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PROCEEDINGS OF THE

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NEW SYNONYMY AND RECORDS OF MUTILLIDAE FOR AMERICA NORTH OF MEXICO

(HYMENOPTERA)[1]

CLARENCE E. MICKEL, *University of Minnesota*

The following notes regarding new synonymy and records are the result of the examination of the type specimens, and of the collecting of D. J. and J. N. Knull, Ohio State University, in southwestern United States. The location of the type is indicated in brackets after each citation.

Dilophotopsis concolor ssp. **paron** (Cameron), N. comb.

Sphaerophthalma paron Cameron, Biol. Centr.-Amer., Hymen. 2: 381, 1896, male. [Brit. Mus. (Nat. Hist.)]

Dilophotopsis concolor ssp. *sonorensis* Schuster, Ent. Amer. 37(N.S.): 88, male. (**New synonymy.**) [Univ. Minn., St. Paul]

Southwestern United States and northern Mexico.

Sphaerophthalma (**Photopsis**) **coaequalis** Cameron, N. comb.

Sphaerophthalma coaequalis Cameron, Biol. Centr.-Amer., Hymen. 2: 379, 1896, male. [Brit. Mus. (Nat. Hist.)]

Mutilla albicincta Fox, Trans. Amer. Ent. Soc. 25: 255, 1899, male. (**New synonymy**). [Amer. Ent. Soc. Phila.]

Western United States and northern Mexico.

Odontophotopsis (**Odontophotopsis**) **eubule** (Cameron), N. Comb.

Sphaerophthalma eubule Cameron, Biol. Centr.-Amer., Hymen. 2: 383, 1896 male. [Brit. Mus. (Nat. Hist.)]

Mutilla hamata Melander, Trans. Amer. Ent. Soc. 29: 314, 1903, male. (**New synonymy**.) [U.S. Nat. Mus.]

New Mexico and northern Mexico.

Pseudomethoca damia (Cameron), N. comb.

Sphaerophthalma damia Cameron, Biol. Centr.-Amer., Hymen. 2: 321, 1894, female. (Secondary homonym, preoccupied by Smith, 1864.) [Brit. Mus. (Nat. Hist.)]

Mutilla sphaerophthalmica Dalle Torre, Cat. Hymen. 8: 87, 1897, female. (New name for secondary homonym *damia* Cameron.)

Sphaerophthalma Danica (!) Dalle Torre, Cat. Hymen. 8: 87, 1897, female.

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[1] Paper no. 5181 Scientific Journal Series, Minnesota Agricultural Experiment Station, St. Paul 1, Minnesota.

Type locality: Amula, Guerrero, Mexico. New United States record: female, Ruby, Arizona, August 7, 1952 (D. J. and J. N. Knull), in collection of University of Minnesota.

Pseudomethoca ilione (Fox), N. comb.

Mutilla ilione Fox, Trans. Amer. Ent. Soc. 25: 268, 1899, female. [Amer. Ent. Soc. Phila.]

Ephuta (*Ephuta*) *ilione* André, Gen. Ins. 11: 60, 1903, female.

Mutilla aprica Melander, Trans. Amer. Ent. Soc. 29: 323, 1903, female. (**New synonymy**.) [Mus. Comp. Zool.]

Pseudomethoca aprica Mickel, Proc. U.S. Nat. Mus. 64(15): 16, 1924, female; Mickel, Trans. Amer. Ent. Soc. 61: 393, 1935, female; Krombein, USDA Agr. Mon. 2: 759, 1951, female.

Photopsis ilione Krombein, USDA Agr. Mon. 2: 754, 1951, female. Texas.

Dasymutilla alesia Banks

Mutilla versicolor Smith (nec Fabr.), Cat. Hymen. Brit. Mus. 3: 63, 1855, female. (Misidentification).

Dasymutilla alesia Banks, Ann. Ent. Soc. Amer. 14: 24, 1921, female.

Smith's specimen from St. John's Bluff, E. Florida extends the range of *alesia* to Florida. Smith's specimen of *versicolor* was made available to me through the courtesy of the British Museum (Natural History).

Dasymutilla apicalata (Blake)

Mutilla (*Sphaerophthalma*) *apicalata* Blake, Trans. Amer. Ent. Soc. 3: 238, 1871, male. [Amer. Ent. Soc. Phila.]

Sphaerophthalma perfidiosa Cameron, Biol. Centr.-Amer., Hymen. 2: 368, 1895, male. (Secondary homonym, preoccupied by Smith, 1879.). (**New synonymy**.) [Brit. Mus. (Nat. Hist.)]

Sphaerophthalma guerreroensis Cameron, Biol. Centr.-Amer., Hymen. 2: 369, 1895, male. (**New synonymy**.) [Brit. Mus. (Nat. Hist.)]

Mutilla perfida Dalle Torre, Cat. Hymen. 8: 72, 1897, male. (New name for secondary homonym *perfidiosa* Cameron.)

Dasymutilla apicalata Mickel, Bull. 143, U.S. Nat. Mus., 273, 1928, male.

The type of *perfidiosa* Cameron has the first abdominal segment ferruginous rather than black as in *apicalata* Blake. This appears to be a common color variation as noted by Blake in his original description, in which he designated the specimens with the first abdominal segment ferruginous as "var. a."

Mexico, Texas, and Arizona.

Dasymutilla connectens (Cameron), N. comb.

Sphaerophthalma connectens Cameron, Biol. Centr.-Amer., Hymen. 2: 362, 1895, female. (Secondary homonym, preoccupied by Cresson, 1865.) [Brit. Mus. (Nat. Hist.)]

Mutilla eggeri Dalle Torre, Cat. Hymen. 8: 33, 1897, female. (New name for secondary homonym *connectens* Cameron.)

Dasymutilla helva Mickel, Bull. 143, U.S. Nat. Mus., 259, 1928, female. (**New synonymy**.) [U.S. Nat. Mus.]

Arizona, U.S., and Chihuahua, Jalisco, and Baja California, Mexico.

Dasymutilla ferruginea (Smith), N. comb.

Mutilla ferruginea Smith, Descr. New Species Hymen. 226, 1879, female. [Brit. Mus. (Nat. Hist.)]

Dasymutilla chrysocoma Mickel, Bull. 143, U.S. Nat. Mus., 266, 1928, female. (**New synonymy**.) [Amer. Mus. Nat. Hist.]

Arizona, U.S., and Puebla and Oaxaca, Mexico.

Dasymutilla sicheliana (Saussure)

Mutilla Sicheliana Saussure, Ann. Soc. Ent. Fr. (4)7: 360, 1867, female. [Mus. d'Hist. Natur., Geneva]

Sphaerophthalma prunotincta Cockerell, Ent. News 6: 60, 1895, female. [Lost?]

Sphaerophthalma thera Cameron, Biol. Centr.-Amer., Hymen. 2: 358, 1895, female. (Secondary homonym, preoccupied by Smith, 1864.) (**New synonymy**.) [Brit. Mus. (Nat. Hist.)]

Mutilla gynaecologica Dalle Torre, Cat. Hymen. 8: 45, 1897, female. (New name for secondary homonym *thera* Cameron.)

Dasymutilla sicheliana Mickel, Bull. 143, U.S. Nat. Mus., 246, female; Mickel, Rev. Ent., Rio 7: 190, 1937, female.

Arizona, U.S., and Mexico.

Dasymutilla vestita (Lepeletier)

Mutilla vestita Lepeletier, Hist. Nat. Ins., Hymen. 3: 634, 1845, female and male. [Zool. Mus. Univ. Torino?]

Mutilla montezumae Lepeletier, Hist. Nat. Ins., Hymen. 3: 634, 1845, female. [Zool. Mus. Univ. Torino?]

Mutilla californica Cresson (nec Radoskowski), Proc. Ent. Soc., Phila. 4: 432, 1865, female (in part). (Misdetermination.)

Mutilla fulvohirta Cresson, Proc. Ent. Soc. Phila. 4: 433, 1865, male. (**New synonymy**.) [Amer. Ent. Soc. Phila.]

Sphaerophthalma aspasia Cameron, Biol. Centr.-Amer., Hymen. 2: 370, 1895, male. (Secondary homonym, preoccupied by Blake, 1879.) (**New synonymy**.) [Brit. Mus. (Nat. Hist.)]

Mutilla aspasioides Dalle Torre, Cat. Hymen. 8: 12, 1897, male. (New name for secondary homonym *aspasia* Cameron.)

Ephuta californica var. *euchroa* Cockerell, Ann. Mag. Nat. Hist. (6)20: 513, 1897, female. (**New synonymy**.) [U.S. Nat. Mus.]

Dasymutilla fulvohirta Mickel, Bull. 143, U.S. Nat. Mus., 66, 1928, female and male.

Dasymutilla vestita Mickel, Rev. Ent., Rio 7: 185, 1937, male and female.

A careful comparison of Mexican specimens of this species with those from the United States and Canada leads to the conclusion that only one species is involved and that the name *vestita* Lep., having priority, is the correct one to apply. The species has a very wide distribution in the Rocky Mountain region and adjacent areas in the United States and Canada, southward in Mexico to the state of Oaxaca.

Photomorphus (Photomorphina) myrmicoides (Cockerell)

Mutilla parvula Blake, Trans. Amer. Ent. Soc. 13: 206, 1886, female.

Sphaerophthalma myrmicoides Cockerell, Ent. News 6: 62, 1895, female. [Amer. Ent. Soc. Phila.]

Mutilla impar Melander, Trans. Amer. Ent. Soc. 29: 321, 1903, female. [Mus. Comp. Zool.]

Odontophotopsis subtenuis Viereck, Trans. Amer. Ent. Soc. 30: 85, 1904, male. (**New synonymy.**) [Amer. Ent. Soc. Phila.]

Photomorphus myrmicoides Mickel, Ann. Ent. Soc. Amer. 27: 610, 1934, female and male.

United States, east of Rocky Mountains.

A NEW JOHANNSENOMYIA FROM BRAZIL

(DIPTERA: CERATOPOGONIDAE)

The first Neotropical species of *Johannsenomyia* Malloch was described from Panama in the genus *Dicrohelea* Kieffer by Lane and Wirth (1961, Rev. Brasil. Ent. 10: 81). More recently Wirth (1962, Ann. Ent. Soc. Amer. 55: 276) has shown that *Dicrohelea* is a synonym of *Johannsenomyia*. *Dicrohelea blantoni* Lane and Wirth must therefore be transferred to *Johannsenomyia* (**New Combination**). The purpose of this note is to describe the second known Neotropical species, from southern Brazil.

Johannsenomyia lanei n. sp.

Female.—Length of wing (measuring from basal arculus) 2.75 mm. Head yellowish except occiput shining brown, distal five flagellomeres and extreme apices of proximal flagellomeres brownish. Thorax subshining brownish black; scutum, scutellum and upper pleuron with moderately heavy, semiappressed, coarse golden scalelike hairs; anterior scutal spine erect and moderately prominent. Legs yellowish, fore and mid tibia somewhat brownish on extensor side on proximal halves; mid and hind coxae dark brown; hind femur shining blackish from near base to distal third, with a broad subapical yellow band, but extreme apex brown; hind femur becoming stouter distad, on yellow subapical portion slightly but distinctly more swollen than the remainder; hind tibia dark brown on proximal half; fifth tarsomeres brownish, each with 4–5 pairs of long, black batonnets; claws each with short basal tooth on external side, equal on fore legs, very unequal on mid and hind legs. Wing hyaline, the anterior veins yellowish, costa extending to 0.87 of wing length; only one radial cell, the radial crossvein obsolete, but its location faintly indicated by a dip in vein R1 and an indentation of the membrane. Halter deeply infuscated. Abdomen dull blackish; terga with heavy silvery white pruinosity as seen in posterior view. Spermathecae not examined.

Type.—Holotype female, Nova Teutonia, Santa Catarina, Brazil, Oct. 1962, F. Plaumann (in Canadian Nat. Coll., Ottawa).

Discussion.—The other three American species of *Johannsenomyia* can readily be distinguished from *lanei* as follows: *annulicornis* Malloch has the female abdomen shining black and the hind femur without the subapical yellow ring; *argentata* (Loew) has the wing prominently infuscated in the radial field and the leg markings variable, but usually with the hind femur entirely pale or with the subapical pale ring less prominent; and *blantoni* (Lane and Wirth) with the legs much darker, the fore and mid femora extensively brownish, with subapical yellow rings.—WILLIS W. WIRTH, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

ON THE AUTHORSHIP OF TACHARDINA THEAE

(Homoptera: Lacciferidae)

Tachardina theae, the lac insect occurring on tea, cinchona, and *Ficus* spp. and distributed over China, Formosa, and northern India, is presently thought to have been described by Green and Mann. A study of the original paper revealed that Green and Mann (1907, Mem. Dept. Agr. India, Ent. Ser. 1(5): 337–355, pls. 16–19) have dealt with the Coccidae attacking tea plants in India and Ceylon, in the following five parts:

> "I. Introduction, II. List of Coccidae affecting the tea plant in India and Ceylon, III. Descriptions of new species (E. E. Green), IV. Distribution and relative importance of scale insects on tea in Northern India (H. H. Mann), V. Distribution and relative importance of scale insects on tea in south India and Ceylon (E. E. Green)."

In the third part, pages 344–349, the following species were formally described for the first time:

> *Chionaspis manni* [now *Phenacaspis manni*], *Dactylopius theaecola* [now *Pseudococcus theaecola*], *Tachardia decorella* var. *theae* [now *Tachardina theae*].

The first two of the above coccid species have always been credited to Green; the third one, *T. decorella* var. *theae*, was erroneously credited to both Green and Mann first by Sanders (1909, Catalogue of recently described Coccidae II. Tech. Ser., U.S. Dept. Agr. 16(3): 43), although the author of variety *theae* was clearly mentioned as Green on page 339 in the second part of the original work, as well as by Green (1908, Mem. Dept. Agr. India, Ent. Ser. 2(2):28). Ramakrishna Ayyar (1921, Proc. Fourth Ent. Meet. Pusa: 240) also gave Green as author of *Tachardia decorella* var. *theae*.

Specific rank was given to this variety by Chamberlin (1923, Bull. Ent. Res. 14(2): 210), who placed *theae* in the genus *Tachardina* Cockerell, but, unfortunately, kept Green and Mann as the joint authors. Since then this error has been perpetuated and has been cited by Takahashi (1929, Observations on the Coccidae of Formosa 1: 69), Kapur (1958, A catalogue of lac insects (Lacciferidae, Hemiptera): 40), and Varshney (1962, Indian Jour. Ent. 24(4): 282–283) as *Tachardina theae* (Green and Mann) instead of *Tachardina theae* (Green).

Earlier it was thought that according to Article 10 b of the International Code of Zoological Nomenclature, Chamberlin (who elevated the variety *theae* to specific level in 1923) should be the author of the species with June 30, 1923 as date of publication. But, since variety *theae* was published before 1961, according to Article 45 e, it is not of infrasubspecific status in express statement, and so Chamberlin cannot be the author of the species.

It is very clear from the contents of the original paper and also from some other earlier references, that Green is the author of taxon *theae, in* Green and Mann. According to Article 50 of International Code of Zoological Nomenclature, Green "is alone responsible both for the name and the conditions that make it available." The type material of this species was collected by Dr. Harold H. Mann on tea plants in Darjeeling during February 1907, and also in Assam during December 1900, *vide* Green and Mann (*loc. cit.*).

The author is grateful to Dr. Jon L. Herring of the Entomological Society of Washington, and Mr. Curtis Sabrosky, a member of the International Commission

on Zoological Nomenclature, for their comments and assistance regarding this matter.—R. K. VARSHNEY, *Entomology Division, Indian Lac Research Institute, Namkum, Ranchi, Bihar, India.*

OCCURRENCE OF DERMANYSSUS QUINTUS VITZTHUM IN NORTH AMERICA

(ACARINA: MESOSTIGMATA: DERMANYSSIDAE)

Dermanyssus quintus Vitzthum was described from Germany in 1921. Since then it has been reported from England (Turk and Turk, 1952, Ann. Mag. Nat. Hist., ser. 12, 5: 484) and the U.S.S.R. (Bregetova, 1956, Gamasid mites (Gamasoidea), Acad. Sci. U.S.S.R., Moscow, p. 202). All hosts have been woodpeckers (Picidae) with *Dendrocopos leucotos* and *Dendrocopos major* specifically identified. In addition to the above two species, *Dryobates major* has been listed as a host by Strandtmann and Wharton (1958, Inst. Acar. Cont. No. 4, p. 123) and Evans and Till (1962, Ann. Mag. Nat. Hist., ser. 13, 5: 286–288); however, according to Peters (1948, Check-list of birds of the world, Vol. VI, Harvard Univ. Press, Cambridge, pp. 180–215), this is the same species as *Dendrocopos major.*

One ♀ of this mite was among a collection of ectoparasites received from Dr. R. E. Mumford of Purdue University. It was collected from *Dendrocopos villosus*, 5 mi. W. of Estes Park, Larimer Co., Colorado (2,300 m.) on June 6, 1960, by Dr. Mumford.

