsant (see Gordon, 1971). The male specimen in the USNM from British Guiana, Bartica District, Kartabo, is here designated as the holotype of *nigricollis*. The other 2 specimens previously discussed, both females in the Crotch Collection, may or may not be conspecific and are not designated as paratypes.

Zenoria flavicollis Gordon

A single male from Brazil, labeled "Ega," is in the Paris Museum. The pronotum is not as described for the holotype, being nearly all black with anterior and lateral margins yellow, the yellow not extending to base of pronotum. The larger size of *flavicollis* will probably separate that species from *linteolata*, but male genitalia are needed to separate *flavicollis* from *nigricollis*. The Paris Museum specimen of *flavicollis* is topotypical.

Zenoria major Crotch

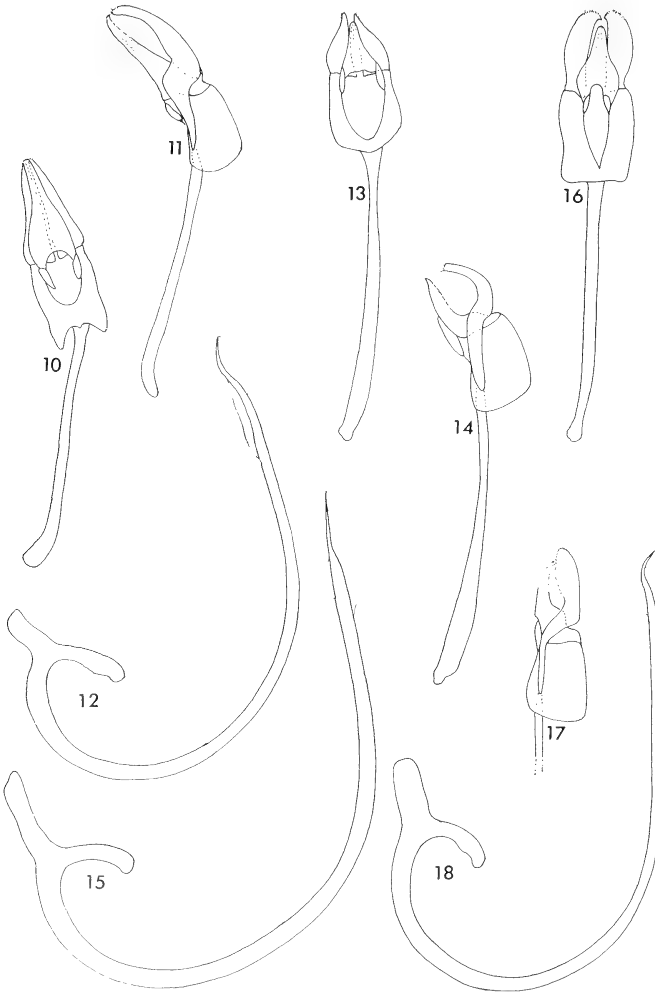
A single female specimen from Brazil, Santarem, is almost certainly this species. It bears the label "Santarem (Bates)," agrees in all respects with the type specimen, and may be considered a topotype.

Zenoria carinata Gordon

A female specimen labeled "Guyane Francse, Laurent du Maroni, collection le Moult" is in the Paris Museum collection. It is the third specimen of *carinata* to be recorded, the others being from Surinam. The male is still unknown.

Zenoria purpurea, n. sp.
(Figs. 10, 11, 12)

Holotype Male.—Length 3.36 mm, width 2.75 mm. Form round, slightly elongate. Color mainly yellow; pronotum black with broad lateral and anterior margin yellow; elytron dark metallic purple; meso- and metasternum black; abdomen reddish yellow. Pronotum sparsely covered with grayish white, semidecumbent pubescence, average length of hairs 0.12 mm; punctures fine, separated by their diameter or less; width to length ratio of pronotum 2.00 to 0.85 mm. Elytron with sparse, grayish white, semi-erect pubescence, average length of hairs 0.15 mm; coarse punctures shallow, separated by their diameter or less, becoming smaller and sparse on disc, interspersed fine punctures separated by 1 to 4 times their diameter; margin of elytron broadly explanate; epipleuron with inner carina extending half the distance to lateral margin. Postcoxal line reaching hind margin of first abdominal sternum, abruptly bent forward, apex nearly reaching coxal cavity. Abdomen with 6th sternum deeply notched, notch occupying apical half of sternum; 5th sternum depressed medially. Male genitalia with basal lobe equal in length to paramere, apex curved upward in lateral view, bluntly pointed; para-



Figs. 10–18, male genitalia. *Zenoria purpurea*, n. sp.: 10, phallobase, ventral; 11, phallobase, lateral; 12, sipho. *Z. peruviana*, n. sp.: 13, phallobase, ventral; 14, phallobase, lateral; 15, sipho. *Z. dozieri*, n. sp.: 16, phallobase, ventral; 17, phallobase, lateral; 18, sipho.

mere narrowed toward apex (figs. 10, 11); sipho with apex curved slightly upward (fig. 12).

Female.—Similar to male except 6th sternum entire, 5th sternum emarginate. Head with black spot on vertex, pronotum entirely black except narrow anterior border between eye and anterolateral angle yellow.

Variation.—Length 3.36 to 3.60 mm, width 2.75 to 3.05 mm.

Holotype.—Peru: Iquitos, Mar. 24, 1969, B. K. Dozier (USNM 71721).

Paratypes.—Total 2. Peru: same data as holotype. (H. L. Dozier collection).

Discussion.—The metallic purple elytron will immediately separate *purpurea* from any presently described species of *Zenoria*. The emarginate 5th sternum of the female is also unusual in the genus. The male genitalia are most like those of *Z. tricolor* Nunenmacher but the basal lobe is sinuate and distinctly bent upward at the apex in lateral view in *purpurea*, nearly straight and just perceptibly curved upward at apex in *tricolor*. In the key to species of *Zenoria* (Gordon, 1971) *purpurea* goes to couplet 6 where the purple elytron will separate it.

Zenoria peruviana, n. sp.
(Figs. 13, 14, 15)

Holotype Male.—Length 3.71 mm, width 3.15 mm. Form nearly round, slightly elongate. Color mainly yellow; pronotum with median basal projection black; elytron dark metallic green with a small yellow area along lateral margin at humeral angle; meso- and metasternum black, abdomen reddish brown. Pronotum with grayish white, semidecumbent pubescence, average length of hairs 0.12 mm; punctures fine, separated by less than to 3 times their diameter; width to length ratio of pronotum 2.38 to 1.10 mm. Elytron with dense grayish white, semi-erect pubescence, average length of hairs 0.16 mm, discal area with an indistinct spot caused by dark brown pubescence; coarse punctures deep, separated by their diameter or less, not extending onto disc, interspersed fine punctures separated by less than to 4 times their diameter; margin of elytron distinctly explanate; epipleuron with inner carina extending half the distance to lateral margin. Postcoxal line nearly reaching hind margin of first abdominal sternum, abruptly bent forward, apex nearly reaching coxal cavity. Abdomen with 6th sternum notched, 5th sternum depressed medially. Male genitalia with basal lobe subequal in length to paramere, in lateral view tapered to pointed apex, in ventral view strongly narrowed from base to midpoint, gradually narrowed from midpoint to bluntly rounded apex; paramere strongly curved downward, outer margin widely flared near base (figs. 13, 14); sipho with apex nearly straight, attenuate (fig. 15).

Female.—Not known.

Holotype.—Peru: Iquitos, 100 mi. N.E. on Napo River, Mar. 18, 1969, B. K. Dozier (USNM 71722).

Paratype.—Total 1. Peru: same data as holotype. (H. L. Dozier collection).

Discussion.—*Z. peruviana* will go to couplet 28 in the key to species of *Zenoria.* The male genitalia must be used to separate *peruviana* from the other species with this type of color pattern. The genitalia are most like those of *paprzycki*, but the basal lobe is thickened, not bent upward in *peruviana* and is more abruptly narrowed medially in ventral view.

Zenoria dozieri, n. sp.
(Figs. 16, 17, 18)

Holotype Male.—Length 3.90 mm, width 3.43 mm. Form round, slightly elongate. Color mostly black; head, narrow anterior and anterolateral angle of pronotum, propleuron, prosternum and legs yellow; elytron black with shining discal spot of dark brown pubescence, lateral fourth of elytron with metallic bronze and green lustre. Pronotum with grayish white, semidecumbent pubescence, average length of hairs 0.10 mm; punctures fine, separated by 1 to 3 times their diameter; width to length ratio of pronotum 2.30 to 0.81 mm. Elytron with grayish white, semi-erect pubescence, average length of hairs 0.15 mm; coarse punctures deep, separated by their diameter or less, not extending onto disc, interspersed fine punctures separated by to 4 times their diameter, lateral margin of elytron distinctly explanate, sinuate; epipleuron with inner carina extending nearly to outer margin. Postcoxal line reaching hind margin of first abdominal sternum, abruptly curved forward, nearly reaching coxal cavity. Male genitalia with basal lobe shorter than paramere, in lateral view curved upward apically, in ventral view abruptly narrowed to bluntly rounded apex in apical half; paramere inflated, in lateral view constricted near base, in ventral view inner apical angle with a small tooth (figs. 16, 17); sipho straight before apex, curved downward and recurved at apex (fig. 18).

Female.—Not known.

Holotype.—Peru: Iquitos, Mar. 24, 1969, B. K. Dozier (USNM 71723).

Discussion.—The male genitalia of *dozieri* resemble somewhat those of *discoidalis* Kirsch in having the paramere inflated with an apical tooth. The basal lobe is quite different in the 2 species. *Z. dozieri* goes to couplet 25 in the key to species of *Zenoria*, and here the male genitalia are quite different from those of *patula* or *serva.* If the presence of the metallic bronze and green lateral border on the elytron of *dozieri* proves to be constant it will immediately distinguish that species.

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CHLOROPID FLIES ATTRACTED TO SYNTHETIC CHEMICAL LURES

JOHN A. FLUNO,[1] HARRY G. DAVIS,[2] *and* WM. M. ROGOFF,[2] *Entomology Research Division, Agricultural Research Service, U.S. Department of Agriculture*

ABSTRACT—Species of Chloropidae in Maryland, Florida, Idaho, Oregon, and Washington were attracted to 2,4-hexadienyl butyrate, 2,4-hexadienyl propionate, and heptyl butyrate. However, species of chloropid gnats of economic importance did not respond.

After the initial discovery in 1962 (Davis et al., 1967) that 2,4-hexadienyl butyrate, 2,4-hexadienyl isobutyrate, and 2,4-hexadienyl propionate were attractive to the yellow jacket, *Vespula pensylvanica* (Saussure), in Oregon, the senior author tested these lures against eastern species of *Vespula* in Silver Spring, Maryland. Thus, he opened a bottle of 2,4-hexadienyl butyrate at 5:05 p.m. EDST on May 10, 1963. Within 5 minutes, he was surprised to find small gnats gathering around the bottle. Four of the gnats were collected, and C. W. Sabrosky subsequently determined them to be *Tricimba trisulcata* (Adams), a species of the family Chloropidae.[3]

From time to time during the summer of 1963 more gnats were collected in Maryland with 2,4-hexadienyl butyrate. The senior author also collected gnats with this lure in June 1965 at Winter Park, Florida and with 2,4-hexadienyl propionate at Gainesville, Florida. In addition, the junior authors trapped gnats in Farragut State Park, Idaho in July 1969 and in The Dalles, Oregon, and Pullman, Washington in August 1970 with still another yellow jacket lure, heptyl butyrate (Davis et al., 1969).

The present paper reports on the collections.

COLLECTIONS IN MARYLAND IN 1963

Between May 11 and September 26, 1963, 415 specimens of gnats were attracted to 2,4-hexadienyl butyrate. In all, 9 species in 4 genera were identified from the collection as follows:

Conioscinella flavescens (Tucker)—12 specimens
C. melancholica (Becker)—2 specimens
C. species near *hinkleyi* (Malloch)—2 specimens
Olcella cinerea (Loew)—75 specimens
O. parva (Adams)—113 specimens

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[1] Beltsville, Maryland 20705.
[2] Fresno, California 93727.
[3] We wish to acknowledge the assistance of C. W. Sabrosky, Systematic Entomology Laboratory, U.S. Department of Agriculture, Washington, D.C. Dr. Sabrosky determined most of the specimens in this study.

O. trigramma (Loew)—94 specimens (of 7 examined, 2 were males, 5 were females)
Oscinella coxendix (Fitch)—1 specimen
O. minor (Adams)—1 specimen
Tricimba trisulcata (Adams)—119 specimens (22 examined were females)

Collections in Florida in 1965

Gnats attracted to 2,4-hexadienyl butyrate at Gainesville, Florida, on June 21, 1965, included *Conioscinella flavescens* and *Olcella parva* and three other species not collected in Maryland: *Conioscinella submarginalis* (Sabrosky), *Hippelates dissidens* (Tucker), and a species of *Olcella,* probably *quadrivittata* (Sabrosky).

A similar test on June 30, 1965, with 2,4-hexadienyl propionate at Winter Park, Florida yielded tremendous numbers of *Conioscinella flavescens* and *Olcella cinerea.*

Collections in Idaho in 1969

In July 1969, yellow jacket traps baited with heptyl butyrate were operated by the second author in Farragut State Park, Idaho, at the site of the National Boy Scout Jamboree. Some gnats captured in the traps with the wasps were identified by Dr. Maurice James of the Department of Entomology, Washington State University, Pullman, as *Oscinella melancholica* Becker (now *Conioscinella melancholica* (Becker)). Dr. Sabrosky subsequently confirmed the determination and also found single specimens of a species of *Oscinella* and a *Tricimba* and 20 specimens of a *Conioscinella* sp. near *triorbiculata* (Sabrosky), which may be a new species.

Because of the large number of traps and specimens taken in the Idaho study, it was not feasible to carry identification beyond those noted. The junior authors therefore agreed upon a classification system of gnat abundance and limited the observations to sample traps. As a result, 50 traps each at 4 of the 20 trapping sites in the Jamboree area were considered as representative samples, and a gnat count was conducted with these traps only. Furthermore, of these traps containing over 90 gnats each, only one from each of the four sites—the one with the largest apparent number of the gnats—was fully counted. The classification gave the following results:

	Total traps	*% of Total*
Traps with no chloropids	11	5.5
Traps with 1–49 chloropids each	77	38.5
Traps with 50–89 chloropids each	70	35.0
Traps with 90 or more chloropids each	42	21.0

The maximum numbers of gnats counted were 189, 203, 262, and 277.

Collections in Oregon in 1970

In August 1970, a large number of traps baited with heptyl butyrate were operated for yellow jacket studies at The Dalles, Wasco County, Oregon. Chloropidae taken in these traps were identified by C. W. Sabrosky as *Olcella* spp., *Tricimba occidentalis* Sabrosky, *Oscinella* (probably a new species), and *Conioscinella melancholica* (Becker). In a sample sent for identification, there were 9 *Olcella*, 4 *Tricimba*, 111 *Oscinella*, and 4 *Conioscinella*. Also, there were specimens of Milichiidae, Cecidomyiidae, and Ceratopogonidae. As with the Idaho collections, too many specimens were collected for individual identification. The three groups of 50 traps were therefore classified as follows:

	Total traps	*% of Total*
Traps with no chloropids	25	17
Traps with 1–49 chloropids each	108	72
Traps with 50–89 chloropids each	14	9
Traps with 90 or more chloropids each	3	2

Collections in Washington 1970

In August 1970 traps baited with heptyl butyrate were operated in connection with yellow jacket studies at the apiary of the Washington State University at Pullman. Chloropids taken in these traps were determined by C. W. Sabrosky as *Tricimba occidentalis* Sabrosky and *Conioscinella* n. sp. (?) near *triorbiculata* Sabrosky. Four specimens of the first and 13 of the second species were sent for determination. No counts were made of the total numbers of gnats taken.

Discussion

The collection of 14-plus species of chloropids in 5 genera in Maryland, Florida, Idaho, Oregon, and Washington suggest that 2,4-hexadienyl butyrate, 2,4-hexadienyl propionate, and heptyl butyrate are highly attractive to at least some kinds of chloropid gnats. *Hippelates pusio* Loew, an important pest of man and animals in Florida, did not respond to the attractants; however, it was not abundant at the time of collecting, and trapping was not conducted in an area of known abundance of this pest. The species that were collected are of no known economic importance. In this connection, it is of note that in 1970 Beavers et al. (1972) attracted *Hippelates pusio* Loew near Orlando, Florida, to 2,4-hexadienyl butyrate.

We have not discussed the traps used in the various studies because to do so in detail would suggest an importance of trap design that was not observed. However, for the record, glass jars with screen cones and water-filled moat traps (the attractant in a pie dish with detergent-water mixtures to drown the victims) were tried in Maryland, and both gave good catches. The pie-dish trap was used in Florida. A paper ice cream carton trap with a screen cone was used in Idaho, Oregon, and Washington.

Our observations suggest that an effective attractant might be found for such economically important chloropids as the species of *Hippelates* commonly referred to as eye gnats and for the frit fly, *Oscinella frit* (L.). Since specimens not commonly collected were found in the samples, the study also suggests that many synthetic attractants now being studied might be employed by taxonomists as a means of collecting material of interest.

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OVATUS RETICULATUS, A NEW SPECIES OF APHID FROM OXALIS IN NORTH CAROLINA

(HOMOPTERA: APHIDIDAE)[1]

O. E. HEIE, *Department of Biology, Skive Seminarium, DK-7800 Skive, Denmark*

ABSTRACT—The apterous viviparous female, the oviparous female, and the brachypterous male of *Ovatus* **reticulatus**, n. sp. are described. The new species, which is related to *Ovatus phloxae* (Sampson, 1939), but much darker, lives on *Oxalis ?stricta* in the mountains of North Carolina, being holocyclic and not host alternating.

The following description of a new North American aphid species is based on a sample consisting of apterous viviparous females and sexuales collected by me in North Carolina in 1961. I realized that it belonged to an undescribed species, but hesitated to describe it. This

[1] Manuscript submitted through and recommended for publication by Louise M. Russell, Systematic Entomology Laboratory, U.S. Department of Agriculture.

could better be done by some one having better opportunities than I to study the species in nature. But, after ten years, this has not happened, and therefore I describe the species, hoping that the description may give rise to further finds and augmented knowledge of its ecology.

Ovatus reticulatus, n. sp.

Apterous viviparous female:

Body broadly oval. Tergum sclerotic, with a heavily pigmented shield from mesonotum to VIth abd. tergite, including the marginal parts; VIIth abd. tergite free, sclerotic; VIIIth abd. tergite with transverse, dark bar; a small pale area in front of each siphunculus (fig. 1 B). Pigmented area with very conspicuous polygonal reticulation, not, except on VIIth and VIIIth tergites, formed by rows of spinules but by black lines or rather ridges (visible as such in the margins). A similar, but less distinct kind of reticulation in the non-pigmented cuticle of thorax and abdomen. Pleural and marginal intersegmental muscular sclerites occur in the pigmented area, with rather small, subcircular, hexagonal cells. Body hairs few in number, very short, blunt; VIIIth abd. tergite with 4–6 hairs; length of dorsal body hairs about ⅓ of the basal diameter of IIIrd antennal segment. Small, flat marginal tubercles irregularly present on tergites II–V. Head and Ist and IInd antennal segments very dark, scabrous, partly imbricated or scaly (fig. 1 A). Frons concave, with well developed lateral tubercles, the inner margins of these almost parallel, but diverging a little. Antenna 6-segmented, markedly imbricated, a little shorter than body; IIIrd segment pale, like IVth segment with faintly brownish apex, Vth segment with dark apex, VIth segment all very dark; secondary rhinaria absent; processus terminalis 4.3–4.8 × length of basal part of VIth segment, 1.3–1.5 × length of IIIrd segment; IVth and Vth segments of about equal length; longest hair on IIIrd antennal segment only about ¼ of basal diameter of that segment. Rostrum reaching a little past 2nd coxae; apical segment shorter than 2nd segment of hind tarsi, with 4 short accessory hairs (one or two may be missing) (fig. 1 F). Legs pale, with faintly darker apices of tibiae and quite dark tarsi; femora distally and ventrally somewhat imbricated; tibiae without small spines besides the normal hairs in adults and nymphs; first tarsal segments with 3–3–2 hairs; 2nd segment of hind tarsi about as long as basal part of VIth antennal segment. Siphunculi about ⅕ body's length, about 2¼ × length of cauda, uniformly dark, evenly imbricated, rather slender, but broad at base; the basal half tapering, the distal fourth or fifth a little swollen, slightly constricted below the small, but conspicuous flange. Cauda elongated triangular, rather acute, dark, with 4–8 hairs.

Color while alive shining black. Larvae not shiny.

Body length about 1.67–1.83 mm.

Measurements of holotype in mm: Body 1.80; antenna 1.77, antennal segments: I 0.10, II 0.09, III 0.38, IV 0.30, V 0.27, VIa 0.12, VIb 0.51; siphunculus 0.36, cauda 0.16, apical segment of rostrum 0.09, 2nd segment of hind tarsi 0.11.

Oviparous female (one specimen):

The sclerotic, distinctly reticulated area from mesonotum to VIth abd. tergite rather pale; VIIth and VIIIth tergites with dark bars. Siphunculi rather thick towards apex, narrowly hour-glass-shaped, hardly twice as long as cauda. Proximal

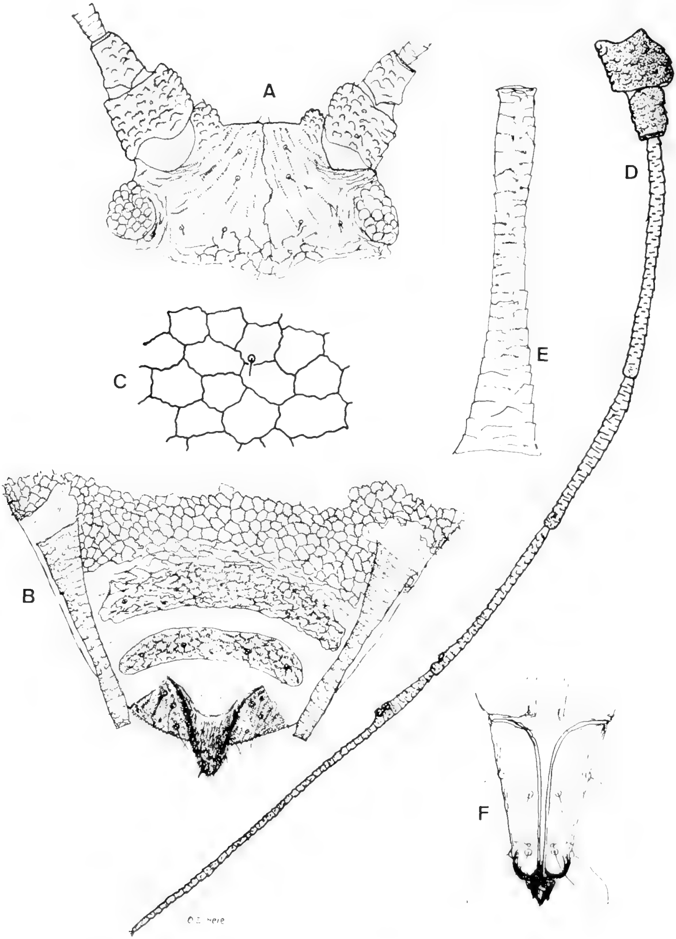

Fig. 1. *Ovatus reticulatus*, n. sp., apterous viviparous female: A, head in dorsal view (100×); B, posterior part of body (100×); C, reticulation pattern of tergum in high magnification; D, antenna (100×); E, siphunculus (145×); F, apical segment of rostrum (270×).

half of hind tibiae swollen, diameter about 2 × diameter of distal part, with about 30 pseudosensoria. Otherwise like apterous viviparous female.