This specimen compares favorably with the figures and descriptions given by Vitzthum (1921, Arch. Naturg. 86A(10): 7–14), Bregetova (1956, *op. cit.*), and Evans and Till (1962, *op. cit.*) with few exceptions. Ventrally the Colorado specimen has 14 body setae posterior to coxae IV and exclusive of those on or posterior to the U-shaped ridge. Vitzthum (1921, *op. cit.*) describes and illustrates 6 setae; Bregetova (1956, *op. cit.*) and Evans and Till (1962, *op. cit.*) illustrate 11 and 12 setae, respectively. The Colorado specimen has 3 pairs of hypostomal setae. Vitzthum (1921, *op. cit.*) and Evans and Till (1962, *op. cit.*) do not illustrate or describe these setae; Bregetova (1956, *op. cit.*) illustrates 2 pairs of hypostomal setae. Dorsally the chaetotaxy agrees perfectly with that described and illustrated by Evans and Till (1962, *op. cit.*).

It seems strange that this striking dermanyssid mite has not been reported before from North America and more frequently from Europe. The published records indicate it is a parasite of the Picidae, a family of worldwide distribution. *D. quintus* may be primarily a nest parasite and a search of woodpecker nests might disclose additional records. At present the distribution is very disjunct with records from Europe and western North America.—NIXON WILSON, *Bernice P. Bishop Museum, Honolulu, Hawaii 96819.*

A REVIEW OF THE COLPOCEPHALUM OF THE CORVIDAE WITH THE DESCRIPTION OF A NEW SPECIES

(MALLOPHAGA: MENOPONIDAE)[1]

ROGER D. PRICE AND JAMES R. BEER, *Department of Entomology, Fisheries, and Wildlife, University of Minnesota, St. Paul*

As a continuation of our studies upon lice of the genus *Colpocephalum* Nitzsch, 1818, we here review the status of the lice found upon the family Corvidae (Passeriformes). Although the genus *Colpocephalum* as currently interpreted by most workers is associated with a number of bird orders, the only members of the Passeriformes known to harbor these lice belong to the Corvidae (except for *C. ignotum* Tendeiro reported by Tendeiro (1958) as a possible straggler from the Cuculidae to the Hirundinidae). We have been able to examine over 400 specimens of *Colpocephalum* from 20 species of Corvidae; included among these are series of both sexes from the eight type hosts upon which the seven currently recognized species of *Colpocephalum* are based. Thus we are able to render an opinion as to the status of these species as well as to place the additional materials from the other hosts.

The *Colpocephalum* of the Corvidae may be characterized generically by the same features reported earlier (Price and Beer, 1963b). All specimens we have seen from the Corvidae bear a remarkable similarity not only to each other but also to the *Colpocephalum* of the owls and to the *polybori*-group of *Colpocephalum* from hawks. Both sexes of all of these have (1) four minute middorsal head setae, (2) a minute outer and a long inner pair of occipital setae, and (3) marginal pronotal setae of short, long, short, and three (less often four) long setae on a side. The females have a broadly rounded vulva without a prominent lateral row of hooked setae and have a comparatively simple oval anus without inner setae. All males have genitalia similar to those in Fig. 4, with a barbed penis and the lateroposterior projections of the genital sclerite bluntly pointed.

All observations of lice in this work are based on specimens mounted on slides. Measurements, where given, are in millimeters. The value placed in parentheses following a statement of range represents the mean. The nomenclature of the hosts follows that of Peters (1962).

Colpocephalum fregili Denny

(Figs. 1–4)

Type host.—*Pyrrhocorax p. pyrrhocorax* (Linn.).

Colpocephalum subaequale Burmeister, 1838 (*nec* Haan, 1829). Handb. Ent. 2: 438.

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[1] Paper no. 5161, Scientific Journal Series, Minnesota Agricultural Experiment Station, St. Paul 1, Minnesota.

Type hosts.—*Corvus frugilegus* Linn. and *Corvus corax* Linn.

Colpocephalum fregili Denny, 1842. Monogr. Anopl. Brit.: 198, 208.

Type host.—*Fregilus graculus* (Linn.) = *Pyrrhocorax p. pyrrhocorax* (Linn.).

Colpocephalum semicinctum Rudow, 1866. Z. ges. Naturwiss. 27: 475.

Type host.—*Corvus scapulatus* Daudin = *Corvus albus* Müller.

Colpocephalum trimaculatum Piaget, 1880. Les Pediculines: 525.

Type hosts.—*Platycercus palliceps* Lear = *P. adscitus palliceps* Lear and *P. barrabandi* (Swainson) = *Polytelis swainsonii* (Desmarest)—errors. **N. Syn.**

Colpocephalum elongatum Piaget, 1880. Les Pediculines: 529.

Type host.—*Pyrrhocorax alpinus* Vieillot = *Pyrrhocorax graculus* (Linn.). N. Syn.

Colpocephalum ellipticum Piaget, 1880. Les Pediculines: 570.

Type host.—*Xulla* (*Larus*) *mangola* [author unknown] = *Corvus e. enca* (Horsfield). N. Syn.

Colpocephalum splendens Ansari, ?1955. Proc. 7th Pak. Sci. Conf. (Sect. Agric.): 51. (Also described as n. sp. in Ind. Jour. Ent. 17 (1956): 399 and Ind. Jour. Ent. 18 (1957): 428.)

Type host.—*Corvus s. splendens* Vieillot. N. Syn.

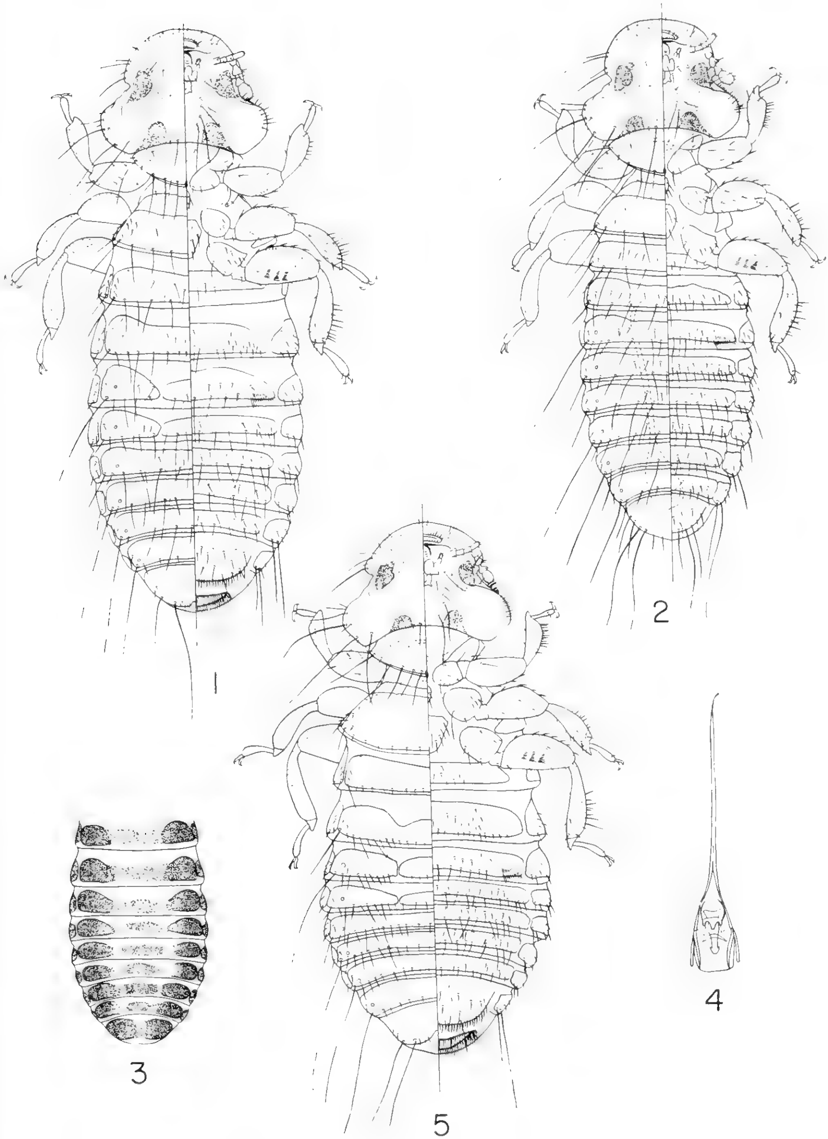
Colpocephalum laurencei Ansari, ?1955 (*nom. nov.* for *subaequale* Burmeister). Proc. 7th Pak. Sci. Conf. (Sect. Agric.): 51. (Also given as *nom. nov.* in Ind. Jour. Ent. 17 (1956): 399 and Ind. Jour. Ent. 18 (1957): 427.) N. Syn.

Colpocephalum bengalensis Ansari, ?1955. Proc. 7th Pak. Sci. Conf. (Sect. Agric.): 58. (Also described as n. sp. in Pak. Jour. Sci. Res. 8 (1956): 57 and Ind. Jour. Ent. 17 (1956): 399.)

Type host.—*Corvus macrorhynchus* = *Corvus macrorhynchos* Wagler. N. Syn.

Female.—Specimens from type host as in Fig. 1. Pronotum marginally with a short, long, short, and 3 long setae on each side. Metanotum with majority of marginal setae of moderate length; metasternal plate with 8–11 (9.4) setae. Abdomen with first 2–3 segments somewhat longer than remainder. Tergites III–IV tripartite, with remainder of tergites darker laterally, pigmentation as in Fig. 3. Tergocentral setae: 5–8 (6.0) on I, 9–12 (10.1) on II, 9–14 (11.9) on III, 10–16 (13.0) on IV, 9–13 (10.9) on V, 7–12 (9.4) on VI, 4–8 (6.6) on VII, and 4–5 (4.5) on VIII; these setae usually medium to long, but with occasional short or minute seta within row, especially on more posterior segments; tergocentral setae on VIII typically all minute. Anterior tergal setae: 4–11 (6.8) on I, 10–15 (12.5) on II, 2–4 (3.1) on III, 1–3 (2.1) on IV, 0–7 (2.9) on V, 0–1 (0.3) on VI, and 0 on VII–VIII. Postspiracular setae very long except variable on V and short on IV. Last tergite with 2 minute lateral setae, then 2 very long setae, and a group of 2–5 short to minute inner posterior setae on each side. Sternite II with lateral grouping of shorter setae; sternites II–III usually with at least 2 longer median marginal setae. Vulva flatly rounded, sometimes indented slightly at midline; 32–37 (34.4) evenly spaced short marginal setae. Anal fringe of 44–52 (48.3) setae ventrally, 38–49 (43.8) dorsally. Dimensions: preocular width, 0.33–0.35; temple width, 0.47–0.49; head length, 0.30–0.32; prothorax width, 0.30–0.32; metathorax width, 0.47–0.52; total length, 1.59–1.69.

Although the above description applies only to females from *P. pyrrhocorax*, those from all additional hosts, including the type hosts of all synonyms, show remarkable similarity to this material. The only indication of potential differences lies in such quantitative features as number of tergocentral, anterior tergal, vulval, and anal setae. The setal counts of some individuals are outside the limits given



Figs. 1–4, *Colpocephalum fregili*. Fig. 1. Dorsoventral view of female; Fig. 2. Dorsoventral view of male; Fig. 3. Pigmentation of dorsum of abdomen of female; Fig. 4. Male genitalia.

Fig. 5, *Colpocephalum tristis*, n. sp., dorsoventral view of female.

for lice from *P. pyrrhocorax*; however, there is always sufficient overlap among the series to prevent any separation. Since the wider limits of setal number may be of assistance to others studying these lice, we shall give here the composite range for certain counts, including data from 3–11 females from each type host of the synonyms. Tergocentral setae: 9–19 on II, 7–19 on III, 8–18 on IV, 7–19 on V, 4–16 on VI, 4–13 on VII, 4–9 on VIII. Anterior tergal setae: 4–17 on II, 0–6 on III, 0–7 on IV. Ventral anal setae, 36–56; dorsal anal setae, 33–55. Marginal vulval setae, 28–41. Metasternal setae, 6–15. Except for total length, 1.34–1.93, other size ranges are from 0.02–0.04 wider at each extreme.

Male.—Specimens from type host as in Fig. 2. Chaetotaxy of head and thorax similar to female. All abdominal segments of approximately equal length and with uniformly pigmented undivided tergites. Tergocentral setae: 4–5 (4.3) on I, 4–7 (5.8) on II, 6–9 (7.2) on III, 7–10 (8.0) on IV, 6–9 (7.5) on V, 6–8 (7.2) on VI, 4–5 (4.5) on VII, 4 on VIII; lengths of setae much as with females, except for generally longer setae on VIII. Anterior tergal setae: 5–7 (5.8) on I, 10–13 (11.8) on II, 1–7 (4.5) on III, 1–6 (3.5) on IV, 0–3 (1.2) on V, 0.3 (2.0) on VI, and 0 on VII–VIII. Postspiracular setae long on all segments. Each side of last tergite with 2 medium-long setae laterally, then 2 very long setae, and 2–3 medium setae. Genitalia as in Fig. 4; genital sclerite with bluntly pointed lateroposterior projections; penis barbed. Dimensions: preocular width, 0.32–0.33; temple width, 0.44–0.45; head length, 0.29–0.31; prothorax width, 0.29–0.30; metathorax width, 0.39–0.41; total length, 1.42–1.47; genitalia length, 0.52–0.57.

Again, as with the females, the above description is restricted to specimens from *P. pyrrhocorax*. A consideration of 3–8 males from each type host of the synonyms shows an expansion of the tergocentral setal ranges as follows: 4–14 on II–VI, 3–11 on VII, 4–8 on VIII. The ranges of all series overlapped those from the type host of *Colpocephalum fregili*. The most variable quantitative feature involves the anterior tergal setae, whose composite ranges extend from 5–26 on II and 0 as a minimum to 17–25 as a maximum on III–VIII. The lice from *Corvus splendens* lie in the upper region of these ranges, showing, respectively, on II–VIII, 14–26 (19.6), 6–18 (13.4), 10–19 (13.5), 8–21 (13.8), 7–21 (13.5), 5–18 (12.0), and 4–16 (10.0). Those from *C. macrorhynchos* encompass the widest range, showing on II–VIII, 8–20 (12.0), 3–18 (9.0), 4–19 (9.2), 2–25 (9.8), 0–17 (7.3), 0–16 (6.0), and 0–17 (4.8). The lice from *Pyrrhocorax pyrrhocorax* and *Pyrrhocorax graculus* have counts at the lower portion of the ranges, with other series intermediate in position. Thus, even though males from *Corvus splendens* have consistently more anterior tergal setae than those from *P. pyrrhocorax*, the great variability of these counts, coupled with the presence of considerable overlapping of counts from series from other hosts, makes reliable separation into species seemingly impossible on this basis. Furthermore, these setae may appear shorter when they are more numerous, a deceptive feature should one have at hand only short series of lice lying at both limits of the range. Total length of males varies from 1.12–1.79, with other dimensions being from 0.01–

0.04 wider at each extreme. Thus, with no reliable quantitative or qualitative features for differentiation of species for either sex, we must conclude that, in light of our present knowledge, all series considered here are conspecific with *Colpocephalum fregili*.

Bedford (1939) recognizes the similarities of a number of these lice. He considers *Colpocephalum fregili* and *C. semicinctum* to be synonyms of *C. subaequale*, but fails to note the unavailability of *C. subaequale*. In addition to the type hosts of the above, Bedford notes the following hosts to have this same species: *Corvus macrorhynchos, C. brachyrhynchos* Brehm, *C. capensis* Lichtenstein, *C. rhipidurus* Hartert, *C. albicollis* Latham, and "Australian Common Crow." Hopkins and Clay (1952) point out the correct status of *Colpocephalum subaequale*, but they recognize *C. semicinctum* as a distinct species. Kellogg and Paine (1914) cite *C. semicinctum* as being not only from its type host but also from *Corvus splendens*.

Material examined.—Eight females, 4 males from *Pyrrhocorax pyrrhocorax* from Eire and N. Wales; 29 females, 11 males from *Corvus albus* from Africa; 3 females, 4 males from *P. graculus* from England; 13 females, 4 males from *C. enca* from Sula Mangola, Borneo, and Philippine Islands; 32 females, 21 males from *C. corax* from Lower California, Clarion Island, England, and Africa; 3 females, 3 males from *C. frugilegus* from Scotland; 18 females, 13 males from *C. splendens* from Burma, Maldive Islands, and India; 28 females, 9 males from *C. macrorhynchos* from Thailand, Burma, Malaya, and Philippine Islands; 23 females, 14 males from *C. albicollis* from Africa; 22 females, 17 males from *C. capensis* from Africa; 17 females, 8 males from *C. corone* Linn. from Japan, Cape Verde Islands, Jugoslavia, and Egypt; 2 females, 2 males from *C. coronoides* Vigors and Horsfield from Tasmania; 15 females, 12 males from *C. cryptoleucus* Couch from U.S.A. and Mexico; 11 females, 8 males from *C. ossifragus* Wilson (no locality); 14 females, 15 males from *C. rhipidurus* from Jerusalem, Arabia, Uganda, and Abyssinia; 1 female from *C. typicus* (Bonaparte) from Celebes; 2 females from *Cyanopica cyanus* (Pallas) from Japan; 1 female, 1 male (paratype of *C. trimaculatum*) "Sur un *Platycercus palliceps*" with no further data.