Color unknown, probably black.

Measurements in mm: Body 1.64; antenna 1.46, antennal segments: I 0.09, II 0.07, III 0.29, IV 0.23, V 0.23, VIa 0.10, VIb 0.45; siphunculus 0.29, cauda 0.15, apical segment of rostrum 0.09, 2nd segment of hind tarsi 0.11.

Alate male (one specimen):

Brachypterous, wings useless, venation indistinct. Antennae and legs darker than in apterous viviparous female. Abdomen with marginal sclerites and spinal bars, both with very distinct reticulation, dark spots at the spiracles and intersegmental muscular sclerites in pleural and marginal positions. Antennae 6-segmented, longer than body; IIIrd segment with 8–11 extremely small, irregularly arranged rhinaria, IVth segment with 7, Vth segment without secondary rhinaria. Siphunculi almost cylindrical, thinnest in the middle, rather short, only about 0.15 of body's length, hardly twice as long as cauda. Cauda short, triangular, with 9 hairs.

Color unknown.

Measurements in mm: Body 1.30; antenna 1.49, antennal segments: I 0.08, II 0.06, III 0.32, IV 0.22, V 0.24, VIa 0.08, VIb 0.49; siphunculus 0.19, cauda 0.10; rudiments of fore wing 0.64, hind wing 0.30.

Types:

Holotype: One apterous viviparous female (no. 2192 b 1) in the collection of the U. S. Nat. Mus. Nat. Hist. in Washington.

Paratypes: I brachypterous male in the U. S. Nat. Mus., 3 apterous viviparous females in Dr. D. Hille Ris Lambers' collection in Bennekom, Netherlands, 2 apterous viviparous females in Dr. C. F. Smith's collection in Raleigh, North Carolina, and 1 apterous viviparous female and 1 oviparous female in the author's collection in Skive, Denmark.

Type locality: Pleasant Gardens, Marion, North Carolina, U.S.A.

Biology:

The aphids were collected Oct. 13, 1961, in the mountainous area of western North Carolina in a garden that extended from a valley onto a slope overgrown with forest trees and scrub. The aphids were on the undersides of curved leaves of an *Oxalis* sp. with yellow flowers. Later herbarium material of the plant was identified by Dr. J. Hardin as *Oxalis ?stricta*, a species native to North America.

The presence of sexuales shows that the species is holocyclic and not host alternating.

Taxonomy:

The genus *Ovatus* van der Goot is related to *Myzus* Passerini. Both genera have well developed, converging, scabrous frontal tubercles, lack secondary rhinaria on the antennae of apterous females, have mostly short hairs on the body and appendages, and have subcylindrical to slightly swollen siphunculi. *Ovatus* differs from *Myzus* s. lat. in lacking the abdominal sclerotization typical for alatae of *Myzus* and in having a more or less distinct reticulation pattern on dorsum of apterae. It differs from *Myzus* s. str. in the absence of spinules between the dorso-apical hairs on the hind tibiae in nymphs. And *Ovatus* differs from *Nectarosiphon* Schouteden in the differences from *Myzus* s. lat. and also in having less swollen siphunculi in summer and autumn generations.

O. reticulatus, n. sp. has several characters in common with *O. phloxae* (Sampson, 1939), which was described as a *Phorodon* but was placed in *Ovatus* by Hille Ris Lambers (1966: 600); e.g. reticulated tergum (particularly distinct behind bases of siphunculi), extremely short hairs on body and antennae, and the same shape of siphunculus, but *O. phloxae* is much paler, and its frontal tubercles are more prominent and converge more strongly.

In *Myzus leucocrini* Gillette and Palmer, according to the description in Gillette and Palmer (1929: 470–471), old apterous females are almost black, are reticulated on the dorsum, and the shape of the frons and siphunculi is nearly the same as in *Ovatus reticulatus*, n. sp. It is also described by Mason (1940: 11) and Palmer (1952: 338). I have not seen *M. leucocrini* myself. It differs from *O. reticulatus* in that the processus terminalis is only about 3 times as long as the basal part of the ultimate antennal segment, and the cauda is more elongate, slightly constricted, and bears 10 hairs.

Acknowledgments

I wish to thank Dr. D. Hille Ris Lambers for drawing my attention to the similarity between *O. reticulatus*, n. sp. and *O. phloxae*, for lending me slides of *O. phloxae* for comparison, and for critical remarks, Miss Louise M. Russell for correcting the language and proof-reading, and Dr. J. W. Hardin of North Carolina State University for the identification of the host plant.

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A NEW SPECIES OF MALAYA FROM WEST MALAYSIA (DIPTERA: CULICIDAE)[1, 2]

SHIVAJI RAMALINGAM *and* A. GANAPATHI PILLAI,
Department of Parasitology, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia

ABSTRACT—A new species, *Malaya* **incomptas** is described from West Malaysia. Comments are made on how to distinguish it from other species of *Malaya* in Southeast Asia. The distribution of the genus *Malaya* in West Malaysia is given.

The genus *Malaya* is a relatively small one comprising 11 species distributed over the Ethopian, Oriental and Australasian regions. Two species of *Malaya* have been reported to occur in West Malaysia, *Malaya genurostris* Leicester, 1908 and *Malaya jacobsoni* (Edwards, 1930). *Malaya genurostris* was designated by Leicester, as the type species of the genus *Malaya*. The only other species of this genus recorded from Southeast Asia is *Malaya splendens* (Meijere, 1909). Since 1966, in connection with the Mosquitoes of Malaysia Project organized by the senior author, more than 3,600 collections of mosquitoes have been made throughout West Malaysia and Singapore. Preliminary studies of the material indicate a new species of *Malaya* occurring in West Malaysia.

The terminology used in describing the adult and pupal stage, is from the recent series "A Mosquito Taxonomic Glossary" by Knight and Laffoon (1970–1971), except for the larval stage where Belkin's (1962) terminology is used. In the description of the immature stages, the following system is used to enumerate seta branching: if only one numeral is given in parentheses following the seta number, it represents the only number of branches encountered in the sample; if two sets of figures are given, the first represents the mean number of branches and the second, the range encountered in the sample.

Malaya incomptas, n. sp.

Adults are readily identified by the complete absence of the median line of broad, flat, round, silvery scales on the scutum. The pupa can be recognised from the other two *Malaya* species in Malaysia by seta 6-VII, which is weak and has an average of 2 branches arising about half-way from the base.

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FEMALE.—Wing, 2.46 mm. Proboscis, 1.15 mm. Fore femur, 1.88 mm. Abdomen: About 1.5 mm. Small to medium in size; brown with silvery-white markings on head, thorax and abdomen.

Head: A broad patch of flat silvery scales on vertex, extending cephalad between the eyes (thus separating the eyes) and slightly broadening out before terminating at the frons: similar silvery patch on side of head below eyes. Remainder of head covered with broad, decumbent, brown scales, with metallic-green lustre from certain angles. Erect scales absent. Interocular and ocular setae present. Clypeus narrow, about $2.5 \times$ as long as broad; pale yellow in colour, with silvery sheen. Maxillary palpus small and composed of two segments; about the same length and colour as the clypeus. Proboscis hairy, with a joint at about two-thirds from base, with apical one-third swollen. Basal two-thirds pale cream or yellow in colour, with two rows of long setae pointed forward and upwards. Apical one-third brown to dark brown in colour, with many setae; inserted at the tip of the labium are two pairs of long setae curved upwards at the tip; the ventral pair slightly longer than dorsal pair. Pedicel (torus) of antenna with gold-brown integument; two to three minute setae present on the inner side. Flagellum of antenna pilose; approximately 1.25 mm long.

Thorax: Integument brown. Scutum covered with narrow, curved, light brown scales, without a median line of broad, flat, silvery scales. Acrostichal and dorsocentral setae absent. Scutal fossal, supra-alar and prescutellar setae present. Scutellum trilobed, with a large median and two smaller lateral lobes, each covered with a patch of broad, flat scales. Most of the scales on the scutellum are brown coloured, rarely a few pale scales may be present in the midline. Setae arising in three groups. Mesopostnotum bare, integument brown. All scales on pleurae are flat, rounded and silvery. Antepronotal lobes well-developed, but not meeting each other at midline behind head; dorsal aspect covered with silvery scales; row of long setae on anterior side. Postpronotum covered with similar scales, except for the narrow posterior, basal aspect, which is bare; single seta present on posterior border. Single prespiracular seta present. Post spiracular setae absent. Propleuron and upper part of postprocoxal membrane covered with silvery scales. Paratergite bare. A large patch of silvery scales present involving the lower part of postspiracular, entire subspiracular area, immediately adjacent upper posterior half of mesepisternum and anterior third of mesepimeron. Upper mesepimeron with group of 6–8 setae on posterior margin. Setae absent on following sclerites: prealar, mesepisternum, mesomeron and metepisternum. Base of mesomeron slightly higher than base of hind coxa.

Leg: Integument brown, except for trochanter and part of coxae which are pale. All three legs are uniformly covered with small brown scales; except for the coxae which has silvery white scales on the anterior side. Fore femur much longer than proboscis. Mid and hind femur slightly smaller than the fore femur. Unguis (claws) of all legs simple and equal, that of hind legs slightly smaller than the other two.

Wing: Brown scaled. Squame scales brown and closely covering wing veins. Cell R2 about two and one half times the length of its stem. Anal vein ending about level of fork of Cu. Alula with 2–3 narrow scales. Upper calypter bare.

Halter: Base and pedicel light coloured; capitellum covered with dark brown scales.

Abdomen: The terga are covered with rounded dark brown scales, with patches of silvery scales laterally. Terga I and II with lateral silvery patches covering the entire side. Tergum III entirely dark scaled, no lateral silvery patch. Tergum IV with large, lateral silvery patch except for the basal band of dark scales. Tergum V with lateral silvery patch less than half of the segment. The lateral silvery patch becomes progressively smaller in terga VI and VII. Sterna II and III with silvery scales. Sternum IV with narrow basal band of brown scales; rest of sternum covered with silvery scales. Sterna V and VI with basal half covered with brown scales and apical half with silvery scales. Sternum VII mostly covered with brown scales, except for apical band of silvery scales.