Colpocephalum tristis, new species

(Fig. 5)

Type host.—*Corvus tristis* Lesson and Garnot.

Female.—Specimens from type host as in Fig. 5. Chaetotaxy of head as for *C. fregili*. Pronotum marginally with a short, long, short, and 4 long setae on each side. Median marginal setae of metanotum all minute; metasternal setae, 10–13 (10.9). Tergites III–IV tripartite with II and/or V often showing similar signs of division. Tergocentral setae: 11–18 (13.1) on I, 20–25 (22.0) on II, 20–27 (22.5) on III, 18–25 (22.5) on IV, 17–24 (20.2) on V, 14–21 (18.2) on

VI, 14–19 (16.0) on VII, 7–12 (9.3) on VIII; short to minute on I, longer laterally and shorter medially on II–VII, minute on VIII. Usually no anterior setae (1 specimen with 1 on II, 4 on IV, and 1 on V; 2 other specimens with 1 on IV). Postspiracular setae very long on all but IV–V. Last tergite with same chaetotaxy as in *C. fregili*, but more sharply indented at midline. Ventral abdominal chaetotaxy much as for *C. fregili*, but with marginal vulval setae, 39–53 (45.5), ventral anal setae, 50–64 (58.7), and dorsal anal setae, 44–72 (57.6). Dimensions all within the limits given for *C. fregili*; the slightly telescoped state of the abdomen of the illustrated female accounts in large part for the appearance of being shorter and broader.

Females of *C. tristis* may be separated from those of *C. fregili* by (1) the larger number of long marginal pronotal setae (although *C. fregili* rarely may show the 4 long median setae on only one side, its usual condition is 3 long setae), (2) the larger number and relative lengths of tergocentral setae, (3) the very short marginal metanotal setae, and (4) the larger number of marginal vulval and ventral and dorsal anal setae.

Male.—Close to that of *C. fregili*, but distinguished by the following features: (1) margin of pronotum with same chaetotaxy as with female, that is, with 4 long inner setae on each side instead of 3; (2) a greater number of tergocentral setae on most segments: 8–12 on I, 16–17 on II-V, 12–14 on VI, 11–12 on VII, and 8–10 on VIII; (3) a tendency for the tergocentral setae to be shorter than with *C. fregili*, with few if any extending completely across the following tergite; and (4) fewer and shorter anterior tergal setae: 0–1 on I, 1–5 on II, 1–4 on III, 0–7 on IV, 0–6 on V–VI, 0–3 on VII, 0–1 on VIII.

The foregoing is based on the 2 males from the type host. Three other males are available from *Corvus fuscicapillus* Gray, these presumably representing the same species. They closely agree with characteristics of the above, showing tergocentral setae 10–14 on II, 15–18 on III–V, 13–14 on VI, 10–12 on VII, 5–7 on VIII, and anterior tergal setae 0–4 on II, 0–1 on III, 0–4 on IV, 0–3 on V–VI, and 0 on VII–VIII.

The 3 host species listed in material examined are interestingly enough all found in the same geographic area and are listed consecutively in Peters (1962). Thus, the occurrence of this species of louse, which is distinctive from the other species found on *Corvus* in other parts of the world, may substantiate the presumed relationship between these species of birds.

Material examined.—Fifteen females, 2 males from *Corvus tristis* from New Guinea; 3 females, 3 males from *C. fuscicapillus* from Waigeu (Western Papuan Islands); 1 female from *C. woodfordi woodfordi* (Ogilvie-Grant) from Solomon Islands; 2 females from *C. w. meeki* Rothschild from Bougainville Island.

The material from *Corvus tristis* was chosen as the type series and the disposition of the type material is as follows: holotype female, allotype male, and 8 female paratypes deposited at the British Museum (Natural History); 6 female, 1 male paratypes at the University of Minnesota.

Discussion

As noted earlier in this paper, the *Colpocephalum* from the Corvidae show a remarkable similarity to those from the owls and of the *polybori*-group from the hawks. Aside from specific differences in chaetotaxy, the principal means of separation was initially believed to lie in the tripartite nature of abdominal tergites III–IV for all females of the Corvidae material. Virtually all of the lice which are not overly cleared and are without internal interference show conspicuous division of these two tergites, as illustrated in Figs. 1 and 5. All *Colpocephalum* from owls (Price and Beer, 1963a) have females with complete abdominal tergites, without the pattern of Fig. 3, usually with a distinctively shaped gula, and lacking anterior tergal setae on the abdomen. *C. fregili* always has at least some anterior tergal setae, a differently shaped gula, and usually tergites III–IV conspicuously tripartite. Although females of *C. tristis* lack anterior tergal setae, the lengths and numbers of tergocentral setae and the tripartite tergites are most distinctive from the owl lice. Males of owl *Colpocephalum* also always lack anterior tergal setae and show little sexual dimorphism; the males of the Corvidae *Colpocephalum* usually have anterior tergal setae on at least several segments and show a distinct sexual dimorphism.

The species of the *polybori*-group (see Price and Beer, 1963b) of the hawk *Colpocephalum* have females with an anterior setal row present on some abdominal tergites and thus differ from *C. tristis.* The inclusion of *C. trimaculatum* Piaget within the hawk lice resulted solely from its close morphological similarity, since we only had the one female and one male paratypes from what we presumed to be an incorrect host. However, now that we have studied the *Colpocephalum* of the Corvidae, we realize that the correct affinity of *C. trimaculatum* is with the lice of the Corvidae and that it is synonymous with *C. fregili.* The type host of *C. trimaculatum* was from the Zoological Garden of Rotterdam, thus offering opportunity for straggling from one host to another; coincidentally with this, Piaget (1880) described his *C. elongatum* from *Pyrrhocorax alpinus* from the same Zoological Garden. Although *C. maculatum* Piaget as well as several other hawk species of *Colpocephalum* was likewise collected from this site, additional specimens we obtained from other sources verified the correctness of the hosts.

The abdominal pigmentation shown by the remaining three species of the *polybori*-group of hawk lice is very close to that of Fig. 3, and on several specimens weak lines on tergite III and sometimes IV may be an indication of a division of these tergites. In our paper on the *Colpocephalum* of hawks, we had concluded that these tergites for this group of hawk lice were probably entire, although poorly sclerotized centrally. We must now admit that the possibility of a tripartite state for tergites III–IV exists among lice of the *polybori*-group; however, it is not as pronounced in material we have seen as with most *Colpocephalum* of the Corvidae. Reference to our keys (Price and Beer, 1963b) to the species of hawk and owl *Colpocephalum* will enable differentiation of females of *C. fregili* from *C. maculatum*, *C. ?ibicter* (Eichler), and *C. polybori* Rudow, and males of *C. fregili* from *C. ?ibicter* and *C. polybori*, bearing in mind that *C. trimaculatum* is a synonym of *C. fregili*. The number of anterior tergal setae on III–VI will usually, but not always, enable separation of males of *C. fregili* from *C. maculatum*.

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NORTH AMERICAN SPECIES OF THE GENUS MARGARODES GUILDING, WITH A DESCRIPTION OF A NEW SPECIES FOUND IN TEXAS

(COCCOIDEA: MARGARODIDAE)[1]

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The family Margarodidae were erected by Morrison (1927) and contains as its type the genus *Margarodes* Guilding. The following year he published a monumental work that treated the entire family Margarodidae which has been used as the basis for all subsequent classification dealing with the family. Since the late Dr. Harold Morrison has been recognized by coccidologists all over the world as being the foremost authority of this group, it is only fitting that the new species herein described be named in honor of him in recognition of his contribution to science.

The genus *Margarodes* Guilding, according to Morrison (1928), contained 25 species. Of these, three were recorded from North America: *M. hiemalis* Cockerell, from New Mexico; *M. meridionalis* Morrison, from Georgia and Florida; and *M. rileyi* Giard, from Florida.

The genus *Margarodes* has in the past appeared in the literature due to its unique habits of being a subterranean group and of being able to survive through periods of adverse environmental conditions. This has brought about extensive interest in the group resulting in a large amount of literature pertaining to the genus *Margarodes*.

Morrison (1928) constructed a key to 11 members contained in the genus which included the three that were known to be present in North America. However, he states that the key was not based on an extended critical morphological study and was to be considered as only suggestive. During the course of the present work it was found that certain structures used by Morrison did not lend themselves in separating only the North American species. Therefore, new structures have been employed. This does not imply that the key by Morrison is not workable as it applies itself quite well to the species he considered. No attempt has been made, however, to revise the key constructed by Morrison to include the new species herein described. Instead, an entirely new key has been constructed for only the North American species.

Margarodes morrisoni, n. sp.

(Fig. 1)

Adult female.—Body oval-shaped; derm not chitinized. Dorsum beset with multilocular disk pores near margin and in submargin; interspersed with numerous

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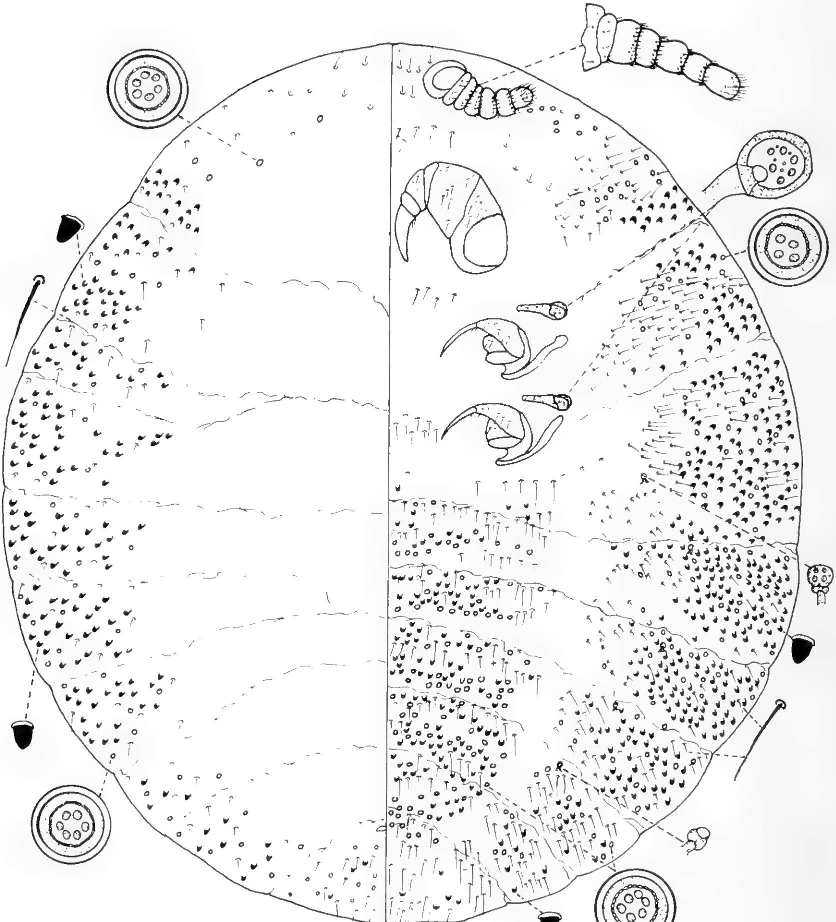

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Fig. 1, *Margarodes morrisoni* n. sp., left side showing taxonomic characters of dorsal view of female holotype; right side, taxonomic characters of ventral view.

"acorn-shaped," and less numerous simple, setae. Central section of dorsum devoid of setae of either type. Ventrally: antennae 7-segmented; segment 1 large, short, with several setae; segment 2 large, indicated by a suture, form similar to segment 1 but longer, with many small setae arranged in row near distal end; segments 3, 4, 5, and 6 smaller than segments 1 and 2, all with setae arranged in a similar fashion as described for segment 2; segment 7 larger than segments 3–6, rounded at apex, with 12 stout sensory setae of varying lengths. Legs I strongly modified for digging, claw portion heavily sclerotized, tapering to knife-like edge on inner surface, trochanter and coxa fused, with setae and sensory pores. Legs

II and III much smaller, resembling legs I in being modified for digging, tarsal claw extending to sharp point at apex, trochanter and coxa fused, with numerous setae and sensory pores. Mouthparts indicated by small microscopic hole where rostralis was removed in process of mounting.[2] Thoracic spiracles well developed, opening circular with lightly sclerotized bar, internal disk pores of two types with 5–6 macropores arranged in cluster in center of opening and 2–6 micropores found in center of ring of macropores or in outer area between macropore and rim of spiracles. Five small abdominal spiracles on abdominal segments 1–5. First abdominal spiracle usually with 4 internal disk pores arranged in circle around opening of spiracle. Internal disk pores sometimes wanting in some abdominal spiracles on same specimen. Abdominal segments clearly delineated with each segment having two types of setae: the "acorn-shaped" type scattered irregularly on all abdominal segments, extending to segment containing legs I, and simple setae of various sizes dispersed among "acorn-shaped" setae, not situated in rows. Multilocular disk pores dispersed irregularly throughout ventral region, circular with 4–6 macroloculi in center of ring of microloculi. Anal opening semicircular with internal tube.

Male.—Not available.

Type.—The species described from a female holotype from *Stenotaphrum secundatum* (Saint Augustine grass), collected in Corpus Christi, Nueces County, Texas, in 1963 and deposited in the National Collection of Coccoidea, Washington, D.C. Paratypes collected at type locality on same date as holotype deposited in the Coccoidea Collection of the Department of Entomology and Parasitology, University of California, Davis (single female) and author's personal collection (single female).

Remarks.—*Margarodes morrisoni* may be separated from all other species of *Margarodes* found in North America by the presence of "acorn-shaped" setae scattered over entire body. In a key constructed by Morrison (1928) *M. morrisoni* keys to *M. trimeni* but is separated from this species by the arrangement and distribution of the "acorn-shaped" setae.

The following redescription of species of *Margarodes* found in North America were made possible through the kind assistance of Louise M. Russell, by making available for study the following scale insects deposited in the National Coccoidea Collection: *M. hiemalis* Cockerell, from Poston, Arizona, December 22, 1942; *M. meridionalis* Morrison, from roots of Bermuda grass in Douglas, Arizona, February 16, 1934; and *M. rileyi* Giard, from Key Largo, Florida, October 29, 1923.

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[2] Mouthparts that are customarily attached to the ventral portion of scale insects are located on dorsal side of the scale covering (commonly referred to as the pearl covering). The only indication of a mouthpart on the scale itself is the rostralis which enters the insect between legs I and II. This is discussed in detail in a forthcoming paper by McDaniel and Peacock treating the morphology and host-plant relationship.

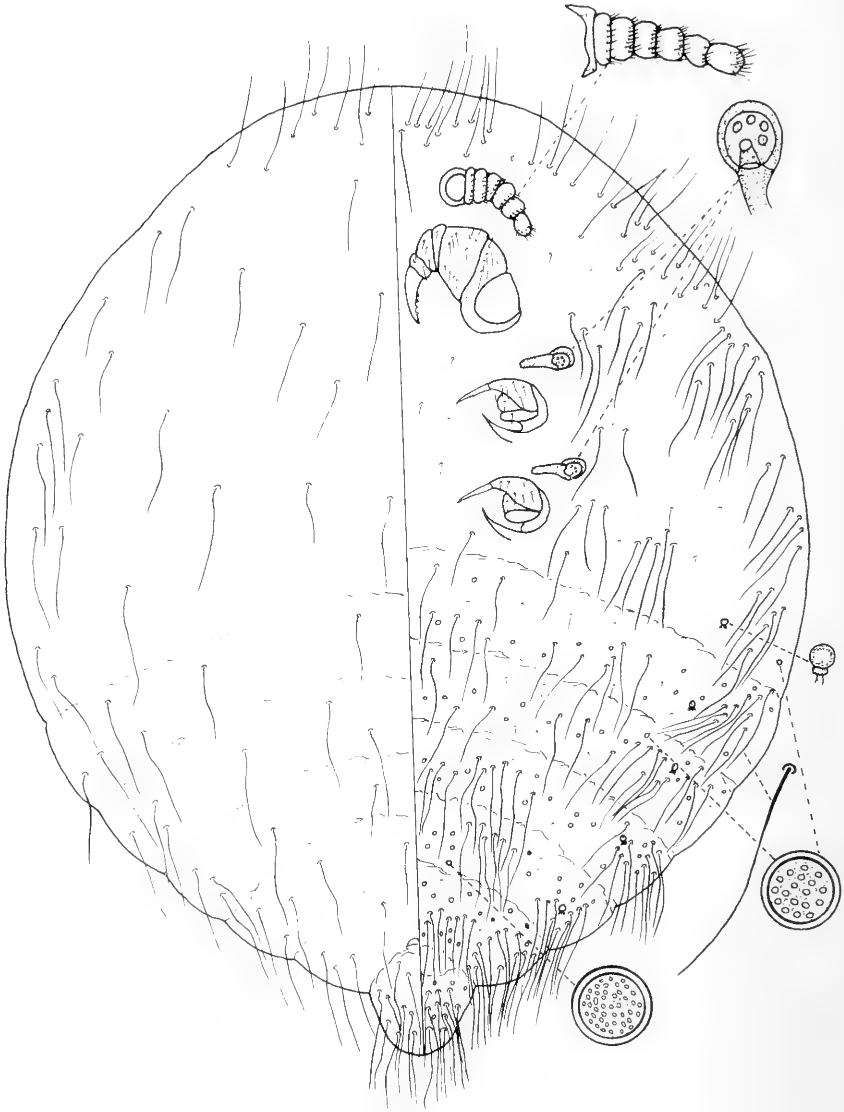

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Fig. 2, *Margarodes hiemalis* Cockerell, left side showing taxonomic characters of dorsal view of female; right side, taxonomic characters of ventral view.