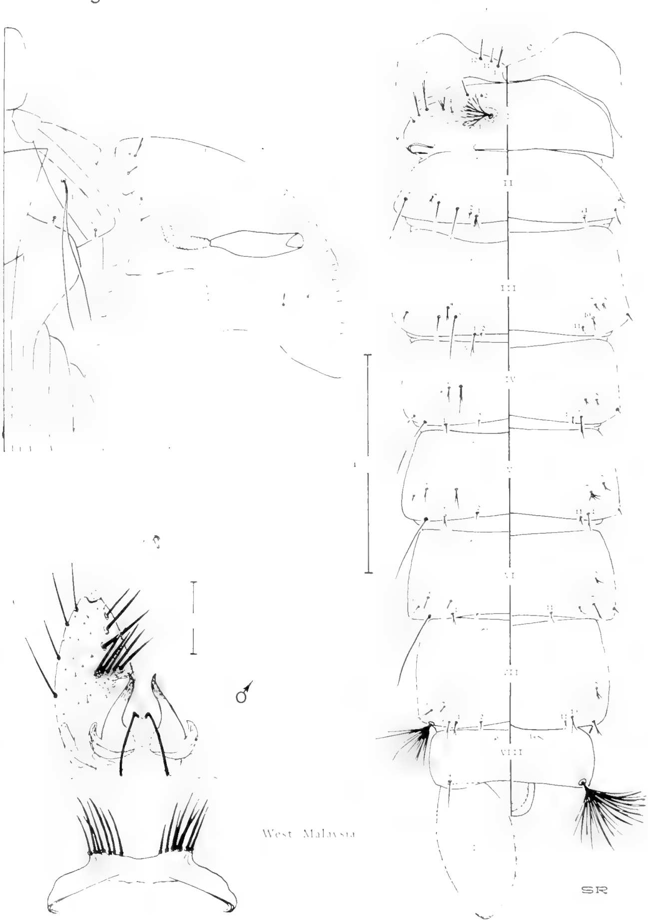
MALE.—Wing, 2.4 mm. Proboscis, 1.1 mm. Palpi, 0.17 mm. Fore femur, 1.85 mm. Resembles the female except for the male genitalia and the absence of pale scales in the central patch of the scutellum. Head: Maxillary palpus about the same length as in the female; approximately 0.15 the length of the proboscis. Antenna 1.2 mm long; pilose. Unguis same as in the female.

MALE TERMINALIA (Fig. 1).—As figured. Tergum of segment IX distinctly lobed; each lobe bearing 7 to 16 large setae. IX sterna membranous. Gonocoxite broad; basal mesal lobe fairly prominent, bearing 4 to 5 thickened setae and one slightly less thickened. Gonostylus tapering slightly from base towards apex; slightly longer than half of gonocoxite; gonostylar claw small and blunt. Paraproct fairly long and slender; tip pointed and slightly curved; apical half with stronger sclerotization.

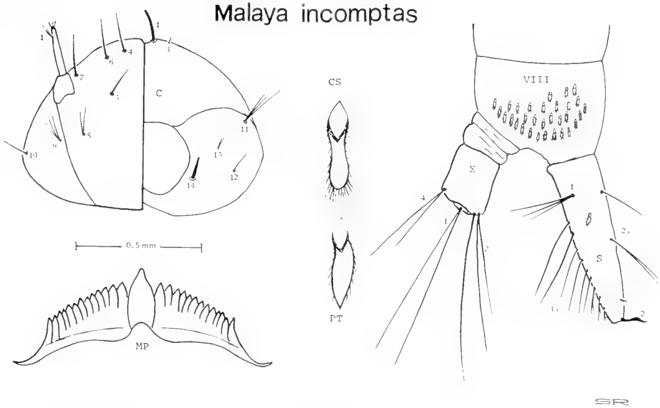
PUPA (Fig. 1).—Abdomen, 2.88 mm. Trumpet, 0.28 mm. Paddle, 0.53 mm. Integument of cephalothorax and abdomen pale yellow except for the dorsal parts of the cephalothorax, segments I to IV and small areas of the metanotum which are brown. Chaetotaxy as figured; setae light with only slight pigmentation.

Cephalothorax: Trumpet: Light brown in colour with a sculptured appearance; slight bulge at the centre. Index about 2.6 to 3.3; pinna about 0.15 of trumpet length. Setae lightly pigmented and inconspicuous. Seta 1 long and two branched, 2(2,2–3), 3(2,1–3), 4(3,2–3), 5(2,2–3), 6(1,1–3), 7(1,1–2), 8(1,1–2), 9(2,1–3), 10(2,2–3), 11(1), 12(1,1–2). Abdomen: The more conspicuous setae in the abdominal segments are the float hair (1) in segment I; hair 5 in segments V and VI and hair 9 in segments VII and VIII. Segment I: Float hair with 5(3–7) main branches, each with several secondary branches; lightly pigmented; slightly longer than half the length of the segments; 2(1), 3(1), 4(2,1–2), 5(5,4–6), 6(2), 7(2), 9(1). Segment II: 1(5,2–5), 2(1), 3(1), 4(3,3–4), 5(1), 6(1), 7(3,1–3), 9(1), 11(1). Segment III: 1(2,2–3), 2(1), 3(1,1–2), 4(2,1–2), 5(1), 6(2), 7(2,2–3), 8(2,1–2), 9(1), 10(2,1–3), 11(2,1–2). Segment IV: 1(2,2–3), 2(1), 3(3,2–4), 4(2,2–3), 5(1,1–2), 6(2), 7(2,2–4), 8(2,1–2), 9(1), 10(2), 11(2,2–3). Segment V: 1(2,1–2), 2(1), 3(2,2–3), 4(4,2–6), 5(1), 6(2,1–4), 7(5,2–6), 8(2,1–3), 9(1), 10(2,2–3), 11(2,2–3). SegmentVI: 1(2,1–3), 2(1), 3(2,1–2), 4(2,2–3), 5(1), 6(2,1–2), 7(2,1–2), 8(3,3–5), 9(1), 10(2,1–3), 11(2). Segment VII: 1(2), 2(1), 3(2,1–2), 4(2), 5(2,2–4), 6(2,2–4), 7(2), 8(4,3–5), 9(15,13–17), 10(2,2–3), 11(2). Segment VIII: 4(1,1–2), 9(24,22–26). Paddle: Uniformly

Fig. 1



Malaya incomptas



West Malaysia

Fig. 2

lightly pigmented; midrib inconspicuous; length about 1.6 times breadth; margin minutely serrated along edges and without fringe. Seta 1 inconspicuous.

LARVA (Fig. 2).—Since the available material are two somewhat damaged, associated larval skins, only the head and the terminal segments are being described. Head, 0.69 mm long. Siphon, 0.7 mm. Anal saddle, 0.16 mm. Chaetotaxy of head and terminal segments as figured. Setae very lightly pigmented. Stellate setae and spicules absent. Head: width about 1.36 of length. Integument smooth, pale yellow in colour. Mouth brushes well-developed, brown in colour. Maxillary horn absent. Mental plate with a prominent middle tooth with 12 to 13 small regular teeth on either side. Seta 1 single, prominent, thick and slightly curved, with blunt end; 3(1, minute), 4(1), 5(1,1–2, inconspicuous, placed well behind setae 4 and 6), 6(1), 7(1), 8(2), 9(3), 10(1), 11(3,2–4, prominent seta), 12(1,1–2), 13(1–3), 14(1, stout).

Antenna: Length about 0.33 of head. Shaft with very slight narrowing of width from base to tip. Integument smooth, without spicules; pale yellow in colour. Seta 1, 2–3 branched, about 0.87 from base, other setae single.

Abdominal Segment VIII: Combscales approximately 25–38, in 3–5 rows; very lightly pigmented; free portion finely fringed and rounded at tip. Setae 1–5 are displaced in the 2 specimens and hence are not included in the drawing and description. Siphon: Index 5.2 (4.9–5.5). (The siphon index used here is that of Belkin's (1962): "Ratio of dorsal length to median width.") Pale yellow pigmentation; smooth integument. Pecten extending to 3.9 of siphon; teeth 3(4–5), in number, pointed towards tip and fringed. Seta 1 of siphon large; 3 branched; seta 2 flattened, broad at center, hooked at tip; accessory ventral setae (1a-S) as figured, about 11 setae very close to the midventral line; from 1–3 branched. Accessory subdorsal setae (2a-S) as figured. Three setae on either side. Anal segment: Saddle incomplete, same colour as siphon; spicules present on caudolateral border. Gills as figured, about 3 times the length of the anal segment, with rounded ends. Seta 1(2–3), 2(2,1–2), 3(1), 4(1–2).

This species is named *incomptas* as it is the only species of *Malaya* in Southeast Asia, whose scutum is unadorned with a conspicuous median line of silvery scales.

TYPE DATA.—Holotype male (653.100), with slides of associated pupal skin and genitalia, Limau Kasturi, Kelantan, West Malaysia, elevation 200 feet above sea level, from leaf axil of Pandanus in secondary rain forest, 23 April 1967, Samuel Wilson James and Sulaiman bin Omar (USNM). Allotype female (653.15) with slide of associated larval and pupal skins, same data as holotype (USNM). Paratypes: 11 females, 5 males, 1 slide associated larval and pupal skins, 1 slide associated pupal skin, all from the same collection (653) as holotype 6 female (one with associated skin 653.12), and 2 male (USNM). Three female (one with associated pupal skin 653.104), 1 male and 1 slide male genitalia (BM). Two female, 2 male and 1 slide male genitalia (Ramalingam).

SPECIMENS EXAMINED.—12 female, 6 male, 4 associated skins and 3 male genitalia slides from type collection (653).

TAXONOMIC DISCUSSION.—Adults: *Malaya incomptas* can be easily recognised from the five other species of *Malaya* from Southeast Asia and the Australasian region, by the absence of a median line of flat, round, silvery scales on the scutum. This line is very distinct in the other species, including the two species (*genurostris* and *jacobsoni*) occurring in Malaysia. In addition, the mid lobe of the scutellum in *incomptas* is covered with dark scales, rarely with a few pale scales; instead of a conspicuous, large patch of silvery scales in both *genurostris* and *jacobsoni*. The eyes of both *incomptas* and *genurostris* are separated by a line of silvery scales. This line broadens out below the eyes of *incomptas* and ends abruptly in *genurostris*. Adults of *incomptas* can be separated from *jacobsoni* by several characters: (a) *Malaya jacobsoni* is slightly larger and darker than *incomptas*. (b) The eyes are not separated by a silver line of scales in *jacobsoni* as they are in *incomptas*. (c) The patches of silvery scales on the head and thorax of *jacobsoni* have a blue-green tint, whereas they are silvery-white in *incomptas*. (d) The clypeus and basal part of the proboscis are brown coloured in *jacobsoni* and pale yellow or cream coloured in *incomptas*.

Immature stages: In the pupal stage, the three species found in West Malaysia can be easily recognised by the examination of seta 6 on abdominal segment VII: In *incomptas* this seta is weak with an average of 2 branches and a range of 2 to 4 branches; the branches

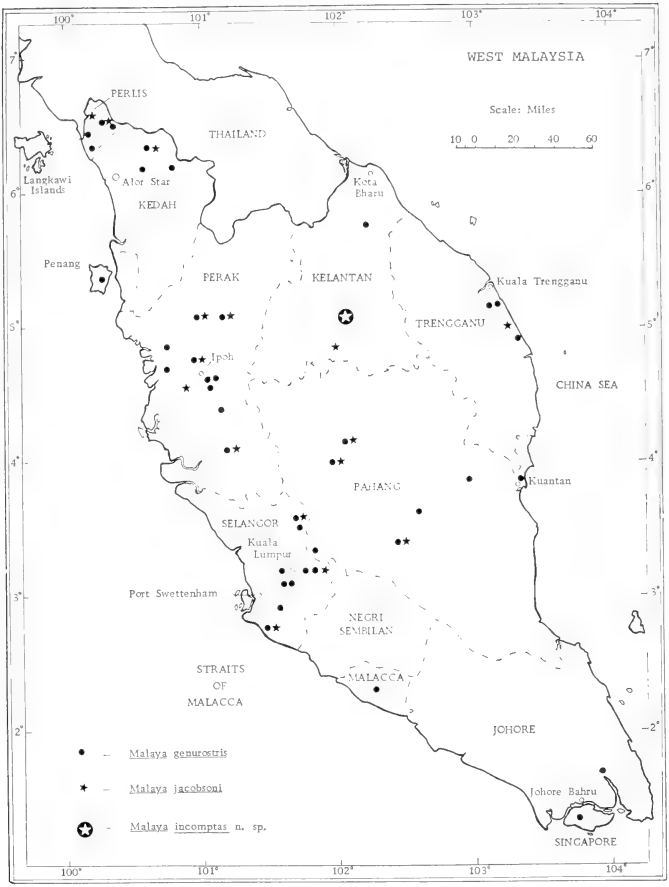


Fig. 3. Distribution of *Malaya* species within West Malaysia.

arising about half way from the base. In *genurostris* seta 6–VII is more stout with an average of 5 branches and a range of 3–5 branches; the branches arising at the base of the seta. In *jacobsoni* seta 6–VII is very stout and in fact resembles seta 9 on the same segment, although it is slightly smaller; the average number of branches is

10 with a range of 8–11 branches. The branches arise from the base of the seta. No attempt is being made to characterise the larval stages of the 3 species of *Malaya*, although a few differences are apparent, because of the paucity of *incomptas* larval specimens.