Margarodes hiemalis Cockerell

(Fig. 2)

Adult female.—Body oval-shaped. Dorsum with two types of setae: the long hair-like forms found in clusters at margin of posterior section of body and small microsetae arranged irregularly over dorsal surface. Ventrally: antennae 7-segmented; segment 1 short, ring-like, 3 times as broad as long, with small microsetae near distal end; segment 2 small, not broad as segment 1, also with small microsetae as found in segment 1; segment 3 transversely oval; segment 4 short and broad; segments 5 and 6 with microsetae scattered irregularly over segments and 2 microsetae located at anterior end of each segment; segment 7 spherical with numerous macrosetae of same structure as those found in segments 5 and 6. Legs I strongly modified for digging, claw portion heavily sclerotized, inner surface pitted with surface toothed, trochanter and coxa fused, with setae. Legs II and III smaller than legs I, modified for digging, claw with surface toothed as shown on anterior legs, differing in that they do not extend to apex of claw. Thoracic spiracles well developed, opening circular with a flap-like extension; four internal disk pores well developed, absent in abdominal spiracles. Six abdominal spiracles, absent on last 2 segments. Derm minutely papillose. Abdominal segments with two types of setae: those slender or extremely elongated, arranged in clusters at margin of body in posterior region of abdomen, irregularly scattered over remainder of venter, and microsetae, not elongated, of normal structure, scattered over venter. Multilocular disk pores present on abdominal segments of 2 types: those with only microloculi found throughout pore; and those containing 13–18 macroloculi throughout pore. Abdomen with conspicuous, stout boss broadly curved at the apex, bearing long hair-like setae and multilocular disk pores. Anal opening located anterior to boss, opening a semicircular, transverse slit with internal lobe.

Margarodes meridionalis Morrison

(Fig. 3)

Preadult female.—Body oval-shaped; derm thin. Dorsum with multilocular disk pores dispersed throughout, being more numerous on posterior section and two types of setae: small "acorn-shaped" type at margin of body beginning with fourth abdominal segment, two clusters at posterior section; and simple setae scattered over entire surface, there being two types, macro- and microsetae. Ventrally: antennae 7-segmented; segment 1 with several macro- and microsetae; segment 2 short, ring-like, much broader than long, with sensory pore and numerous setae; segment 3 short, ring-like, setae at anterior portion; segments 4, 5, and 6 transversely oval, with row of setae at distal end; segment 7 spherical with macro- and microsetae, some being sensory in function. Legs I large, strongly modified for digging, claw terminating in point, without teeth, trochanter and coxa fused, microsetae present and arranged in linear manner with several sensory pores, tibia and tarsus not flexible, with macro- and microsetae present. Legs II and III similar in structure to legs I, with claw reduced in size. Mouthparts in specimen available for study indicating that they are preadults.[3] Thoracic spiracles well devoloped, oval, with sclerotized bar, 5 macropores located in a circular manner and enclosing 5 micropores. Abdominal spiracles 7 in number in specimen available for study

[3] See description of *M. morrisoni* n. sp. for adult mouthparts.

with 4 internal disk pores. Abdominal segments clearly delineated, each segment with two types of setae: the "acorn-shaped" type arranged in linear rows on posterior half of each abdominal segment, none found anterior to first abdominal segment, arranged in groups at apex; and simple setae also arranged in linear fashion associated with "acorn-shaped" setae. Multilocular disk pores with small ring of 12 microloculi bearing 2 macroloculi in center dispersed irregularly over entire ventral section of body, most numerous on posterior region. Anal opening semicircular with 2 lateral projections and an internal tube.

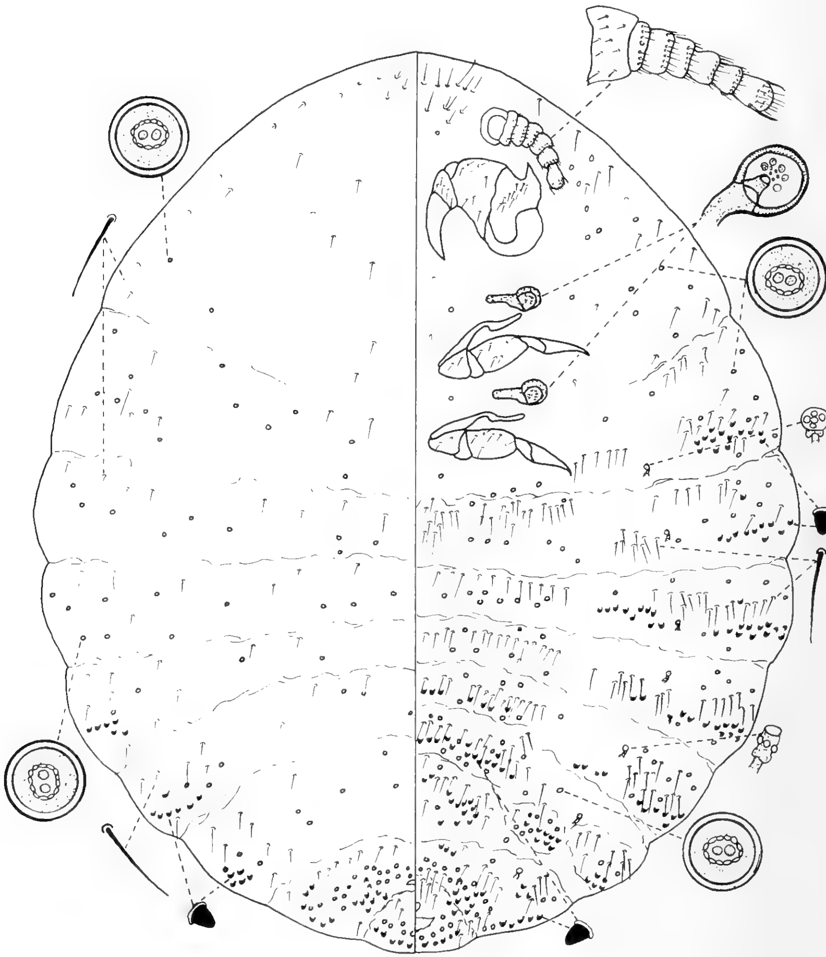

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Fig. 3, *Margarodes meridionalis* Morrison, left side showing taxonomic characters of dorsal view of female; right side, taxonomic characters of ventral view.

Margarodes rileyi Giard
(Fig. 4)

Adult female.—Body oval-shaped; derm not chitinized. Dorsum with multilocular disk pores composed of a ring of approximately 15 microloculi in center of which are 4 macroloculi, simple setae and "acorn-shaped" setae: multilocular disk pores and simple setae scattered in marginal area and arranged in linear fashion

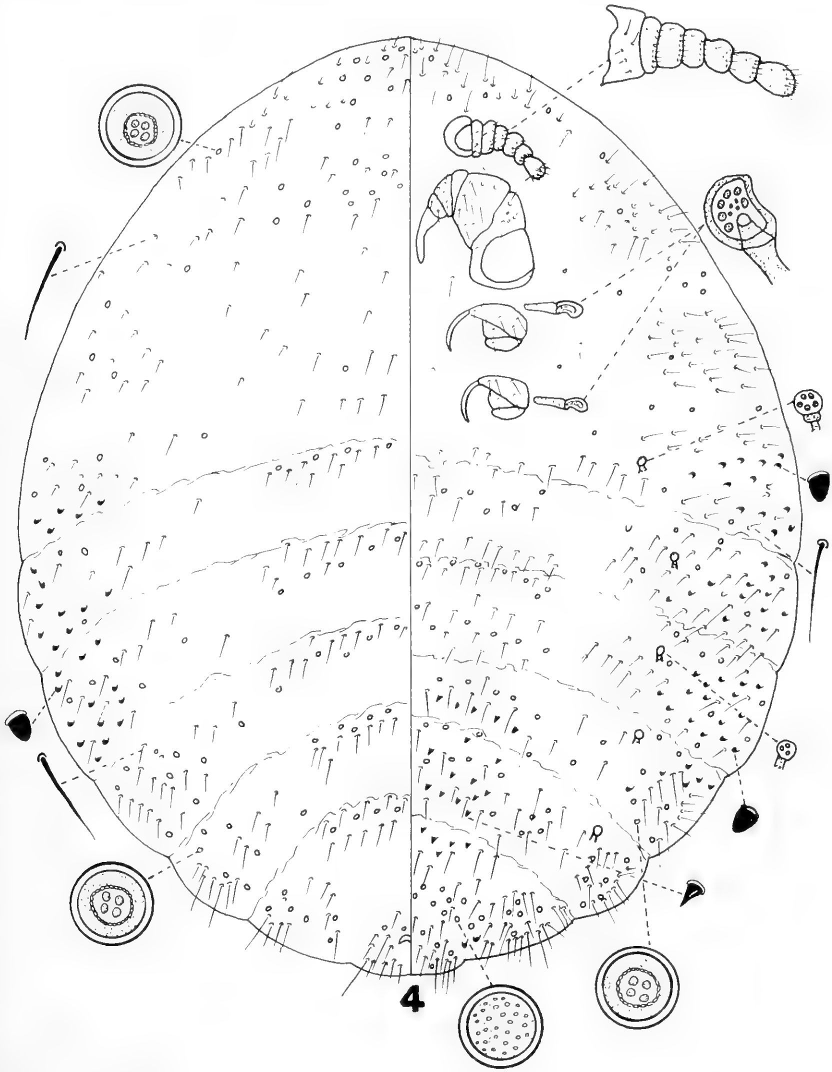

Fig. 4, *Margorodes rileyi* Giard, left side showing taxonomic characters of dorsal view of female; right side, taxonomic characters of ventral view.

in center of dorsum becoming more numerous at posterior section; "acorn-shaped" setae confined to margin with none anterior to abdomen. Ventrally: antennae 7-segmented; segment 1 very short and ring-like, much longer than broad with 3 small setae; segment 2 slightly larger than segment 1, short and ring-like, much longer than broad with several small setae at distal end; segments 3, 4, 5, and 6 ring-like with line of small setae at distal end, 2 large sensory setae on outer margin of line of small setae on each segment; segment 7 spherical, with several sensory setae and numerous simple setae. Legs I strongly modified for digging, claw portion heavily sclerotized, curved and tapering to blunt point, entirely smooth, trochanter and coxa fused, with setae and sensory pores. Legs II and III reduced in size, claw sickle-shaped, terminating in point, tibia and tarsi not flexible, tibia with setae. Thoracic spiracles well developed, kidney-shaped, with a chitinized bar which is flap-like in structure. Internal disk pores of two types: 6–8 macropores arranged in semicircle, with each composed of a ring of microloculi, 2 microloculi in center; and 3–4 micropores in center of semicircle formed by the macropore. Five abdominal spiracles present, reduced in size when compared to thoracic spiracles, with 3–5 internal disk pores. Abdominal segments delineated by arrangement of setae and disk pores. Ventrally: two types of setae: the "acorn-shaped" setae located on margin extending to first abdominal segment with none on cephalic region and restricted to last 3 segments in central region where they are strongly constricted apically, normally with a small but distinct apical nipple, and simple setae always associated with "acorn-shaped" type and scattered over entire ventral section. Multilocular disk pores over entire venter, of two types: those with small microloculi dispersed evenly throughout the pore, restricted to apex, and those with ring of microloculi and 4 macroloculi in center of ring found throughout ventral region. Anal opening semicircular with internal tube.

Key to Species of the Genus Margarodes Guilding Found in North America

1. "Acorn-shaped" setae present on body; multilocular disk pores with microlocular ring containing macroloculi 2

   "Acorn-shaped" setae absent; multilocular disk pores never with microlocular ring, constisting of only microloculi or only macroloculi; apex of body with conspicuous stout boss broadly curved at apex .... **hiemalis** Cockerell

2. Multilocular disk pores with only 2 macroloculi within circle of microloculi; thoracic spiracle with 5 macropores enclosing 5 micropores .... **meridionalis** Morrison

   Multilocur disk pores with more than 2 macroloculi within circle of microloculi; thoracic spiracle with 6 macropores 3

3. "Acorn-shaped" setae not anterior to abdomen, those on last 3 ventral segments strongly constricted apically; multilocular disk pores of two types: those with 4 macroloculi in center of ring of microloculi, and those with only microloculi present .... **rileyi** Giard

   "Acorn-shaped" setae not restricted to abdominal segments, not constricted apically; multilocular disk pores of dorsum with 6 macroloculi within circle of microloculi .... **morrisoni** n. sp.

Acknowledgments

The author wishes to express his sincere thanks to Louise M. Russell, Entomology Research Division, USDA, for loan of specimens and to Mr. C. L. Garrett, Currie Seed Company, for specimens of *M. morrisoni* found infesting lawns in the Corpus Christi area.

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A NOTE ON NEOSEIULUS HUGHES 1948 AND NEW SYNONYMY

(Acarina: Phytoseiidae)

Some other workers also, but most recently Pritchard and Baker (1962, Hilgardia 33(7): 218), and Schuster and Pritchard (1963, Hilgardia 34(7): 199), place *Neoseiulus* Hughes in the Typhlodromini which is characterized by having more than 4 pairs of anterolateral setae. The type of *Neoseiulus* is *N. barkeri* Hughes. For this species Hughes (1948, Mites associated with stored food products, Min. Agr. Fish., London, 140 and 1961, Mites of stored food, Min. Agr. and Fish., London, 222) shows only 4 pairs of anterolateral setae and Hughes (1964, *in litt.*) says, "I have examined the type slide of *Neoseiulus barkeri* and can see only 4 pairs of antero-lateral setae as in my drawing in 'Mites of Stored Food.' " Thus the mite belongs in the Amblyseiini and not the Typhlodromini. Hughes (1961) recognized this by synonymizing *Neoseiulus* with *Amblyseius*; Athias-Henriot (1961, Acarologia 3(4): 419) did the same and placed *Amblyseius barkeri* (Hughes) in "Groupe *Cucumeris*." In 1959 (Fla. Ent. 42(3): 113), overlooking the available name *Nebseiulus* Hughes, I proposed the name *Typhlodromopsis* for the group of amblyseiine mites with the general characters of the mite originally called *Typhlodromus cucumeris* Oud. Since *Neoseiulus barkeri* is a member of the *cucumeris* group, *Neoseiulus* has priority over *Typhlodromopsis* and is the name that should be used for this subgenus of mites. This leaves the group of mites, other than the *cucumeris* group, listed by Muma (1961, Bull. Fla. State Mus. 5(7): 287) under *Typhlodromopsis* without a name. The name *Typhlodromips* is proposed for this subgenus with *T. simplissimus* (DeL.) as type species.

For the Typhlodromine species placed by Muma (*op. cit.*, p. 295) in *Neoseiulus*, *i. e.*, *transvaalensis* (Nesbitt), *singularis* (Chant), and *invectus* (Chant), the generic name *Mumaseius* is proposed with *Mumaseius singularis* (Chant) as type of genus. —Donald De Leon, *Erwin, Tennessee.*

THE ELAPHIDIONINE SUBGENUS PROTANEFLUS

(Coleoptera: Cerambycidae)

John A. Chemsak *and* E. G. Linsley,[1] *University of California, Berkeley*

Protaneflus Linsley (1934), originally proposed as a monobasic genus based on the very narrow metathoracic episterna, the finely, densely pubescent body, and twelve-segmented antennae of the male, has been treated recently as a subgenus of *Aneflus* (Linsley, 1961; Chemsak and Linsley, 1963). In the interval since the taxon was first characterized, five species have been added and a sixth is here described—making a total of seven currently named species.

As now known, the subgenera *Aneflus* s. str. and *Protaneflus* are largely allopatric. *Aneflus*, containing 17 described species, is essentially a Mexican group, the species occurring in the area from southwestern United States to Chiapas and Yucatan. *Protaneflus* is primarily confined to Central America, in the region from Panamá to Guatemala, but extends northward into Mexico at least as far as San Luis Potosí.

Aneflus (**Protaneflus**) Linsley

Protaneflus Linsley, 1934, Psyche 41: 233.
Aneflus (*Protaneflus*), Linsley, 1961, Pan-Pacific Ent. 37: 169; Chemsak and Linsley, 1963, Bull. Brooklyn Ent. Soc. 58: 80.

This subgenus may be characterized by the fine, uniform, dense pubescence, twelve-segmented antennae of the males, and narrow metathoracic episterna. The front coxal cavities are open in all known species and the pronotal disk is shallowly, transversely rugulose without dorsal calluses.

Type species. *Protaneflus pubescens* Linsley (monobasic).

The following key will separate the species known to us:

Key to Species of Protaneflus

1. Antennae with third and fourth segments subequal in length, or third only slightly longer than fourth; head not asperately punctate 2
   Antennae with third antennal segment twice as long as fourth; head grossly asperate punctate. Length, 30 mm. Veracruz ...... **cylindricollis**

2(1). Antennae with scape longer than, or subequal to third segment 3
   Antennae with scape shorter than third segment, third segment 1¼ times as long as fourth; color dark brown, antennae almost black, pubescence dense, grayish white. Length, 30 mm. El Salvador .... **zilchi**

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3(2). Pubescence very short, fine, grayish to golden, not obscuring surface nor distinctly interrupted by rows of round denuded spots each enclosing a coarse puncture bearing an erect seta 4

Pubescence dense, coarse, long, grayish, obscuring surface, interrupted by rows of round denuded spots each enclosing a coarse puncture bearing an erect seta; surface of pronotum obscured. Length, 24–32 mm. Mexico .... **glabropunctatus**

4(3). Antennae with third segment longer than, or subequal in length to fourth 5

Antennae with third segment shorter than fourth segment; elytral pubescence very fine, dense, short, interrupted irregularly by round denuded spots each enclosing a coarse puncture bearing an erect seta; twelfth segment of male only slightly shorter than eleventh. Length, 25–30 mm. Veracruz to Honduras .... **pubescens**

5(4). Antennae with segments densely clothed with very fine, minute, appressed pubescence, surface not obscured, elytral pubescence uniformly fine 6

Antennae with segments densely clothed with fairly long, coarse, depressed, white pubescence which obscures the surface; elytral pubescence consisting of dense patches of fine appressed yellowish white pubescence on surface around coarse punctures which bear coarse, recurved, white hairs. Length, 29–33 mm. Costa Rica .... **pilosicornis**

6(5). Elytra pale brown to dark brown, punctures behind basal one-fourth smaller and more separated than circumscutellar punctures; fine pubescence yellowish white to golden; appendages usually brownish. Length, 21–30 mm. Mexico to Panamá .... **minutivestis**

Elytra reddish brown, punctures behind basal one-fourth confluent, as coarse as circumscutellar punctures; appendages almost piceous; pubescence white, pale yellowish on head. Length, 25–31 mm. El Salvador to Costa Rica .... **planus**

Aneflus (Protaneflus) cylindricollis Bates

Aneflus cylindricollis Bates, 1892, Trans. Ent. Soc., London 1892: 148, pl. 5, fig. 2; Linsley, 1936, Ann. Ent. Soc. Amer. 9: 471.

Aneflomorpha cylindricollis, Casey, 1912, Memoirs on the Coleoptera 3: 293.

Aneflus (Protaneflus) cylindricollis, Chemsak and Linsley, 1963, Bull. Brooklyn Ent. Soc. 58: 84.

We have not studied the type species but, judging from the original description, it is distinctive by having the third antennal segment twice as long as the fourth and the gross asperate punctures of the head.

Type locality. Jalapa, Veracruz.

Aneflus (Protaneflus) zilchi Franz

Aneflus zilchi Franz, 1954, Senckenbergiana 34: 218; pl. 1, fig. 2.

A dark brown, densely white pubescent species characterized by having the antennal scape shorter than the third segment and the third longer than the fourth.

Type locality. Dept San Vicente: Finca El Carmen, 1,300 m. Vulkan San Vicente, El Salvador.

Aneflus (Protaneflus) glabropunctatus Chemsak and Linsley

Aneflus (Protaneflus) glabropunctatus Chemsak and Linsley, 1963, Bull. Brooklyn Ent. Soc. 58: 84, pl. 1.

This species differs from others in the subgenus by the much denser pubescence which is interrupted by round denuded elytral spots each enclosing a coarse puncture bearing a coarse, erect seta.

Type locality. Pisté, Yucatan, Mexico.

Aneflus (Protaneflus) pubescens Linsley

Protaneflus pubescens Linsley, 1934, Psyche 41: 233.
Aneflus (Protaneflus) pubescens, Linsley, 1961, Pan-Pacific Ent. 37: 169; Chemsak and Linsley, 1963, Bull. Brooklyn Ent. Soc. 58: 86.

Color pale brown to pale reddish brown with darker head, prothorax, and appendages. The elytral costae are feeble and the fine pubescence is very short, recumbent, and uniform with round denuded spots irregularly interspersed. The twelfth antennal segment of the males is only slightly shorter than the eleventh.

Type locality. Punta Gorda, British Honduras.

Additional records. 1 ♂, Allen Point, Ascension Bay, Quintana Roo, Mexico, IV-17-60 (J. F. G. Clarke); 3 ♂♂, Cayuga, Guatemala, V-15 (W. Schauss); 1 ♂, La Ceiba, Honduras, V-17-16 (F. J. Dyer).

Aneflus (Protaneflus) pilosicornis, new species

Female.—Form elongate, cylindrical, slightly tapering; elytra reddish brown, remainder of body darker; pubescence yellowish and white, that of elytra consisting of dense patches of fine, appressed, yellowish white pubescence on surface around coarse punctures which bear coarse, recurved, white hairs. Head rather finely, shallowly, confluently punctate on vertex except for median glabrous area; pubescence yellowish white, fairly long, appressed, moderately dense, erect hairs almost absent; antennae eleven-segmented, extending to about mid-elytra, distinctly tapering apically, scape confluently punctate, moderately clothed with fine, depressed, white hairs, segments two to six densely clothed with long, depressed, coarse, white pubescence, segments from seventh densely clothed with short, white, appressed hairs, long suberect hairs abundant on basal segments, scape longer than third segment, third longer than fourth, segments five to ten subequal, eleventh longest, segments three to eight spined at apices. Pronotum longer than broad, cylindrical, sides subparallel, apex with a narrow, glabrous, impressed margin, base slightly constricted; disk convex, coarsely, shallowly, transversely rugose, punctures vague; pubescence moderately dense, yellow white and depressed and white and suberect; prosternum impressed, coarsely punctate and rugose, pubescence dense, yellowish white and depressed and white and suberect; metasternum coarsely, rugosely punctate, more finely toward edges, pubescence at edges very dense, coarse, appressed; scutellum densely clothed with recumbent yellow white pubescence.

Elytra more than three times as long as broad, slightly tapering apically; basal punctures coarse, irregular, somewhat rugose, confluent; pubescence on surface around punctures yellowish, minute, appressed, each puncture bearing a coarse, white, recurved or suberect hair; apices bispinose. Legs slender; femora moderately coarsely, densely punctate, moderately densely pubescent. Abdomen sparsely punctate; pubescence yellowish, appressed, white and depressed and yellowish white and suberect; apex of last sternite rounded. Length, 29–33 mm.

Holotype female (United States National Museum) from San José, Costa Rica, III-23 (F. Nevermann); one female paratype from Costa Rica (F. Nevermann, E. Gongora).

This species presumably resembles *A.* (*P.*) *zilchi* Franz, judging from the illustration of that species (1954). Both have the basal antennal segments densely clothed with coarse depressed pubescence. However, *pilosicornis* has the antennal scape longer than the third segment.

Aneflus (Protaneflus) minutivestis Chemsak and Linsley

Aneflus (*Protaneflus*) *minutivestitus* Chemsak and Linsley, 1963, Bull. Brooklyn Ent. Soc. 58: 85, pl. 1.

This species varies in ground color from pale brownish to pale reddish brown with darker appendages. The twelfth antennal segment of the males is one-half as long as the eleventh, or slightly less. The pubescence is fine, uniform, varying from whitish to yellowish.

Apparently the species ranges from the state of San Luis Potosí in Mexico to Panamá. Specimens are at hand from El Salvador and Barro Colorado, Canal Zone, each locality possibly representing a distinct subspecies. However, the lack of definitive series and gaps in distributional records makes subspecific assignments undesirable at this time. The following material is tentatively designated as representing *A.* (*P.*) *minutivestis*.

1 ♀, Senahu, Guatemala, XI-14-34 (F. Münchmeyer); 1 ♂, 1 ♀, El Salvador (A. Martinez Cuestas); 1 ♂, San José, Costa Rica (F. Nevermann, E. Gongora); 1 ♀, La Lola, Costa Rica, III-9-58 (M. J. Stelzer); 1 ♂, 2 ♀♀, Barro Colorado, Canal Zone, I-35 (M. Bates); 2 ♀♀, Barro Colorado, XII-25-40, I-2-41 (K. W. Cooper); 1 ♀, Barro Colorado, V-41 (J. Zetek); 1 ♂, Barro Colorado, III-6-56 (C. W. and M. E. Rettenmeyer); 1 ♀, Barro Colorado, III-30-40 (G. C. Wood).

Aneflus (Protaneflus) planus Franz

Aneflus protensus planus Franz, 1954, Senckenbergiana 34: 219, pl. 1, fig. 3.

The coarse confluent punctures covering at least the basal half of the elytra, the reddish brown ground color and piceous appendages, and white pubescence will distinguish this species.

Type locality. Dept. San Salvador: San Salvador.

Additional records. 1 ♂, Turrialba, Costa Rica, VI-9-62 (H. Ruckes);

1 ♀, "Hamburgfarm, Reventazon, Ebene Limon," Costa Rica, VII-1-29 (F. Nevermann).

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DISTRIBUTION AND HOST PLANTS OF OLIGONYCHUS PRATENSIS (BANKS)

(ACARINA: TETRANYCHIDAE)

During the 1930's the senior author became interested in a mite then called *Paratetranychus simplex* Banks. More recently Pritchard and Baker, in revising the Tetranychidae, assigned to this mite the name *Oligonychus pratensis* (Banks). For years it had been known as the "date mite", since it occurred in the date gardens of the Coachella Valley of California. In a survey by Dr. Fenner Stickney[1] and the senior author, collections of this mite were made. With only one exception, all mites of the above species were found on plants of the botanical class Monocotyledonae. Such selectiveness is rather rare among mites in the family Tetranychidae. Following is a listing of the host plants and the states from which *O. pratensis* was collected, including a few records by Pritchard and Baker (A Revision of the Mite Family Tetranychidae, Mem. Ser. Vol. 2, San Francisco, 1955).

Washington: Wheat (*Triticum aestivum*), 3 records; timothy grass[2] (*Phleum pratense*), 1 record; a grass, 1 record; Oregon: wheat (*Triticum* sp.), 1 record; Nevada: *Agropyron intermedium*, 1 record; Utah: aspen (*Populus tremuloides*), 1 record; field corn (*Zea maize*), 1 record; New Mexico: wheat, 1 record; Kansas: wheat, 1 record; Louisiana: a grass (*Panicum* sp.), 2 records; Florida: sugar cane (*Saccharum officinarum*), 2 records; para grass, 1 record; Texas: grasses, 2 records; California: Bermuda grass (*Cynodon dactylon*), 14 records; ryegrass (*Elymus* sp.), 1 record; a grass (*Echinochloa colonum*), 2 records; a grass (*Eragrostis cilianensis*), 1 record; a grass (*Chloria virgata*), 1 record; a grass (*Boutelove barbata*), 1 record; a grass (*Sporobolus cryptandrus*), 1 record; a grass (*Conchrus pauciflorus*), 1 record; a grass (*Setaria viridis*), 1 record; a grass (*Digitaria sanguinalis*), 1 record; a reed (*Arundo donax*), 1 record; date palm (*Phoenix dactilifera*), 2 records; Canary Island palm (*Phoenix canariensis*), 2 records; fan palm (*Washingtonia filifera*), 1 record.—E. A. McGREGOR and FENNER STICKNEY.

[1] Deceased.

[2] Types from this host and locality.

NEW PLACEMENTS FOR SOME SPECIES OF PARANTHIDIUM (HYMENOPTERA: APOIDEA)[1]

J. S. MOURE, C.M.F.

While studying the *Paranthidium* species in the U.S. National Museum, I had the opportunity to investigate the structural characters of *Anthidium texanum* Cresson and *Dianthidium arizonicum* Rohwer. That investigation shows that these species have a systematic position different from that indicated by Schwarz (1926) and Michener (1948 and 1951).

On the basis of the structural features, I propose a new genus, *Adanthidium*, for these two species and also remove from *Paranthidium* the subgenus *Mecanthidium*, suggesting a better position for it nearer to *Dianthidium* proper.

Adanthidium, n. gen.

Type species.—Anthidium texanum Cresson, 1878.

Near *Dianthidium*. Mandibles of the female of normal length, with one tooth only, the apical one, small, followed by a continuous edge to the internal angle; maxillary palpi three-segmented. Clypeus overhanging base of labrum; subantennal suture straight; interalveolar area bicarinate; ocelli small; preoccipital ridge not carinate. Pronotal lobe lamellate, forming a small concave area on its upper side. Mesonotum projecting over and hiding pronotum as seen from above, with a large yellow cuneiform transverse spot on each side anteriorly, without lateromarginal stripes; mesepisternum sharply edged but not carinate; scuto-scutellar suture not sulcate; scutellum moderately projecting backward, slightly emarginate medially, rounded laterally. Tegula wide, rounded-subdeltoid; cubito-anal nervure almost coincident with Media. Arolia present; hind basitarsus narrow. Propodeum without a row of pits on its basal area; postspiracular sulcus weak. Metasoma elongate, segments not constricted basally; marginal depressions of terga well developed, smooth, abruptly terminated at sides by a notch; gradulus of first tergum not carinate; sixth tergum rounded-truncate posteriorly, concave in profile, actual margin ventral, separated from posterior edge by a narrow subscopal area; sixth sternum semielliptical.

Antenna of male short, not reaching scuto-scutellar suture, flagellum cylindrical with second segment shorter than first. Posterior coxa unarmed; tarsi normal, not elongate. Sixth metasomal tergum with a pronounced premarginal elevation at each side, subcarinate along median line and the carina ending in small premarginal tubercle; seventh tergum wide, trilobate, lateral lobes broadly rounded, median one spinelike, forming distal extremity of a weak median dorsal carina. Fifth sternum produced, truncate and subemarginate apically; sixth and seventh sterna split, the later tapering in two ogival lobes.

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[1] This work was prepared at the U.S. National Museum and The University of Kansas. The opportunity to visit there was made possible through Rockefeller Foundation Grant RF-63046 to the University of Paraná. Permanent address: Departamento de Zoologia, Universidade do Paraná, Curitiba, Brazil.

This genus can be easily separated from *Paranthidium* by the shape of the mandibles of the female, the presence of the interantennal carinae, spots and anterior projection of the mesonotum, and in the male by the shorter antennae and the structure of the last metasomal tergum.

In the key of Michener (1948) *A. texanum* goes to *Dianthidium*, but the shape of pronotal lamella is quite distinct, the coxal spine of the male is absent, and the sharp carinae on the preoccipital ridge and on the mesepisternum are absent, etc.

From a conservative point of view *Adanthidium* could be included as a subgenus of *Dianthidium*, but other South American groups, such as *Epanthidium*, must be excluded on the basis of the earlier mentioned characteristics.

Mecanthidium has been considered a subgenus of *Paranthidium*, but probably this genus could be grouped with *Dianthidium*, as can be seen from *M. sonorum* Michener and *M. macrurum* Cockerell, in spite of the peculiar color of these species. *Mecanthidium* has the same structure of the marginal depression of the terga, suddenly abbreviated at each side by a notch, and the short antennae of the males. The presence of the carinae between the antennal sockets indicates its close relation to *Adanthidium*.

The species included are:

Adanthidium texanum (Cresson, 1878) n. comb.
Adanthidium arizonicum (Rohwer, 1916) n. comb.
For the separation of these two species, see Schwarz, 1926.

Paranthidium gabbi (Cresson) n. comb.

Anthidium gabbi Cresson, 1878, Trans. Am. Ent. Soc. 7: 115.

I had the opportunity to study the type specimen of *A. gabbi* at the Academy of Natural Sciences of Philadelphia. It seems to me that four female specimens in the U.S. National Museum, lot n:8239, from Mexico City, Mexico, H. C. Baker ("in trap with turpentine"), belong to this species. There are six more female specimens of this species at the American Museum of Natural History, with a manuscript name by the late Mr. F. H. Schwarz.

P. gabbi is very similar to *P. jugatorium* by the pattern of the yellow markings, but is larger and more robust, and the ocelli have a larger size in that species, being very small in the other species of the genus.

Female.—Black with following yellow maculations: large subtriangular spot on each side of clypeus separated from apical border by narrow black band; a complete parocular stripe tapering above; a short stripe parallel to orbits on upper third of gena; very small spot on pronotal lobe; mesoscutal stripe in an inverted L at each side anteriorly; scutellar band along posterior margin, medially interrupted and shortened before axillae, which are black; vestigial mesepisternal spot; upper anterodistal third of femur, anterior surface of tibia, and a small spot on basitarsus of front leg; small spots on distal ends of median and hind femora and a basal one on median tibia; discal bands on terga 1–6, broadly interrupted on first tergum, interruption diminishing in size to fourth tergum and bands complete on two last terga; small spot on lateral extremities of sterna 2–4. Tegula brownish-fuscous; nervures and pterostigma piceous, wings fuscous chiefly on anterior border.