DISTRIBUTION (Fig. 3).—West Malaysia, Kelantan State, Limau Kasturi. Known only from the type locality, situated in the interior of W. Malaysia, just east of the central mountain ridge.

BIOLOGY.—Only one collection was made of *incomptas* from the rain forest in the state of Kelantan. The locality is accessible only by the north-south rail link. The breeding site was the leaf axil of *Pandanus* plants. The type collection (653) includes immature instars collected from several axils of *Pandanus*. Other mosquitoes identified from this collection are *Aedes* (*Finlaya*) *poicillius*, *Aedes* (*Stegomyia*) *albopictus* and *Topomyia gracilis*. Nothing is known as yet about the interesting association between the adults of *incomptas* and *Cremato-gaster* ants, as observed in other species of *Malaya*. The probability of some such association is suggested by the proboscis of *incomptas*, which is typical of *Malaya*.

DISTRIBUTION OF *MALAYA* IN WEST MALAYSIA.—The first species of *Malaya* reported from West Malaysia was *Malaya genurostris* Leicester, 1908. This species was described from a single male collected at the edge of the rain forest, probably on the outskirts of Kuala Lumpur. Macdonald (1957) gives another locality within Selangor State, where *genurostris* was collected and mentions that it is probably quite widespread within West Malaysia. During our survey, 77 collections of *genurostris* were obtained from almost every state in West Malaysia. The collection sites are indicated on Fig. 3. *Malaya genurostris* has previously been known to occur in many other countries in the Oriental and Australasian regions.

Malaya jacobsoni was described by Edwards in 1930, from the island of Sumatra in Indonesia. It is also known to occur in India, Thailand and Taiwan (Stone, Knight et al. 1957). Macdonald (1960) reported this species as occurring in the rain forest in Ulu Gombak, Selangor State, Malaysia. During this study, 30 collections were made of *jacobsoni* in West Malaysia. From fig. 3 it will be seen that *jacobsoni* also has a fairly wide distribution in West Malaysia. *Malaya incomptas* n. sp. now forms the third species of this genus, from West Malaysia. It appears to be rare and is known only from the type locality.

Acknowledgments

We are grateful to members of the field team, Mr. Sulaiman bin Omar and Mr. Samuel Wilson James, who made the collections, and to other members of the Mosquitoes of Malaysia Project who assisted with preparation of the material and in various other ways. We wish to thank Dr. Botha de Meillon, Southeast Asia Mosquito Project, and Dr. P. F. Mattingly, British Museum, for reading the manuscript and for their helpful comments.

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A NEW SPECIES OF ARMIGERES FROM SABAH, BORNEO (DIPTERA: CULICIDAE)[1, 2]

SHIVAJI RAMALINGAM, *Department of Parasitology, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia*

ABSTRACT—A new species, *Armigeres* (*Armigeres*) **kinabaluensis** is described from Sabah, East Malaysia. The adult female and male, pupa and larva are described in detail. Illustrations of the male genitalia, pupa and larva are provided. *Armigeres kinabaluensis* is a mountain species and breeds mostly in tree holes, and artificial containers.

During a recent mosquito survey in Sabah, East Malaysia, a new species of *Armigeres* was discovered on Mount Kinabalu and Tambunan on the Crocker Range. Reference to this species and a drawing of the male genitalia was made by Baisas (1935), from a single specimen sent to him from Mount Kinabalu, at about 4,000 feet elevation. As the specimen was in poor condition, Baisas did not

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name nor describe it. Several collections of this species were obtained during our survey so that a fairly large series of adults, immature stages and associated skins are now available for description.

The terminology used in describing the adult and pupal stage is from a recent series "A Mosquito Taxonomic Glossary" by Knight and Laffoon (1970–71), except for the larval stage where Balkin's (1962) terminology is used. In the description of the immature stages, the following system is used for seta branching: if only one numeral is given in parentheses following the seta number, it represents the only number of branches encountered in the sample; if two sets of figures are given, the first represents the mean number of branches rounded out to the nearest whole number and the second, the range encountered in the sample. The chaetotaxy of the immature stages was determined from a sample of ten individuals.

Armigeres (Armigeres) kinabaluensis, n. sp.

FEMALE.—Wing, 4.29 mm. Proboscis, 2.39 mm. Fore-femur, 2.47 mm. Abdomen: 3.97 mm. Large in size.

Head: Eyes nearly meeting above pedicel of antenna. Pale scales of head white to dingy white; dark scales brown-black in colour with bluish lustre at certain angles. Narrow band of pale scales along ocular line, broadening ventrally in postgenal area. Vertex covered with flat, broad, dark scales except for small central patch of pale scales. Frontal and ocular setae present. Erect scales all dark and forked, restricted to occiput region of head. Side of head mostly white scaled with dark scales on posterior aspect. Clypeus with dark integument; bare. Proboscis long, laterally compressed in apical half, covered over uniformly by dark scales. Pedicel of antenna with dark integument, covered with small white scales except for dorsal, outer sector, which is bare. Flagellum of antenna pilose; approximately 2.41 mm. long.

Thorax: Integument brown to dark brown. Scutum densely covered with long, narrow, curved, brown-black scales, having metallic lustre. A narrow border of narrow, curved, white scales extending from anterior promontory and ending over root of wings. Acrostichal, dorsocentral and scutal fossal setae absent. One to 4 prescutellar, and a row of supra-alar setae present. Scutellum covered with small, flat, dark scales, in three distinct lobes, with a few white scales at the tip of each lobe. Setae arising in three groups. Mesopostnotum bare, integument light brown. Antepronotal lobes of normal size, covered by small, white scales on sides and front; top with small, dark scales and row of setae. Postpronotum with brown, dingy-white scales on lower posterior half; a few narrow pale scales may be present above these; anterior, dorsal aspect with narrow, dark scales; row of 4–7 setae along posterior border. Prespiracular setae absent. Postspiracular area with patch of small white scales. Propleuron with white scales. Paratergite with a line of white scales. Mesepisternum with 2 large patches of white scales; a row of setae along the posterior border and a dense group in the prealar region. Mesepimeron with a large patch of white scales on anterior upper portion; a single lower and a dense patch of upper mesepimeral setae present. Setae and scales absent on mesomeron and metepisternum. Base of mesomeron in line with or slightly higher than base of hindcoxa.

Leg: Fore coxa covered by white scales with a patch of dark scales in the centre; mid and hind coxae with a patch of white scales on anterior side. Trochanter of all legs with pale scales. Fore and mid femur with a band of white scales on ventral side to knee; hind femur with band of white scales on outer aspect, narrows towards knee. Rest of legs covered with dark scales. Unguis of fore leg equal, each with a tooth; unguis of mid and hind legs smaller than that of fore leg, equal and without a tooth.

Wing: Dark Scaled. Cell R2 about 1½ times the length of its stem. Anal vein ending beyond fork of Cu. Alula and upper calypter with a row of hair like scales.

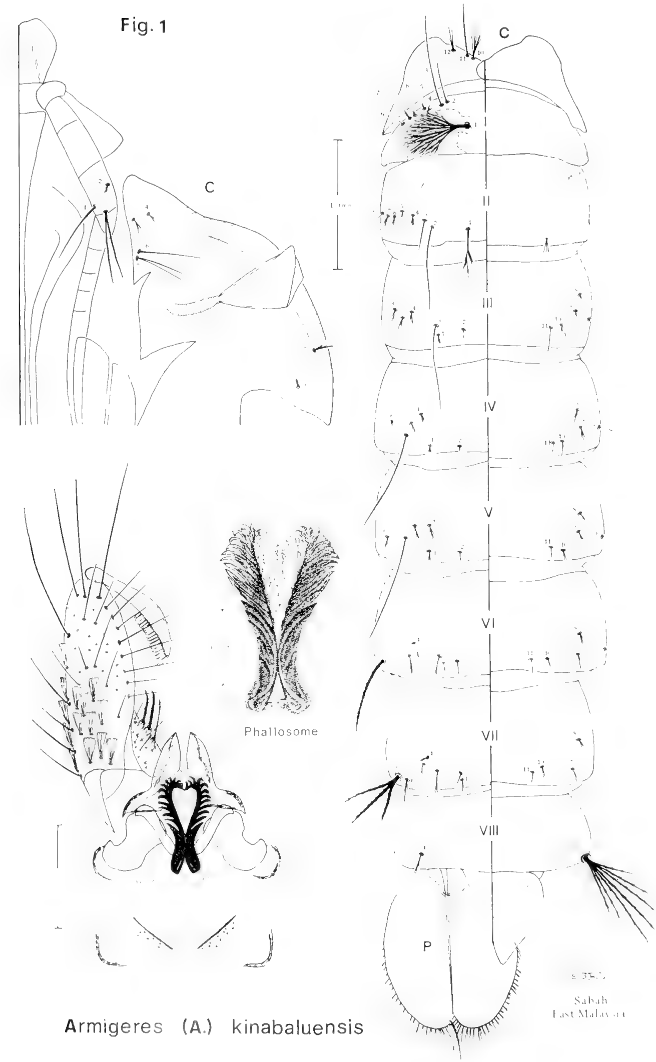
Haltere: Capitellum dark, rest light in colour.

Abdomen: Terga I to VII dark scaled on dorsal aspect with patches of white scales laterally; tergum VIII dark scaled, with a row of pale scales at the base. Scale pattern on abdominal sterna variable. Sternum II: mostly covered with white scales, but occasionally a few scattered dark scales are present. Sterna III to V: all white scaled (42%); or white scaled with two small to medium lateral patches of dark scales in the middle of the sternite (50%); or very occasionally with a central dark band (8%). Sternum VI: mostly white scales; occasionally a few scattered dark scales are present among the white scales and very occasionally an apical or subapical band of dark scales are present. Sternum VII: mostly dark scales with an apical or subapical band of pale scales (50%), speckled white and black (39%), or all white (11%).

MALE.—Wing, 4.14 mm. Proboscis, 2.42 mm. Palpi, 2.93 mm. Fore femur, 2.52 mm. Resembles the female except in the following characters: Head: Palp approximately 1.2 the length of the proboscis. Antenna: 2.06 mm long; strongly plumose; last two segments much elongated and annulated. Unguis of fore leg much larger than in female; one much larger than the other, each with a single tooth. Unguis of mid and hind legs similar to the female. Abdominal sternum II: mostly dark scaled with few scattered white scales or entirely white scaled. Sterna III and IV dark scaled with narrow, basal and apical bands of white scales. Sternum V: as in previous sternum; though occasionally the basal or apical white bands may be broad. Sternum VI: mostly white scaled with narrow basal and apical dark bands. Sternum VII: mostly dark scaled, though a few apical white scales may occasionally be present.