Pubescence pale yellowish on dorsal side, becoming whitish towards ventral side, including scopal hairs; fuscous on black parts of terga. Short, but more developed on frons, gena, and flank of propodeum.

Punctures very dense and deep with shining cariniform intervals smaller than diameter of a puncture, almost uniform on head and thorax, slightly sparser on bases of terga, becoming finer and denser on the apical thirds of terga, particularly on first tergum, and lacking on narrow impunctate margins of terga 2–5. This margin broader on second tergum and becoming progressively narrower toward fifth tergum.

Eye length equal to upper interorbital distance and slightly longer than lower interorbital distance (84 : 84 : 82); interocellar distance less than ocellorbital, and this slightly longer than ocelloccipital distance (19 : 26 : 24 and comparative diameter of median ocellus 8). Mandible large, shaped as in *P. jugatorium*, with a very large apical tooth, its diagonal length equal to the length of eye, and apical width slightly longer than half length of eye (84 : 44).

Size.—Body length 10 mm, wing including tegula 9.5 mm; head and abdominal width 3.7 mm.

The allotype specimen and one alloparatype are deposited in the U.S. National Museum, six alloparatypes in the American Museum of Natural History, one in The University of Kansas, and one in my collection.

One of the alloparatypes has two small yellow spots on the vertex as in some specimens of *Paranthidium jugatorium perpictum* and the band on fourth tergum is complete.

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A CLARIFICATION OF THE STATUS OF LIRIOMYZA TRIFOLII (BURGESS) AND SOME RELATED SPECIES

(Diptera: Agromyzidae)

Kenneth A. Spencer, *19 Redington Rd., London N.W. 3, England*

There has been much confusion regarding the true status of *Liriomyza trifolii* (Burgess), which was originally bred from leaf-mines on *Trifolium repens* L. in the District of Columbia. The name *trifolii* has recently been used by Griffiths, Hering, Nowakowski, and Spencer for the common European species mining Leguminosae in Europe, first described as *congesta* (Becker). Frick also identified as *trifolii* a species he bred from *Medicago*, *Trifolium*, and *Vicia* in Washington State. Hering (1957) described *L. pisivora*, bred from *Lathyrus* and *Pisum* in Germany, which cannot satisfactorily be distinguished on external characters from *congesta* (Becker). I have recently seen long series of a species bred from Leguminosae and six other families in Florida by C. Stegmaier which I considered to represent *L. archboldi* Frost; a further common species in Florida, occurring also on Leguminosae was identified as *L. guytona* Freeman (Spencer, 1963: 362).

I have now reviewed all my available material in this group, including specimens kindly lent by Prof. E. M. Hering, G. C. D. Griffiths, and G. Steyskal. I have been able to confirm the distinctness of *congesta* (Becker) and *pisivora* Hering. I have established that *trifolii* (Burgess) is distinct from these two European species and represents one of the two highly polyphagous species widespread in Florida. I have discovered that Frick's species from Washington is not *trifolii* (Burgess) but a new species described below as *fricki* sp. n. I have been able to clarify the position of *L. archboldi* Frost and *L. guytona* Freeman, which has now been found to be synonymous with *L. munda* Frick (Steyskal, 1964). I have also confirmed that *L. pictella* is definitely distinct from *L. munda*. These six species are discussed in more detail below.

I would like to thank George Steyskal, Insect Identification and Parasite Introduction Research Branch, U.S. Department of Agriculture, for a number of helpful comments on some of the problems dealt with in this paper and for assistance in final preparation of the manuscript.

Liriomyza archboldi Frost

Liriomyza archboldi Frost, 1962: 51–3. Holotype ♂ in coll. S. W. Frost.

Orbits entirely yellow, both vt on yellow ground, black of occiput reaching eye margin for short distance below outer vertical bristle; third antennal segment with conspicuously long pubescence; mesonotum brilliantly shining black, with large yellow patches in hind corners adjoining scutellum; mesopleura predominantly yellow, with black patch on lower margin and slightly extending up each side; anterior scutellar bristles arising from yellow ground; femora entirely yellow, tibiae and tarsi darker, brown; wing length up to 1.75 mm, discal cell relatively large, last section of vein m4 slightly less than three times length of penultimate; male genitalia: aedeagus as in Fig. 1a, b; surstyli each with two strong teeth (Fig. 1c); spermal sac with blade conspicuously angular on outer corners (Fig. 1d).

The shining black mesonotum immediately distinguishes this species from *trifolii* (Burgess). In this character it resembles *munda* Frick but is distinguishable by the more pubescent third antennal segment, both vt and the anterior scutellars arising from yellow ground, and the distinctive genitalia.

The holotype and 20 paratypes were taken in a light trap in Florida. Specimens bred from *Pisum sativum* L. were included as paratypes but, following personal correspondence with Prof. Frost, it is now agreed that these represent *L. trifolii.* The host plant of *archboldi* thus remains to be clarified.

Material examined.

Florida: Highlands Co., Archbold Biological Station, 1 ♂ paratype, genitalia slide 780, taken at light, 9.xi.1959.

Liriomyza congesta (Becker)

Agromyza congesta Becker, 1903: 90. Three ♀ syntypes in Zoologisches Museum, Berlin.

Liriomyza congesta (Becker), Hendel, 1931–1936: 213.

Externally not distinguishable from *trifolii* (Burgess) apart from having acrostichals in two regular rows; male genitalia: aedeagus in side view as in Fig. 2a, mesophallus very small; distiphallus and mesophallus in ventral view as in Fig. 2b; spermal sac dark, blade large (Fig. 2c).

There has in the past been confusion over the status and possible synonymy of this species and *trifolii* (Burgess). Hendel (1931–1936: 214) thought the synonymy to be probable but not certain. Frick (1953) synonymized *congesta* with *trifolii* and was followed by Hering (1957), after seeing specimens of *fricki* sp. n. identified by Frick as *trifolii.* The name *trifolii* has subsequently been used by European workers in a number of minor papers. Sasakawa (1961) discusses *trifolii* in Japan but his genitalia drawings show that the species referred to is *pisivora* Hering.

Becker described this species from 1 ♂ and 3 ♀ caught in Egypt. I have seen the three female syntypes but the male appears to be lost. In its absence I do not propose to designate a lectotype. I have also seen males from Egypt recently caught on *Vicia faba* which clearly represent Becker's species. The genitalia of these and other specimens now show conclusively that *congesta* is entirely distinct from *trifolii.*

Hammad (1955) confirms this species on *Vicia faba* and *Pisum sativum* L. at Alexandria, Egypt.

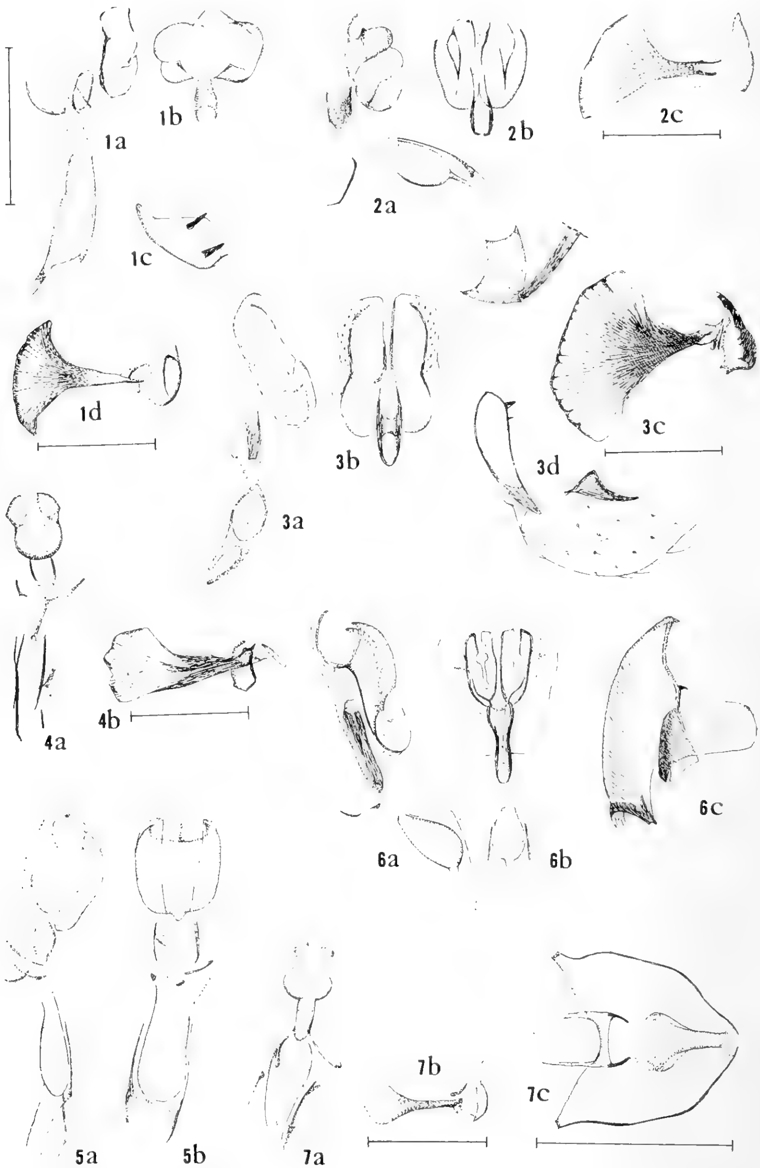

Fig. 1, *Liriomyza archboldi* Frost: a, aedeagus, side view; b, distiphallus, ventral view; c, surstylus; d, spermal sac. Fig. 2, *Liriomyza congesta* (Becker): a, aedeagus, side view; b, distiphallus, ventral view; c, spermal sac. Fig. 3, *Liriomyza fricki* sp. n.: a, aedeagus, side view; b, distiphallus; c, spermal sac; d, surstylus. Fig. 4, *Liriomyza munda* Frick: a, aedeagus, ventral view; b, spermal sac. Fig. 5, *Liriomyza pictella* (Thompson): a, aedeagus, side view; b, same, ventral view. Fig. 6, *Liriomyza pisivora* Hering: a, aedeagus, side view; b, same, ventral view; c, sur-

The species is widespread in the Mediterranean area and throughout Western Europe.

Material examined.

Egypt: Fayûm, 2 ♀ (syntypes), March 1899 (Becker, No. 44788); Cairo, 1 ♂, caught on *Vicia faba*, Jan. 1963.
Siala, 1 ♀ (syntype), March 1899 (Becker, No. 44878).

England: Herts., Abbots Langley, 1 ♂, genitalia slide 606, ex *Vicia faba*, 3.ix.58 (K.A.S.).
Hunts., Woodwalton Fen, 1 ♂, caught 16.vii.60 (Griffiths).
Kent, Darenth, 1 ♂, ex *Vicia sepium* L., 13.v.1954 (Griffiths).
Middx, Finchley, 1 ♂, ex *Vicia cracca* L., 29.vii.53 (Griffiths).

Persia: Gaht-i-Saar, 7,500 ft, 1 ♂, ex *Vicia persica* Boiss., 13.viii.61 (Griffiths).

Spain: Algeciras, 1 ♂, genitalia slide 702, ex *Vicia faba*, 24.iv.55 (K.A.S.).
Canary Is., Palma, El Paso, 1 ♂, genitalia slide 763, ex *Vicia* sp., 12.iv.1926 (Hering).

Liriomyza fricki sp. n.

Essentially as in *L. trifolii* (Burgess), with following points of difference:
Mesopleura almost entirely yellow, with at most a small, frequently indistinct, black bar below which does not extend along whole lower margin; femora entirely bright yellow, without any darker brown markings; acrostichals in two regular rows; male genitalia: aedeagus in side view as in Fig. 3a, distiphallus enlarged, elongated, mesophallus significantly shorter, darker, almost black; distiphallus and mesophallus in ventral view as in Fig. 3b; spermal sac with blade enormously enlarged (Fig. 3c), surstylus as in Fig. 3d.

Holotype ♂, genitalia slide 781, U.S.A., Washington State, Benton Co., Prosser, bred 3.vi.1953 ex leaf-mine on *Medicago sativa* L. (Lot No. 53.21), in U.S. National Museum. Paratypes 6 ♂, genitalia slide 640; 2, Prosser, ex *Vicia villosa* Roth., 18.vii.1950 (Lot No. 227-1), 4, Yakima Co., Buena, ex *Trifolium hybridum* L., 10.vi. and 19.vii.1950 (Lot No. 207-1), 4 in U.S. National Museum, 1 in Zoologisches Museum, Berlin, 1 in author's collection; entire series collected by K. E. Frick. There are 5 ♂♂ and 8 ♀♀ in the U.S. National Museum and in Frick's personal collection which I have not seen and which cannot be designated as paratypes.

This is the species used by Frick in preparing his key to North American *Liriomyza* species, where it is included as *trifolii* in Couplet

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←
stylus. Fig. 7, *Liriomyza trifolii* (Burgess): a, aedeagus, ventral view; b, spermal sac; c, phallobase, epiphallus, and aedeagal hood.

Scale line = 0.1 mm, that in upper left-hand corner applying to all figures without accompanying line.

34 (Frick, 1959: 400 and 410). Apart from its more yellow coloration, *L. fricki* is immediately distinguishable from *trifolii* by the arrangement of the acrostichals in two regular rows.

Liriomyza munda Frick

Liriomyza munda Frick, 1957: 60; 1959: 407. Steyskal, 1964: 388. Holotype ♂ in California Academy of Sciences.

Liriomyza guytona Freeman, 1958; Spencer, 1963: 362; Steyskal, 1964: 388. Holotype ♂ in U.S. National Museum.

Orbits yellow, both vertical bristles on dark ground, vti at margin of black and yellow; mesonotum brilliantly shining black; mesopleura largely yellow but variably black on lower half, either with separated black areas, as indicated by Frick for *munda* (1957: 67, Fig. E) or with entire lower half uniformly black. Male genitalia: aedeagus in ventral view as in Fig. 4a, distiphallus distinctly divided, pale, basiphallus with darker, asymmetrical sidearms; spermal sac dark (Fig. 4b).

Steyskal (1964) after comparing the holotypes of *guytona* Freeman and *munda* Frick synonymized *guytona* with *munda*. I have myself seen paratypes of *guytona* and *munda* and can confirm this synonymy. It has been further suggested by Steyskal (private communication) that *munda* may be synonymous with *propepusilla* Frost, 1954, but I prefer to leave the establishment of this possible synonymy to an American worker who is able to examine the holotype of *propepusilla*.

This is a highly polyphagous species. Frick (1957: 63) records tomato, potato, and *Datura meteloides* as hosts and also "frequenting tobacco." I have seen specimens, bred by C. Stegmaier in Florida, from *Bauhinia, Cajanus, Cassia, Cestrum, Cucumis, Cucurbita, Hydrocotyle, Passiflora, Phaseolus, Plantago, Ricinus,* and *Solanum*; I bred the species myself in Jamaica from *Moringa*.

Liriomyza pictella (Thomson)

Agromyza pictella Thomson, 1868: 609. Holotype ♂ in Riksmuseum, Stockholm.
Liriomyza pictella (Thomson), Frick, 1957: 66; 1959: 408.

Orbits distinctly darkened to upper fronto-orbital; mesopleura predominantly black, only upper margin yellow. Male genitalia: aedeagus as in Figs. 5a, b; distiphallus shorter, broader than in *munda* and basiphallus paler, less chitinized.

I have examined the holotype from California. It is even darker than suggested by Frick and the mesopleura resemble the illustration given for *propepusilla* Frost (Frick, 1957: 67, Fig. A).

The differences in coloration and genitalia make this species immediately distinguishable from *munda* Frick.

Steyskal (private communication) has examined specimens identified by Frick as *pictella*, reared from a number of different plant families, and in all cases the species has proved to be *munda*. The name *pictella* must therefore, for the time being, be restricted to the holotype, the host plant of which is unknown.

Liriomyza pisivora Hering

Liriomyza pisivora Hering, 1957: 12. Holotype ♂ in Zoologisches Museum, Berlin.

Color exactly as in *congesta* (Becker) and *trifolii* (Burgess) except for the black bar on lower margin of mesopleura being possibly smaller, more as in *fricki*; acrostichals in two rows, slightly irregular. Male genitalia: aedeagus in side view as in Fig. 6a, mesophallus largely fused into greatly enlarged distiphallus (Fig. 6b); surstyli distinctive, appearing almost rectangular, with a blunt chitinized area on inner corner representing a rudimentary spine (spermal sac lost in only available specimen).

De Meijere (1925: 282) first established that a second species closely related to *congesta* (referred to as *leguminosarum* sp. n.) occurs on Leguminosae, and misidentified it as *pusio* Meigen. Hering (1957: 12) subsequently confirmed the distinctness of the two species on the basis of constant differences in larva and leaf-mine. In *pisivora* there are normally 4 or 5 and sometimes as many as 8 bulbs on each posterior spiracular process (3 only in *congesta*); the leaf-mine normally begins on and is frequently largely confined to the lower surface (largely upper surface in *congesta*). Hering has noted the mine in Germany on *Lathyrus* spp. and *Pisum* spp.