MALE TERMINALIA (Fig. 1).—As figured. Tergum IX deeply bifurcated by broad V-shaped suture; each lobe bearing a patch of fine hairs. Sternum IX: large and membranous, with narrow lateral and basal sclerotized bands; median patch of about 4 fine setae. Gonocoxites fairly long; well separated from each other sternally; lateral and ventral aspects with long setae and scales; dorsal aspect with short, fine setae. Basal mesal lobe with two stout and one narrower setae on prominent bases, setae directed upwards and towards gonocoxite. Gonostylus about ⅔ the length of the gonocoxite, not reaching basal mesal setae, outer margin convex, with 1–2 small preapical setae; comb of 18(14–21) spiniforms on inner apical aspect; the apical spiniforms very slightly larger than the basal ones; individual spiniforms flat, with bluntly rounded apices. Phallosome-aedeagus complex, ventrally with 2 to 4 basal teeth, occupying

Fig. 1



Armigeres (A.) kinabaluensis

basal two-thirds, apical portion swollen with 7–9 long curved teeth pointing dorsally on each side. Paraproct well developed.

PUPA (Fig. 1).—Abdomen, 5.1 mm. Trumpet, 0.58 mm. Paddle, 1.0 mm. Integument yellow to light brown pigmentation. Chaetotaxy as figured; setae light to dark brown. Prominent setae marked with an asterisk (*). Cephalothorax: yellow to light brown pigmentation. Trumpet: slightly darker pigmentation; length 0.58 mm. Seta 1*(1), 2(4,2–5), 3*(2,2–3), 4(4,3–5), 5(4,3–6), 6*(1,1–2), 7(2,1–2), 8(5,3–7), 9(3,2–5), 10(6,4–8), 11*(1), 12(3,2–5). Abdomen: first four abdominal segments and mesonotum light brown in colour, remaining abdominal segments yellow. Segment I: Seta 1 large, slightly longer than length of segment, with 3 to 11 main branches. Seta 2*(1), 3*(1), 4(7,4–10), 5(2,1–3), 6(3,2–7), 7(3,2–6), 9(1,1–2). Segment II: Seta 1*(15,10–22), 2*(1), 3*(1), 4(5,3–9), 5(2,2–4), 6(3,2–5), 7(4,3–6), 9(1). Segment III: Seta 1(3,2–4), 2(1), 3*(1), 4(4,1–4), 5(3,2–5), 6(3,2–4), 7(3,2–5), 8(3,2–5), 9(1), 10(3,2–4), 11(1,1–2). Segment IV: Seta 1(4,2–6), 2(1), 3*(1), 4(4,2–7), 5(3,2–4), 6(3,2–4), 7(3,2–5), 8(3,2–4), 9(1), 10(2,2–3), 11(1,1–2). Segment V: Seta 1(3,2–5), 2(1), 3*(1,1–2), 4(4,2–5), 5(4,2–6), 6(3,2–4), 7(4,4–7), 8(3,2–4), 9(1), 10(2,2–3), 11(1,1–2). Segment VI: Seta 1(2,1–4), 2(1), 3(2,2–4), 4(2,2–4), 5(3,2–4), 6*(1), 7(2,2–3), 8(3,2–4), 9(1), 10(1,1–2), 11(2,1–2). Segment VII: Seta 1(2,1–3), 2(1), 3(3,2–3), 4(2,2–3), 5(2,1–4), 6(3,2–6), 7(2,1–3), 8(3,2–5), 9*(3,1–5), 10(2,1–3), 11(1,1–2). Segment VIII: Seta 4(3,2–3), 9*(7,5–9). Paddle: lightly pigmented, with strong midrib and long fringe. Hair 1 single, conspicuous. Male genital lobe extending to about 0.59 of paddle, female genital lobe to 0.3.

LARVA (Fig. 2).—Head, 0.87 mm. Siphon, 0.96 mm. Anal saddle, 0.33 mm. Chaetotaxy as figured, setae lightly to moderately pigmented. Stellate setae and spicules absent. Integument smooth. Prominent setae marked with an asterisk (*).

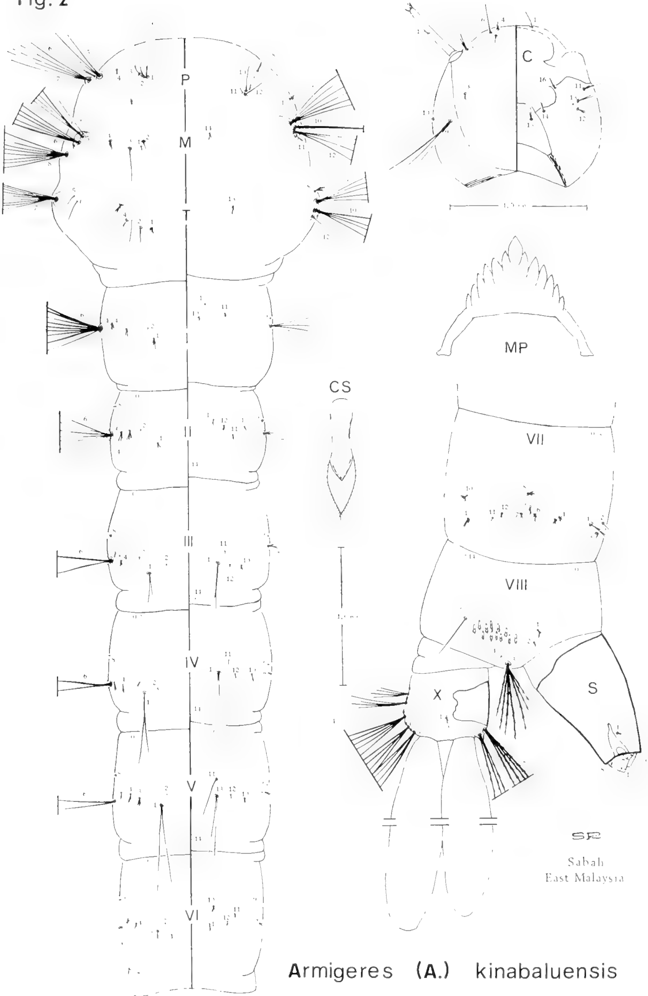
Head: Width about 1.07 of length. Ocular bulge not prominent; collar well marked. Pigmentation yellow-brown in colour except areas around mouth and collar which are slightly darker. Integument smooth. Mental plate with a strong median trilobed tooth and with 5(4–6) well developed teeth on each side. Seta 1(1, small tapering and curved inwards), 4(5,3–8), 5(3,2–4), 6(1), setae 4, 5 and 6 are well forward on the head, 7*(3,2–3), 8(2,1–3), 9*(3,2–3), 10(1,1–2), 11(2,1–3), 12(3,2–5), 14(2,1–3), 15(2,1–3), 16(1,1–2).

Antenna: Length about 0.28 of head. Shaft about same breadth from base of apex. Integument smooth; yellow in colour. All setae single. Seta 1 at 0.49 from base.

Thorax: Long and prominent setae with barbs. Setae 9, 10, 11 and 12 arising from common tubercle. Prothorax: Seta 0(5,3–6), 1*(2,2–3), 2(1,1–2), 3(2,1–3), 4(4,3–6), 5*(3,2–4), 6*(2,1–3), 7*(5,3–8), 8*(3,2–5), 9(3,2–4), 10*(1), 11(2,2–3), 12*(1). Mesothorax: Seta 1(2,2–3), 2(1,1–2), 3*(1,1–2), 4(5,3–6), 5*(4,3–5), 6*(5,3–7), 7*(1,1–2), 8*(8,6–12), 9*(6,4–8), 10*(1), 12*(4,2–4), 13(5,4–7). Metathorax: Seta 1(3,2–4), 2*(2,1–3), 3(5,3–9), 4(2,1–3), 5(1), 6(1), 7*(8,7–11), 8(5,3–6), 9*(5,4–6), 10*(4,2–5), 12*(2,1–3), 13(3,3–5).

Abdomen: Segment I: Seta 1(6,4–7), 2(1,1–3), 3(5,3–7), 4(5,3–7), 5(3,2–5), 6*(9,6–11), 7*(3,2–3), 9(2,1–3), 10(3,2–5), 11(3,2–5), 13(1,1–2). Segment II: Seta 1(4,3–5), 2(1,1–3), 3(5,3–7), 4(5,4–6), 5(2,2–3), 6*(6,4–7),

Fig. 2



Armigeres (A.) kinabaluensis

7*(3,2–4), 8(2,2–4), 9(1,1–2), 10(3,2–4), 11(3,2–4), 12(4,2–5), 13(4,3–6). Segment III: Seta 1*(2,1–4), 2(1,1–2), 3(2,2–3), 4(4,3–5), 5(3,1–4), 6*(2,2–3), 7(4,2–4), 8(2,1–3), 9(1), 10(3,2–4), 11(2,2–3), 12(2,2–3), 13*(2). Segment IV: Seta 1*(2,2–3), 2(1,1–2), 3(2,2–3), 4(3,2–5), 5(3,2–5), 6*(2,1–2), 7(4,2–5), 8(1,1–3), 9(1), 10(3,2–4), 11(3,2–3), 12(2,1–3), 13*(2,2–3). Segment V: 1*(2,1–3), 2(1,1–2), 3(5,4–6), 4(4,3–4), 5(3,2–5), 6*(2,1–5), 7(4,2–5), 8(1,1–2), 9(1), 10(3,2–4), 11*(1,1–2), 12(2,2–4), 13*(2,2–4). Segment VI: 1*(2,1–3), 2(1), 3(3,1–5), 4(4,2–7), 5(4,2–6), 6(5,3–6), 7(4,3–4), 8(2,1–3), 9(1), 10(5,4–7), 11(3,2–3), 12(3,2–4), 13(2,1–3). Segment VII: Seta 1*(4,2–5), 2(1), 3*(2,2–3), 4(4,3–4), 5(4,3–5), 6(6,4–7), 7(3), 8(8,5–12), 9(5,3–7), 10(7,5–9), 11(2,1–3), 12(3,1–3), 13(2,1–3). Segment VIII: Seta 1(6,5–10), 2(2,2–4), 3*(7,5–9), 4(2,1–3), 5*(1). Comb scales 12(8–20) in one to three irregular rows; lightly pigmented and slipper shaped; fringe present on apical half. Siphon: short and stumpy; index 2.2 (1.7 to 2.5); pigmentation brown; pecten teeth absent; seta 1(2,1–2), arising about 0.26 from apical end of siphon), 2(1), 6(1), 7(1), 8(3,1–5), 9(1), 13(1). Anal Segment: Saddle: incomplete, only dorsal plate present; brown pigmented. Gills long, with rounded apices, ventral pair slightly longer than dorsal pair. Seta 1(4,2–5), 2*(4,3–5), 3*(3), 4a*(4,3–4), 4b*(4,3–5), 4c*(5,3–7), 4d*(4,3–7), 4e*(3,3–6).

TYPE DATA.—Holotype male (S-1194.17), with slides of associated larval and pupal skins and genitalia, Mount Kinabalu, Sabah (North Borneo), East Malaysia, elevation 7,500 feet above sea level, from hole in fallen tree, in cloud forest, 6 June 1970, Samuel Wilson James (USNM). Allotype female (S-1194.32) with slide of associated larval and pupal skins, same data as holotype (USNM). Paratypes: 12 male, 19 female, 17 slides of associated larval and pupal skins, 8 slides whole larvae, all from the same collection (S-1194) as holotype. Four male, 2 with slides of associated skins (S-1194.11 and .22), 2 slides male genitalia; 8 female, 5 with slides of associated skins (S-1194.16, .18, .20, .23 and .24) and 3 whole larvae (USNM). Three males, 2 with slides of associated skins (S-1194.14 and .26), 1 slide male genitalia; 4 female, 2 with slides of associated skins (S-1194.21 and .30) and 2 whole larvae (BM). Five males, 3 with slides of associated skins (S-1194.13, .15 and .28), 2 slides of male genitalia; 7 females, 3 with slides of associated skins (S-1194.10, .25 and .27), and 3 whole larvae (Ramalingam).

SPECIMENS EXAMINED.—Total 225: 40 males, 61 females, 49 larvae; 59 individual larval rearings and 16 male genitalia slide preparations.

TAXONOMIC DISCUSSION.—The female of *kinabaluensis* can be distinguished from all other species of *Armigeres* (*Armigeres*) by a combination of the following characters: clypeus bare; mesonotum with a narrow border of pale scales and without distinct golden lines; presence of a single lower mesepimeral seta; fore coxae white scaled with a dark patch in centre; hind femur with line of white scales on outer side, narrowing towards knee; sternite III-V all white scaled (42%) or with small, median, lateral patches of dark scales (50%), very occasionally with central dark band (8%); sternite VI mostly white scaled or with narrow line of apical or subapical dark scales; sternite VII dark scaled with apical or subapical white band (50%), speckled white and black (39%) or all white (11%). The male can be easily recognised by the very distinctive phallosome, the apical outer margin of which bears 7 to 9 long curved teeth on each side. There is an extensive range of variation in the colour pattern of the abdominal sterna, unlike that seen in other species of this subgenus. However, there is little doubt that this is a single species, as the whole range of variations, with intermediates, can be often seen within the same collection, without any corresponding changes in the male genitalia or in the immature stages.

A continuous narrow line of white scales around the mesonotum of *kinabaluensis*, associates it closely with *subalbatus*, *joloensis*, *confusus* and *giveni*. *Armigeres subalbatus* and *joloensis* have their abdominal sterna II to VI with white and black bands and resemble those specimens of *kinabaluensis* that occur at the end of the range of variations of abdominal sterna, where black and white bands are also present. However, the black bands in *kinabaluensis* occur in the center of the abdominal sterna and are flanked on both sides with white bands; whereas in *subalbatus* and *joloensis* they are apical in position. On the other end of the range of variations of abdominal markings in *kinabaluensis*, sterna II to VI may appear all white, in which case there is a close resemblance to *confusus* and *giveni*. Sternum VII in *confusus* and *giveni* is always fully dark scaled, whereas in *kinabaluensis*, sternum VII is either with a mixture of dark and white scales or dark scaled with an apical or subapical white band, but never fully dark scaled. Furthermore, the white line of scales on the outer aspect of the hind femora narrows towards the tip in *kinabaluensis*, but continues as a broad line to the knee in *confusus* and *giveni*.

DISTRIBUTION.—Sabah, EAST MALAYSIA: Collected from only two localities, Mount Kinabalu and Tambunan, both on the Crocker Range, and approximately 30 to 40 miles distant from each other. Not known elsewhere.

BIOLOGY.—*Armigeres kinabaluensis* appears to be restricted to higher elevations and all collections of this species were made in the cloud forest at elevation ranging from 3,900 to 7,500 feet. Nineteen collections of the immature stages were made, the majority (13) of these being from tree holes, a few (5) from artificial containers and a single collection from the pitcher plant *Nepenthes lowii*. Nothing is known of the adult biology.

ACKNOWLEDGMENTS

I am grateful to members of the field team, Mr. Samuel Wilson James, Mr. Sulaiman bin Omar and Mr. Chia Yiew Wang, who made the collections in Sabah; and in acknowledging the assistance and cooperation extended to our field team by Mr. Rajapaksa, Medical Entomologist and by other members of the Medical and Health Department of Sabah. I also wish to thank Dr. Botha de Meillon Southeast Asia Mosquito Project, USNM, Washington, for reading the manuscript.

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TWO PESTS OF BEANS FROM TROPICAL AMERICA
(LEPIDOPTERA: OLETHREUTIDAE)[1]

J. F. GATES CLARKE, *Department of Entomology, Smithsonian Institution, Washington, D. C. 20560*

ABSTRACT—*Laspeyresia* **torostoma**, n. sp., which feeds on string bean stems, is described and illustrated from Costa Rica and compared with *L. fabivora* Meyrick.

The two species referred to below are apparently important pests of beans of several kinds. One has been mentioned in the literature since 1928, under three names; the other, although known for several years, needs a name and is described below.

The drawings of the genitalia were made by Mr. George Venable, and the photographs of the adults were made by Mr. Victor Krantz, both on the staff of the Smithsonian Institution.

Laspeyresia torostoma, n. sp.
(Figs. 1, 2)

Alar expanse 13–19 mm.

Labial palpus deep olive buff; second segment lightly mottled with gray blotches. Antenna blackish fuscous. Head mixed olive buff and gray; laterally

[1] Immediate publication secured by full payment of page charges—Editor.

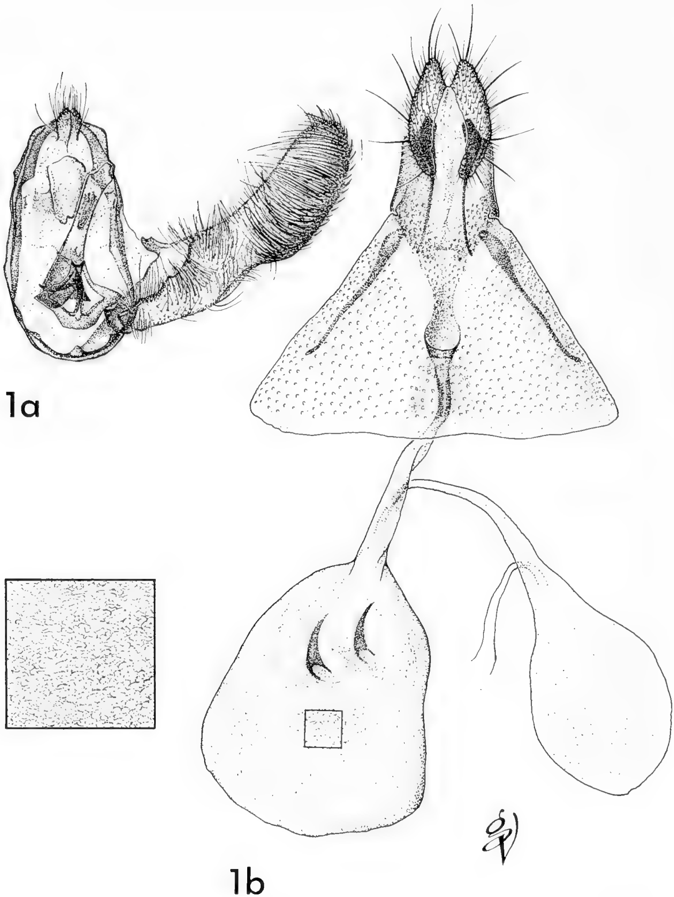

Fig. 1. *Laspeyresia torostoma*, n. sp.: a, ventral view of male genitalia with aedeagus *in situ* and left harpe omitted; b, ventral view of female genitalia with detail of bursa copulatrix to left.

light cinnamon buff. Thorax fuscous mixed olive buff posteriorly; tegula with scattered buff scales. Forewing ground color fuscous; costa marked with a series of eight metallic gray, oblique bars, their extreme costal edges mixed with pale buff scales; subapically an outwardly curved row of four metallic spots; two similar spots apically; basal half of wing with several transverse metallic bars; pretornally, on dorsal edge, a blackish-fuscous spot; ocelloid patch deep olive buff shading to buff terminally; ocelloid patch crossed by two metallic bars; cilia fuscous at apex, gray along termen and buff around tornal edge. Hindwing buff basally shading to fuscous outwardly; cilia grayish apically, shading to buff at anal angle, with grayish fuscous subterminal line. Foreleg deep olive buff shaded with fuscous on outer side; midleg similar; hindleg buff shaded with deep olive buff; tarsal segments annulated grayish fuscous. Abdomen fuscous dorsally, buff ventrally.

Male genitalia slides DRD 1899; USNM 24092, 24093. Harpe slightly longer than tegumen and vinculum combined; cucullus oval clothed with strong setae on inner surface, particularly toward ventral margin; neck incurvation shallow. Gnathos a sclerotized band broadened ventromedially. Socii closely appressed papillae. Vinculum rounded. Tegumen arched, about three quarters the length of harpe. Anellus diamond-shaped with dorsal arm articulating with aedeagus. Aedeagus straight, long, narrowed distally; vesica armed with a cluster of slender cornuti.

Female genitalia slides DRD 1900, 1906; USNM 24094. Ostium small, round; ventral lip strongly sclerotized; lamella antevaginalis a large sclerotized blotch; lamella postvaginalis elongate, Y-shaped, lightly sclerotized. Antrum elongate, slender, strongly sclerotized. Inception of ductus seminalis ventrally from anterior end of ductus bursae. Ductus bursae with a sclerotized patch about middle. Bursa copulatrix very finely spiculate. Signa slender, sharp, thornlike, with broad sclerotized bases.

Holotype: USNM No. 71100.

Type locality: Costa Rica, Turrialba (8.III.65, L. Bonnefil)

Distribution: Costa Rica.

Food plant: String beans (stems).

Described from the holotype female, 5♂♂ and 4♀♀ paratypes, same data as holotype; 1♂, 1♀ paratypes, Costa Rica, La Garita, Alahuela, 30.X.56, Alvaro Cordero (57-983).

Because both of the species included in this paper feed in beans, they might easily be confused in the field so the adults are figured for comparison. Of the two *fabivora* averages a little larger than *torostoma*, some specimens attaining as much as 24 mm. Moreover, *fabivora* has a paler ground color to the forewing and a light colored gray, yellowish or orange apical spot, lacking in *torostoma*. In addition, the base of the hindwing of *torostoma* is light colored, that of *fabivora* wholly dark. In male genitalia the incurvation of harpe is shallow and the aedeagus is straight in *torostoma* but in *fabivora* the incurvation is deep and the aedeagus is bent. The female genitalia of *torostoma* have a well sclerotized antrum and a sclerotized Y-shaped lamella postvaginalis; in *fabivora* the antrum is not sclerotized and

2

3

Fig. 2. *Laspeyresia torostoma*, n. sp., holotype female, Costa Rica, Turrialba, L. Bonnefil. Fig. 3. *L. fabivora* Mayrick, paratype female, Peru, Cañete, E. J. Hambleton.

the lamella postvaginalis consists of two elongate, sclerotized divergent areas.

Laspeyresia fabivora Meyrick
(Fig. 3)

Laspeyresia fabivora Meyrick, 1928. Exotic Microlepidoptera 3:449.

Eulia prosecta Meyrick, 1932. Exotic Microlepidoptera 4:259. NEW SYNONYM.

Laspeyresia leguminis Heinrich, 1943. Proc. Ent. Soc. Wash. 45(3):71, pl. 4, figs. 1–5.

Types: British Museum (Natural History) (*fabivora*); Naturhistorisches Museum, Vienna (*prosecta*); U. S. National Museum of Natural History (*leguminis*).

Type localities: Colombia, Honda (*fabivora*); Costa Rica, Orosi, 5000 feet (*prosecta*); Peru, "Foa" (*leguminis*).

Distribution: With the addition of *prosecta* to the synonymy the distribution of this pest is now Costa Rica, Colombia, El Salvador, Mexico, Panama, and Peru.

Food plants: Lima beans, string beans, soybeans.

In 1958 (Proc. Ent. Soc. Wash. 60(4):187) I reported the identity of *leguminis* with *fabivora.* Since then I have had the opportunity to examine the type of *prosecta*, through the courtesy of Dr. F. Kasy, Naturhistorisches Museum, Vienna, and there is no doubt about the present synonymy. Obviously widespread in tropical America, this species will probably be found wherever beans are grown commercially.