It is not possible satisfactorily to distinguish *pisivora* from *congesta* on external characters.

Material examined.

Germany: Berlin Botanical Gardens, 1 ♂ paratype, genitalia slide 754, ex *Lathyrus silvestris* L., 8.vii.1951 (E. M. Hering).

Liriomyza trifolii (Burgess)

Oscinis trifolii Burgess, 1879: 201. There are no types in the U.S. National Museum and they must be presumed lost.

Agromyza trifolii (Burgess): Coquillet, 1898, Bull. Dept. Agric. Ent. 10: 78; Malloch, 1913, Ann. Ent. Soc. Amer. 6: 278.

Liriomyza trifolii (Burgess): de Meijere, 1925: 282; Hendel, 1931–1936: 213; Frick, 1952: 405; 1959: 410; Spencer, 1963: 354 (as *archboldi* Frost).

Burgess described this species from material bred from leaf-mines on *Trifolium repens* L. in the District of Columbia. In the absence of any type specimens and in view of the past confusion over the status of this species, it is considered desirable to establish a neotype. The specimen selected, a male bred from "alfalfa" (*Medicago sativa* L.) at Lafayette, Ind., 3.xi.1913 (J. M. Aldrich), is in the U.S. National Museum.

The essential characters of the species are as follows:

Orbits entirely yellow, both vertical bristles on yellow ground; black of occiput reaching eye margin beyond outer vertical bristle; all antennal segments bright yellow, third only finely pubescent; mesonotum blackish grey, distinctly pollinose; acrostichals irregularly in 3 or 4 rows in front, reduced to two rows behind, yellow patch at each corner adjoining scutellum; mesopleura with black patch normally extending along lower margin, sternopleura largely black, upper margin yellow; abdomen with tergites variably yellow laterally and on hind margins; legs: coxae yellow, femora largely so but with slight, variable brownish striation; tibiae and tarsi darker, brown. Male genitalia: illustrated by Spencer (1963: Fig. 73a, b, c, as *archboldi* Frost); distiphallus pale, distinctly divided into two symmetrical halves, slightly variable in form and length (Fig. 7a), mesophallus always narrow, obviously elongate; basiphallus entirely pale distally, more distinctly formed behind on one side only; surstyli ending in one well-developed spine with two slight hairs; spermal sac (Fig. 7b) pale, narrow, relatively small; phallophore, epiphallus, and aedeagal hood as in Fig. 7c.

The differences in the aedeagus between *trifolii* and *munda* are surprisingly small. In *trifolii* the mesophallus is distinctly narrower, more elongate, and the basiphallus is less strongly chitinized, appearing quite black in *munda*. These two species can be more reliably separated on external characters as follows:

Mesonotum brilliantly shining black; both vertical bristles arising from dark color .... *munda* Frick

Mesonotum blackish-grey, distinctly pollinose; both vertical bristles arising from yellow .... *trifolii* (Burgess)

There appears to be a distinct variation in the distiphallus of *trifolii*. It is virtually identical in the neotype and in a specimen ex *Tridax procumbens* (genitalia slide 528) but more elongate and less indented in a specimen ex *Pisum* (genitalia slide 610, previously illustrated, 1963: Fig. 73b); there are minor variants between these two extremes in the seven other specimens I have examined. The genitalia are identical in other respects, as are the adults on external characters. A comparable variation has been noted in another highly polyphagous species, *Phytomyza atricornis* Mg. More detailed study will be required to decide whether this variation represents incipient speciation or whether it can in some way be explained as an associated characteristic of the polyphagy of the species concerned.

Frick (1959: 400) keys out this species as having two rows of acrostichals. This is not correct. Frick was misled on this point by considering as *trifolii* specimens he collected in Washington in which the acrostichals are in two rows but which represent the new species *fricki* described earlier in this paper.

L. *trifolii* occurs commonly in Florida on *Phaseolus, Pisum,* and *Vigna* but it also occurs there on *Allium*; *Capsicum* and *Solanum*; *Hibiscus*; *Cucumis* and *Cucurbita*; *Tribulus*; and very frequently on *Compositae*. It is a dominant, polyphagous species and not limited to Leguminosae, as has been the concept hitherto.

Frick (1953: 72) accepts *Oscinis trifolii* Burgess as a homonym and synonym of *Agromyza trifolii* Kaltenbach, 1874; he then places *Liriomyza trifolii* (Burgess) as a synonym of *L. congesta* (Becker). These two proposals are inaccurate both nomenclatorially and taxonomically; de Meijere (1925: 282) first suggested the homonymy of *Oscinis trifolii* Burgess and *Agromyza trifolii* Kaltenbach but Hendel (1931–1936: 213) rightly pointed out that this was not so. *Agromyza trifolii* Kaltenbach is itself a synonym of *A. nana* Meigen.

In Frick's (1959: 400) key to North American *Liriomyza* species *L. trifolii* runs to *alliovora* in couplet 32, not to couplet 34 as shown (Frick's *trifolii* represents *fricki* n. sp.)

Material examined.

Medicago sativa L.: Indiana, Lafayette, 1 ♂, 3.xi.1913 (neotype).

Trifolium repens L.: Florida, Hialeah, leaf-mines only, 16.vi.1963 (C. Stegmaier).

Phaseolus sp.: Florida, Hialeah, ♂♂ and ♀♀, 3.iv.1963 (C. Stegmaier).

Pisum sp.: Florida, Hialeah, ♂♂ and ♀♀, genitalia slide 610, Feb. 1963 (C. Stegmaier).

Cucumis sp.: Florida, Immokake, 2 ♂, 2 ♀, genitalia slide 382, 3.ix.1961 (W. C. Allerz); Hialeah, ♂♂ and ♀♀, genitalia slide 605, Feb. 1963 (C. Stegmaier).

Cucurbita sp.: Florida, Hialeah, ♂♂ and ♀♀, Feb. 1963 (C. Stegmaier).

Capsicum sp. (green pepper). Florida, Hialeah, ♂♂ and ♀♀, Apr. 1963 (C. Stegmaier).

Solanum nigrum L.: Florida, Hialeah, ♂♂ and ♀♀, genitalia slide 605, Feb. 1963 (C. Stegmaier).

Kallstroemia maxima (L.) T. & G.: Florida, Miami Beach, ♂♂ and ♀♀, May 1963 (C. Stegmaier).

Tribulus terrestris L. (Zygophyllaceae): Florida, Hialeah, ♂♂ and ♀♀, genitalia slide 740, May 1963 (C. Stegmaier).

Baccharis halimifolia L.: Florida, Hialeah, ♂♂ and ♀♀, Feb. 1963 (C. Stegmaier).

Bidens pilosa L.: Florida, Miami, ♂♂ and ♀♀, genitalia slide 531, Aug. 1962 (C. Stegmaier).

Dahlia sp. (cult.): Florida, Hialeah, ♂♂ and ♀♀, 30.viii.1962 (C. Stegmaier).

Erechtites hieracifolia (L.) Rafin.: Florida, Hialeah, ♂♂ and ♀♀, Feb. 1963 (C. Stegmaier).

Eupatorium coelestrinum (L.): Florida, Hialeah, ♂♂ and ♀♀, 18.ix.1963 (C. Stegmaier).

Flaveria trinervia Mohr: Florida, Miami, ♂♂ and ♀♀, 15.viii.1962 (C. Stegmaier).

Gaillardia aristata Pursh.: Florida, Key Bahia Honda, ♂♂ and ♀♀, Aug. 1963 (C. Stegmaier).

Gerbera jamesoni Bolus: Florida, Coral Gables, ♂♂ and ♀♀, May 1913 (C. Stegmaier).

Lactuca sp.: Florida, Hialeah, ♂♂ and ♀♀, Feb. 1963 (C. Stegmaier).

Tagetes sp.: Florida, Hialeah, ♂♂ and ♀♀, Feb. 1963 (C. Stegmaier).

Tridax procumbens L.: Florida, Miami, ♂♂ and ♀♀, genitalia slide 528, Aug. 1962 (C. Stegmaier).

Zinnia sp. Florida, Hialeah, 1 ♂, 1 ♀, 2.vii.1963 (C. Stegmaier).

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TWO NEW SPECIES OF DACTYNOTUS RAFINESQUE FROM THE EASTERN UNITED STATES

(HOMOPTERA: APHIDIDAE)

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In this paper two new species of *Dactynotus* Rafinesque from the eastern portion of the United States are described. For an explanation of the terms, methods of clearing and mounting, etc., see Olive (1963).

The author expresses his appreciation to M. D. Leonard, D. D. Leonard, C. E. Olsen, and J. T. Katsanos for aid in obtaining the specimens of one species.

A mimeographed table of measurements for both species in this paper is available upon request.

Dactynotus leonardi n. sp.

(Figs. 1, 3, 4)

Alate Viviparous Female

Color of living specimen.—Entire body dark brown to blackish. Cauda pale yellow.

Color of cleared specimen.—Head and thorax dusky, abdomen pale. Antennal segments I, II, and base of III dark dusky; sometimes I slightly darker than II and base of III. Remainder of antennae dark. Rostral segments III and IV + V dark dusky to dark, basal segments dusky. Legs with basal half of femora pale, distal half dark dusky to dark. Basal tibiae dark dusky, shading to dark apically. Tarsi and extreme tips of tibia slightly paler than apical half of tibiae. Marginal sclerites pale dusky to dusky. Antesiphuncular sclerites broken and dusky. Postsiphuncular sclerites entire and dusky. Scleroites concolorous with marginal sclerites. Siphunculi uniformly dark dusky to dark. Cauda, genital plate, and anal plate concolorous with, or slightly paler than, marginal sclerites.

Morphological characters.—Length of body, 2.34–3.59. Antennal segment III with 33–51 sensoria. Length of hairs on vertex, 0.03–0.045; on antennal segment III, 0.03–0.045. Rostrum attaining or slightly surpassing second coxae. Tarsal segment I with 5 hairs. Abdominal tergite VIII with 4, occasionally 3 hairs. Lateral tubercles small, clear, slightly convex, and usually not occurring on all marginal sclerites of a given specimen. (Few specimens of a population may be lacking tubercles altogether.) Siphunculi with apical third reticulated. Cauda long, narrow, and bearing 14–23 hairs; most specimens average about 17 or 18, but a few have several small, secondary, dorsal hairs.

Apterous Viviparous Female

Color of living specimens.—Similar to that of alate viviparae.

Color of cleared specimens.—Head dusky. Remainder of body pale to pale dusky. Antennae similar to those of alate viviparae. Legs with slightly less than basal two-thirds of femora pale, distal third dark. Tibiae with basal half dusky to dark dusky, shading to dark distally. Tarsi and extreme tip of tibiae slightly paler than rest of tibiae. Marginal sclerites appearing as pale dusky to dusky spots at

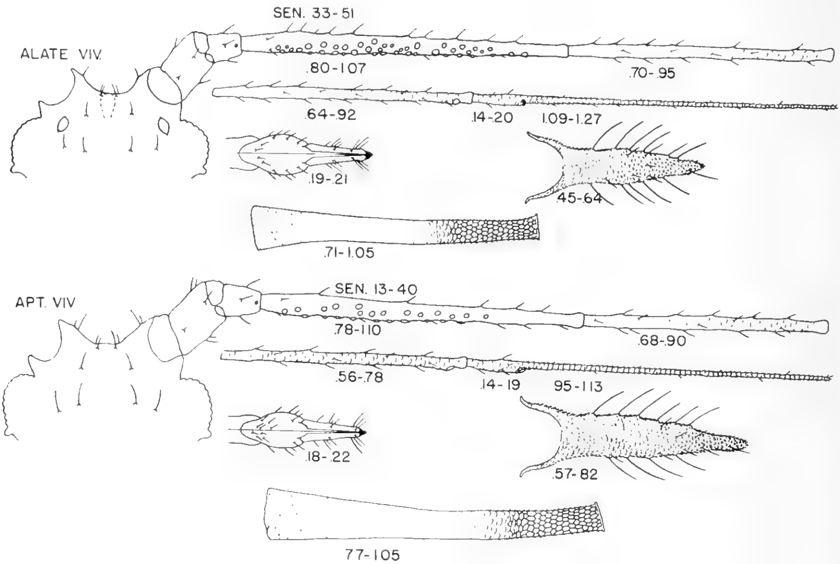

Fig. 1, *Dactynotus leonardi* n. sp.

bases of marginal hairs and marginal tubercles. Otherwise, coloration similar to that of alate viviparae.

Morphological characters.—Length of body, 2.41–3.35. Antennal segment III with 13–40 sensoria. Length of hairs on vertex, 0.04–0.06; on antennal segment III, 0.03–0.045. Rostrum attaining third coxae. Marginal tubercles clear, small, slightly convex, seldom found on all marginal sclerites in a given specimen. Cauda long, narrow, bearing 13–22 hairs; average number about 17–18, with several secondary, dorsal hairs.

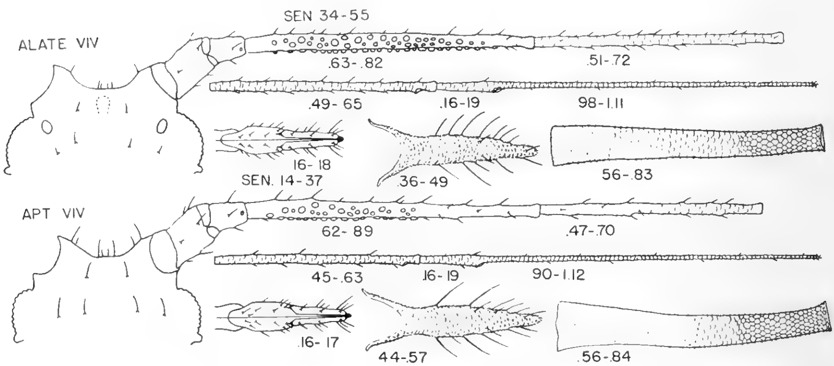

Fig. 2, *Dactynotus reynoldensis* n. sp.

Collections.—On *Rudbeckia hirta* L.: Ridgewood, N. J., July 1962, D. D. Leonard, coll. West Nyack, N. Y., 1961, C. E. Olsen, coll.

On *Rudbeckia serotina* Nutt.: Hadley, Mass., 6-12-62, 7-17-62, J. T. Katsanos, coll.

Types.—Holotype: Alate viviparous female. Hadley, Mass., 6-12-62, on *Rudbeckia serotina* Nutt. J. T. Katsanos, coll. Deposited in the United States National Museum. Paracolonotypes: (Same data as holotype.) There are 4 slides deposited in the collection of the author. Paratypes: There are 31 slides from Hadley, Mass., Ridgewood, N. J., and West Nyack, N. Y., deposited in the collection of the author.

Type-locality.—Hockanum area, Hadley, Mass.

Chief distinguishing characters.—Body color dark brown to blackish. Cauda pale, very long and narrow. Tarsal segment I with 5 hairs. Abdominal tergite VIII with 4 or occasionally 3 hairs. Lateral tubercles small, clear, convex, and not always present on all marginal sclerites. Siphunculi uniformly dark.

Notes.—Other species of *Dactynotus* recorded from *Rudbeckia* spp. are *D. ambrosiae* (Thomas) and *D. rudbeckiae* (Fitch). *Dactynotus leonardi* differs from these two species by having lateral tubercles. Because of the similarity of color *leonardi* could be confused easily with *ambrosiae*. Since *rudbeckiae* is orange-red and *leonardi* is dark brown to blackish, these two are easily distinguished in the field. Superficially, *leonardi* is similar to *Dactynotus chrysopsidicola* Olive. *D. chrysopsidicola* is a much smaller aphid with very dark sclerotization, and occurs almost exclusively on *Chrysopsis* spp. *D. leonardi* also resembles *D. nigrotuberculatus* Olive in size and shape. However, *nigrotuberculatus* is orange-red in life, and the marginal tubercles are dark instead of clear.

This species is named in honor of Dr. Mortimer D. Leonard.

Dactynotus reynoldensis n. sp.

(Figs. 2, 5, 6)

Alate Viviparous Female

Color of living specimens.—Head, thorax, and abdomen dark orange-red. Antennae, legs, and siphunculi appearing blackish, cauda pale.

Color of cleared specimens.—Head and thorax dusky, abdomen pale. Antennal segments I, II, and base of III dark dusky, remainder dark. Sometimes entire antenna almost uniformly dark. Rostral segments III and IV + V dark dusky to dark; basal segments slightly paler. Legs with basal half of femora pale, distal half dark. Tibiae dark except apical tip which is slightly paler. Tarsi concolorous with apical tibiae. Marginal sclerites dusky. Antesiphuncular sclerites broken and dusky. Postsiphuncular sclerites entire and dusky. Scleroites concolorous with, or slightly paler than, marginal sclerites. Siphunculi uniformly dark. Cauda, genital plate, and anal plate dusky, or slightly darker than abdomen.