PHYTOLIRIOMYZA MONTANA FRICK, NEW SYNONYM OF P. ARCTICA (LUNDBECK)

(DIPTERA: AGROMYZIDAE)

Phytoliriomyza artica (Lundbeck), 1901, Naturhist. For. Kjøbenhavn, Vidensk. Meddel. 1900 (= ser. 6, 2): 304 (*Agromyza*); Spender, 1969, Mem. Ent. Soc. Canada 64:202. *P. montana* Frick, 1953, Proc. Hawaiian Ent. Soc. 15:213. NEW SYNONYM.

The male postabdomens of several specimens of *P. montana* from Hawaii, including a paratype from Hawaii National Park, 3 March 1946, were compared with that of a specimen from Elk Point, South Dakota, and the figures given by Spencer. Although the Hawaiian specimens are smaller, the postabdomens agree very well, and the names must be considered synonymous.

GEORGE C. STEYSKAL, *Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture, c/o U. S. National Museum, Washington, D. C. 20560.*

A SYNONYMY IN WESTERN PINE-DWELLING LEPTOTHRIPS SPECIES

(THYSANOPTERA: PHLAEOTHRIPIDAE)

Leptothrips species are slender-legged, usually purplish black phaeothripids that are thought to be predatory on smaller, plant-feeding arthropods. Various species show some preference for the plants that they inhabit, which may be either for the plant species itself or for host-specific prey on the plant. My studies of western species for investigators of pine fauna convinced me that *Leptothrips oribates* Hood (1938, Bull. Brooklyn Ent. Soc. 33(5):205) and *L. oregonensis* Hood (op. cit.:213)are indistinguishable. As first reviser I synonymize *oregonensis* (NEW SYNONYMY). Specimens I have identified by that name should now be known as *oribates. L. oribates* occurs in Oregon, Idaho, Colorado, New Mexico, and Arizona, usually on *Pinus* species, although the 3 type-specimens of *oregonus* were found on *Ribes cereum* and a tree stump. The chief distinction of *oribates* is its pointed postocular and abdominal setae. It may be distinguished from other species with pointed setae by having antennal segment IV usually with 4 normal and no small sense cones; eyes about equally long dorsally and ventrally, depending on the tilt of the head; pronotum weakly and incompletely transversely striate; and clear forewing with cilia uniformly colored and about 7 accessory cilia near the posterior distal margin. I thank J. W. Dale, College of Forestry, University of Idaho, Moscow, for specimens retained for the National Collection from material he collected.

KELLIE O'NEILL, *Systematic Entomology Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland 20705.*

VESPINA, A NEW NAME TO REPLACE THE GENERIC HOMONYM CAREOSPINA DAVIS

(LEPIDOPTERA: INCURVARIIDAE)

It has been brought to my attention that the name *Careospina* Davis, 1972 (type species: *Careospina quercivora* Davis), which was recently proposed for a new genus of incurvariid moths (Davis, 1972, Proc. Ent. Soc. Wash. 74:121), is preoccupied by *Careospina* Peters, 1971 (type species: *Careospina hespera* Peters). The latter was published for a genus of Ephemeroptera from the West Indies (Peters, 1971, Smithsonian Contr. Zool. no. 62, p.11). I, therefore, propose the new name *Vespina* (type species: *Careospina quercivora* Davis) to replace the junior homonym *Careospina* Davis. The etymology of *Vespina* is similar to its synonym and refers to the fact that an epiphysis is absent from the foretibia (Latin ve, meaning without; and Latin spina, meaning spine). Likewise, *Vespina* is to be considered feminine in gender.

I wish to thank both Dr. William Peters and Dr. George Edmunds for notifying me of this oversight.

DONALD R. DAVIS, *Department of Entomology, Smithsonian Institution, Washington, D. C. 20560.*

COLLECTING HIBERNATING CARABIDAE UNDER SNOW

In North America, the large majority of the species of Carabidae seemingly hibernate in the adult stage. On January 1, 1972, I collected a good number of ground beetles at the border of an eutrophic marsh, in Choisy, Vaudreuil County, Quebec. All specimens were taken under six inches of snow, beneath dead leaves and grasses; furthermore, they were motionless. The following is a list of the captures, with the number of specimens of each species: *Acupalpus pauperculus* Dejean (1), *A. rectangulus* Chaudoir (3), *Agonum gratiosum* Mannerheim (2), *A. lutulentum* Leconte (3), *A. puncticeps* Casey (12), *A. propinquum* Gemminger and Harold (1), *A. sordens* Kirby (4), *Badister grandiceps* Casey (1), *B. notatus* Haldeman (3), *Bembidion castor* Lindroth (8), *B. chalceum* Dejean (1), *B. concretum* Csy (2), *B. frontale* Leconte (10), *B. fortestriatum* Motschoulsky (1), *B. graciliforme* Hayward (5), *B. muscicola* Hayward (1), *B. patruele* Dejean (4), *B. praticola* Lindroth (1), *B. quadrimaculatum oppositum* Say (2), *Bradycellus atrimedeus* Say (6), *Chlaenius impunctifrons* Say (1), *Oodes parallelus* Say (2) and *Pterostichus lucublandus* Say (2).

André Larochelle, *Bourget College, C.P. 1000, Rigaud, Quebec.*

LITERATURE FOR SALE

ON THE BIOLOGY OF SOME SCAPHINOTUS AND SPHAERODERUS (COLEOPTERA: CARABIDAE)

According to Lindroth (1961, Opusc. Ent., Suppl. 20:1–200), most species of Cychrini seem to hibernate as larvae, at least in part, except for the species of *Sphaeroderus* which seem to hibernate as adults. I studied the immature forms and mating periods of two species of *Scaphinotus* and three species of *Sphaeroderus*. Every species of *Scaphinotus* studied apparently hibernates as larva, at least in part, whereas the species of *Sphaeroderus* seem to hibernate mostly as adults, except possibly *S. nitidicollis brevoorti* Leconte.

Scaphinotus bilobus Say. Immature beetles from Ontario, 15-VII-1930, and New Hampshire, 20-VII, were seen by Lindroth (*loc. cit.*). In addition, I saw other immature beetles from Québec, 16 and 17-VII-1968. These data suggest larval hibernation.

Scaphinotus viduus Dejean. Immature beetles were taken in Québec, 18-VII-1969 and 24-IX-1968, which suggest larval and imaginal hibernation.

Sphaeroderus canadensis Chaudoir. Immature beetles from Ontario, 24-IX-1948 and Québec, 25-V-1938, were seen by Lindroth (*loc. cit.*) and me. Furthermore, mating pairs from Québec, 2, 3 and 8-V-1970, and 4-VII-1970, have been observed by me. This species seems to normally hibernate in the adult stage.

Sphaeroderus lecontei Dejean. An immature beetle from New Hampshire, 11-VIII, was seen by Darlington (*fide* Lindroth), one emerged from pupa 8-IX, and a mating pair was observed 7-IX. In addition, I found immature beetles from Ontario, 20-VII-1966, and Québec, 21-VIII-1936, 24-VIII-1964 and 30-IX-1969. Copula from Québec, 29-IV-1968, 7-V-1970, 11-V-1970, 16-V-1970, 10-IX-1967 and 8-X-1969, was observed by C. Chantal, J. Dubé, J.-P. Laplante, J.-P. Lebel and me. Apparently larvae and adults are able to hibernate.

Sphaeroderus nitidicollis brevoorti Leconte. Mating pairs from Québec, 20-VII-1969, 9-VIII-1969 and 28-XI-1969, were observed by C. Chantal, J.-P. Lebel and me. The hibernation, at least, seems to take place in the larval stage.

ANDRÉ LAROCHELLE, *Collège Bourget, C.P. 1000, Rigaud, Québec.*

CORRECTIONS ON "A MONOGRAPHIC STUDY OF THE SUBFAMILY TIPHIINAE (HYMENOPTERA-TIPHIIDAE) OF SOUTH AMERICA"

The synonym mentioned below, and several of the other corrections were indicated to me by Dr. Howard E. Evans of Harvard University shortly after publication of my recent paper on the South American Tiphiinae (1972, Smithsonian Contr. Zool., No. 113).

On page 2 and elsewhere, M. S. Wasbauer's name has been misspelled.

Since *Mallochia* is preoccupied in the family Icheumonidae (Viereck, 1912, Proc. U. S. National Museum 43:591), I propose that the synonym in my paper, mentioned on pages 1, 3, 4, 5, 6 and 75, be changed to *Mallochessa*.

On page 6, the specimen of *M. alini* from Curitiba, Parana, Brazil, is a paratype.

On page 8, "arches" should be "arched."

On page 9, the type locality is Sipaliwini not Ripalwini, and the type was collected by P. H. van Doesburg.

On page 12, the term (RNH) should be inserted at the end of the holotype designation of T. *savanna*.

On pages 28 and 42 *academae* is misspelled.

On page 29, the holotype designation for *huallaga*, Bassleri should be changed to Bassler, and (UK) changed to (AMNH).

On page 29, "Anduze" is a man's name and not a locality and should appear as (Anduze).

On page 48 and elsewhere, "Nova" Teutonia should be changed to Nova Teutonia.

On page 65, change "femora (Figure 37)" to "tibiae (Figure 37)."

On page 68, under designation of paratype, insert (USNM) after "same data as holotype."

Throughout the paper, the words "Sao" should be "São" and "Tucuman" should be "Tucumán."

HARRY W. ALLEN, *Collaborator, U. S. Department of Agriculture, Agricultural Research Service, P. O. Box 150, Moorestown, New Jersey 08057.*

NEW STATE RECORDS OF AQUATIC INSECTS FROM VIRGINIA

Under the supervision of Paul J. Spangler of the National Museum of Natural History, Smithsonian Institution, I conducted an aquatic insect survey of a salt marsh impoundment in Chincoteague National Wildlife Refuge. During my survey, I collected 1 species of Hemiptera and 4 species of Coleoptera not before recorded from Virginia. These species are as follows: *Ranatra australis* Hungerford (Hemiptera: Nepidae), *Haliplus confluentus* Roberts (Coleoptera: Haliplidae), *Hygrotus impressopunctatus* Schaller (Coleoptera: Dytiscidae), *Notomicrus nanulus* (LeConte) (Coleoptera: Noteridae), and *Paracymus nanus* (Fall) (Coleoptera: Hydrophilidae).

The Virginia record of *Hygrotus impressopunctatus* Schaller represents a southern extension of its range. *Hygrotus impressopunctatus* Schaller occurs primarily in the boreal regions of Europe and North America. In North America it can be found from New England to Alaska and in Michigan, Ohio, New York, and Pennsylvania.

The Virginia record of the remaining 4 species represents northern extensions of their known ranges. *Ranatra australis* Hungerford was primarly known to occur in coastal areas from Texas to Florida and Georgia, and as far north as Raleigh, North Carolina. *Haliplus confluentus* Roberts has been reported from Florida to Myrtle Beach, South Carolina. *Paracymus nanus* (Fall) has a distribution similar to that of *Haliplus confluentus* Roberts, having been reported from Florida and Georgia.

The discovery of *Notomicrus nanulus* (LeConte) in Virginia is of particular interest because its previously known range in the United States was limited to Louisiana and Florida, and because very little is known about the life history or behavior of any species of *Notomicrus*. One female specimen of *Notomicrus nanulus* (LeConte) was collected on 2 September 1971 from a mud bottomed puddle left after the summer drought. The only other adult insect found in the same pool was the halophilic *Trichocorixa verticalis* Fieber (Hemiptera: Corixidae).

JARRETT L. CROSS, *1905 East West Highway, Silver Spring, Maryland 20910.*

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(New taxa indicated in *italics*)

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