Morphological characters.—Length of body, 1.84–2.34. Antennal segment III with 34–55 sensoria. Length of hairs on vertex, 0.025–0.04; on antennal segment

III, 0.025–0.035. Rostrum attaining or slightly surpassing second coxae. Tarsal segment I with 5 hairs. Abdominal tergite VIII with 2 hairs. Lateral tubercles absent. Siphunculi with slightly more than apical third reticulated. Cauda bearing 9–18 hairs.

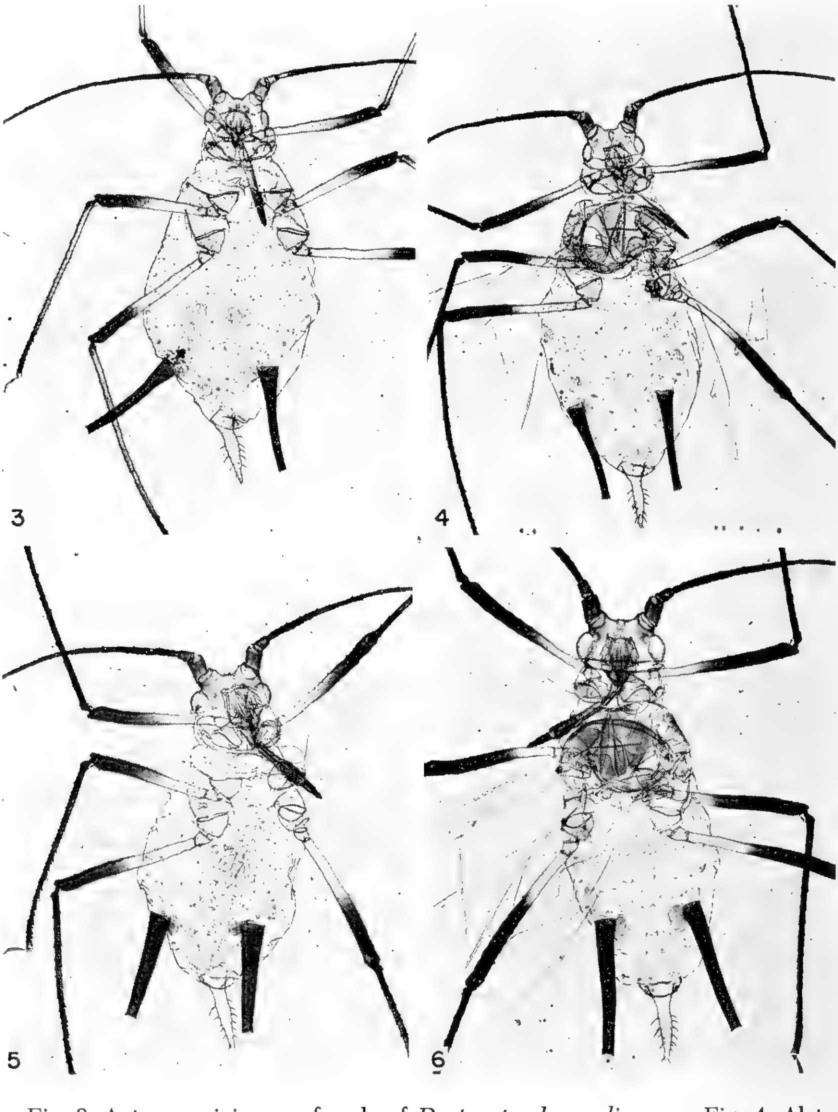

Fig. 3, Apterous viviparous female of *Dactynotus leonardi* n. sp.; Fig. 4, Alate viviparous female of same. Fig. 5, Apterous viviparous female of *Dactynotus reynoldensis* n. sp.; Fig. 6, Alate viviparous female of same.

Apterous Viviparous Female

Color of living specimens.—Similar to that of alate viviparae.

Color of cleared specimens.—Head dusky. Remainder of body pale to pale dusky. Antennae similar to those of alate viviparae. Legs with slightly more than basal half of femora pale, remainder of legs dark dusky to dark. Apices of tibiae and tarsi slightly paler than more proximal portion of tibiae. Marginal sclerites appearing as pale dusky to dusky spots at bases of marginal hairs. Antesiphuncular and postsiphuncular sclerites and scleroites concolorous with marginal sclerites. Otherwise, coloration similar to that of alate viviparae.

Morphological characters.—Length of body, 1.60–2.21. Antennal segment III with 14–37 sensoria. Length of hairs on vertex, 0.04–0.05; on antennal segment III, 0.03–0.035. Rostrum attaining third coxae. Cauda bearing 12 to 17 hairs. Cauda very long and narrow, width at constricted area 1/7 entire length of cauda.

Collections.—On *Coreopsis major* Walt.: Reynolda Gardens of Wake Forest College, Winston-Salem, N. C., 7-14-62, 6-20-63, 6-21-63, 6-29-63, 7-20-63; Saurtown Mountain, N.C., 7-6-63.

Types.—Holotype: Alate viviparous female. Reynolda Gardens of Wake Forest College, Winston-Salem, N.C., 7-14-62, on *Coreopsis major* Walt. A. T. Olive, coll. Deposited in the United States National Museum. Paracolonotypes: (Same data as holotype.) There are 16 slides deposited in the collection of the author. Paratypes: There are 25 slides deposited in the collection of the author.

Type-locality.—In a small patch of woods across the street from the Faculty Apartments of Wake Forest College, Winston-Salem, N.C.

Chief distinguishing characters.—Body color dark orange red. Tibiae of alate and apterous forms uniformly dark except for extreme apices which are slightly paler. Cauda pale to dusky, very long and narrow. Tarsal segment I with 5 hairs. Abdominal tergite VIII with 2 hairs. Lateral tubercles absent. Siphunculi uniformly dark.

Notes.—To my knowledge, this is the only aphid of the genus *Dactynotus* which has been recorded from *Coreopsis* spp. except *D. ambrosiae* (Thomas). The two species may be distinguished most readily by the live color. *D. reynoldensis* is dark orange-red, whereas, *ambrosiae* is red brown to brown.

Two other "bright red" aphids with which *reynoldensis* may be confused are *D. rudbeckiae* (Fitch), and *D. nigrotuberculatus* Olive. The siphunculi of *reynoldensis* are uniformly dark, whereas those of *rudbeckiae* are pale at the bases. *D. reynoldensis* is much smaller than *nigrotuberculatus* and has 2 hairs on abdominal tergite VIII instead of 4–6. *D. reynoldensis* lacks lateral tubercles, while *nigrotuberculatus* has prominent dark ones.

Literature Cited

Olive, A. Thomas. 1963. The genus *Dactynotus* Rafinesque in North Carolina (Homoptera: Aphidae). Misc. Publ. Ent. Soc. Amer. 4(2): 31–66.

THE VERNON L. KELLOGG MALLOPHAGA TYPE MATERIAL IN THE CORNELL UNIVERSITY COLLECTION

K. C. Emerson, *Stillwater, Oklahoma*

Through the courtesy and assistance of Mr. Robert C. Dalgleish, I have examined 47 slides of Mallophaga given to Cornell University by Vernon L. Kellogg. In 1958, a report on the specimens given to the University of Kansas was published; and in 1961, a report on the specimens given to the USNM was published. These collections are of significance because Kellogg did not designate a holotype or type, but considered all material examined as cotypes. In some instances, the series he examined contained specimens from several hosts and are known to contain more than one species of Mallophaga. When genera are revised, and when the type series are found, lectotypes are being designated which assists greatly in stabilizing the Kellogg names.

In this paper, all specimens conspecific with the lectotype are accepted as syntypes. Specimens not conspecific with the lectotype are regarded as no longer being syntypes. If a lectotype has not been designated, all specimens listed by Kellogg are considered to still be syntypes.

In the Cornell University Collection of 47 slides, many have "cotype" labels which were added by someone other than Kellogg. These apparently were added without reference to the original descriptions, since there are many obvious errors. All specimens were remounted by Dr. F. H. Wilson several years ago. He preserved the original labels, but in at least one instance apparently made an error in remounting. The specimens are presently mounted in permanent media, but are uncleared. Detailed study needed for revision will require clearing and remounting.

Colpocephalum osborni Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 521, pl. 71, figs. 2 and 3.

Slide without a number. One male and one female syntype with label "Colpocephalum osborni Kellogg, From Elanus glaucus, Palo Alto, Cal., V. L. Kellogg, Stanford."

Present status.—As originally described.

Docophorus atricolor Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 93, pl. 3, fig. 9.

Slide number 21. Two female syntypes with label "Docophorus atricolor Kellogg, From Synthliborhampus antiquus, Monterey Bay, Cal., V. L. Kellogg, Stanford." Lectotype, designated by Carriker (1957), is on slide 63a in the Stanford University Collection.

Present status.—A synonym of *Craspedonirmus colymbinus* (Denny, 1842).

Docophorus californiensis Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 483, pl. 66, fig. 6

Slide number 407a. Two male syntypes with label "Docophorus californiensis Kell., From Melanerpes formicivorus bairdi, Palo Alto, Cal., V. L. Kellogg, Stanford." Lectotype, designated by Carriker (1957), is on slide 361a in the Stanford University Collection.

Present status.—*Penenirmus auritus californiensis* (Kellogg, 1896).

Docophorus calvus Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 79, pl. 3, fig. 1.

Slide number 30A. One syntype female with label "Docophorus calvus K., From Uria troile californica, Monterey Bay, Cal., V. L. Kellogg, Stanford." Kellogg mentioned only one female in the description. The USNM has a female on slide 64968 with the same data as given above. It is possible that Kellogg failed to record correctly the number of specimens since the data for each agree with the data given in the description. The female on USNM slide 64968 is herewith designated lectotype.

Present status.—*Saemundssonia calva* (Kellogg, 1896).

Docophorus distinctus Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 477, pl. 65, fig. 5.

Slide number 486. One immature syntype with label "Docophorus distinctus Kell., From Corvus corax sinatus, Colorado, V. L. Kellogg, Stanford."

Present status.—A synonym of *Philopterus corvi* (Linnaeus, 1758).

Docophorus excisus major Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 490.

Slide number 612. Two male syntypes with label "Docophorus excisus Nitz. var. major Kellogg, From Petrochelidon lunifrons, Palo Alto, Calif., V. L. Kellogg, Stanford." Lectotype, designated by Carriker (1957), is on slide 372a in the Stanford University Collection.

Present status.—*Philopterus excisus major* (Kellogg, 1896).

Docophorus graviceps Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 82, pl. 3, fig. 3.

Slide number 10. One male and one female syntype with label "Docophorus graviceps K., From Urinator pacificus, Bay of Monterey, Cal., V. L. Kellogg, Stanford." Lectotype, designated by Carriker (1957), is on slide 125b in the Stanford University Collection.

Present status.—A synonym of *Craspedonirmus colymbinus* (Denny, 1842).

Docophorus insolitus Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 94, pl. 4, fig. 5.

Slide number 16. One female and one immature syntype with label "Docophorus insolitus Kellogg, From Ptychoramphus aleuticus, Monterey Bay, Cal., V. L. Kellogg, Stanford." Lectotype, designated by Carriker (1957), is on slide 163c in the Stanford University Collection.

Present status.—*Saemundssonia insolita* (Kellogg, 1896).

Docophorus latifrons occidentalis Kellogg, 1899. Occ. Pap. Calif. Acad. Sci. 6: 6, pl. 1, figs. 5 and 8.

Slide number 387a. One female syntype with label "Docophorus latifrons var. occidentalis Kellogg, From Coccyzus californicus occidentalis, Baja, Cal., V. L. Kellogg, Stanford University." Lectotype, designated by Carriker (1957), is on slide 428a in the Stanford University Collection.

Present status.—A synonym of *Cuculoecus coccyii* (Osborn, 1896).

Docophorus montereyi Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 87, pl. 3, fig. 6.

Slide number 21. Two female syntypes with label "Docophorus montereyi Kell., From Synthliboramphus antiquus, Monterey Bay, Cal., V. L. Kellogg, Stanford."

Lectotype, designated by Carriker (1957), is on slide 151b in the Stanford University Collection.

Present status.—Saemundssonia montereyi (Kellogg, 1896).

Docophorus occidentalis Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 89, pl. 3, fig. 7.

Slide number 86. Two female and one immature syntypes with label "Docophorus occidentalis Kellogg, From Fulmarus glacialis pacificus, Monterey Bay, Cal., V. L. Kellogg, Stanford."

Present status.—Saemundssonia occidentalis (Kellogg, 1896).

Docophorus procax Kellogg and Chapman, 1899. Occ. Pap. Calif. Acad. Sci. 6: 54, pl. 5, fig. 1.

Slide number 29. Two female syntypes with label "Docophorus procax Kellogg and Chapman, From Cepphus columba, Bay of Monterey, Calif., V. L. Kellogg, Stanford University." Lectotype, designated by Carriker (1957), is on slide 468a in the Stanford University Collection.

Present status.—Saemundssonia procax (Kellogg and Chapman, 1899).

Docophorus rufus Kellogg, 1899. Occ. Pap. Calif. Acad. Sci. 6: 7, pl. 1, figs. 6 and 9.

Slide number 454. One male and one female syntype with label "Docophorus rufus Kellogg, From Myiarchus cinerascens nuttingi, Baja California, V. L. Kellogg, Stanford University."

Present status.—Philopterus rufus (Kellogg, 1899).

Goniocotes creber Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 510, pl. 69, fig. 3.

Slide without a number. Two female syntypes with label "Goniodes creber Kellogg, From Phasianus nychthemerus, Bird Store, San Francisco, Calif., V. L. K., Stanford, '99."

Present status.—Probably a synonym of *Goniocotes albidus* Giebel, 1874.

Lipeurus gracilicornis major Kellogg, 1899 (*nec* Piaget, 1880). Occ. Pap. Calif. Acad. Sci. 6: 30, pl. 3, fig. 3.

Epifregata fregatiphagus Eichler, 1943. Zool. Anz. 141: 59 (*Nomen novum* for *Lipeurus gracilicornis major* Kellogg, 1899).

Slide number 128. One male and one female syntype with label "Lipeurus gracilicornis P. var. major Kellogg, From Fregata aquila, Panama, V. L. Kellogg, Stanford University." Lectotype, designated by Carriker (1957), is on slide 401a in the Stanford University Collection.

Present status.—Pectinopygus fregatiphagus (Eicher, 1943).

Lipeurus macgregori Kellogg, 1899. Occ. Pap. Calif. Acad. Sci. 6: 33, pl. 3, figs. 5 and 6.

Slide number 384. One female syntype with label "Lipeurus macgregori Kellogg, From Crotophaga sulcirostris, Panama, V. L. Kellogg, Stanford, University."

Present status.—Vernoniella macgregori (Kellogg, 1899).

Lipeurus macrocephalus Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 504, pl. 68, fig. 3.

Slide number 420. One male and one female syntype with label "Lipeurus macrocephalus Kell., From Chordeiles virginianus henryi, Palo Alto, Cal., V. L.

Kellogg, Stanford." Lectotype, designated by Carriker (1957), is on slide 370a in the Stanford University Collection.

Present status.—*Mulcticola macrocephalus* (Kellogg, 1896).

Menopon incertum Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 533, pl. 73, fig. 2.

Slide number 758. One male and one female syntype with label "Menopon incertum Kell., From Turdus ustulatus, Palo Alto, Cal., V. L. Kellogg, Stanford." Kellogg listed as type material, specimens from *Turdus ustulatus* and *Spinus tristis.* The species of *Myrsidea* found on these two hosts are not conspecific. Dr. T. Clay is reviewing the genus *Myrsidea* and will designate a lectotype which will also fix the type host.

Present status.—*Myrsidea incerta* (Kellogg, 1896).

Menopon infrequens Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 161, pl. 15, fig. 5.

Slide number 44. One male and one female syntype with label "Menopon infrequens, From Larus glaucescens, Monterey Bay, Cal., V. L. Kellogg, Stanford."

Present status.—A synonym of *Austromenopon transversum* (Denny, 1842).

Menopon numerosum Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 159, pl. 15, fig. 1.

Slide number 86. Two female syntypes with label "Menopon numerosum Kell., From Fulmarus glacialis, Monterey Bay, Cal., V. L. Kellogg, Stanford."

Present status.—A synonym of *Procellariphaga brevifimbriata* (Piaget, 1880).

Menopon praecursor Kellogg, 1899. Occ. Pap. Calif. Acad. Sci. 6: 46, pl. 4, fig. 8.

Slide number 411. Two female and one immature syntypes with label "Menopon praecursor Kellogg, From Melanerpes uropygialis, Baja Cal., V. L. Kellogg, Stanford University." This slide also has a male of the genus *Austromenopon* which was probably added through error by Wilson in remounting the material.

Present status.—*Menacanthus praecursor* (Kellogg, 1899).

Menopon titan linearis Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 165, pl. 15, fig. 2.

Slide number 127. Two male syntypes with label "Menopon titan linearis Kell., From Pelecanus californicus, Monterey Bay, Cal., V. L. Kellogg, Stanford."

Present status.—A synonym of *Piagetiella bursaepelecani* (Perry, 1876).

Menopon tridens pacificum Kellogg, 1896. Proc. Calif. Acad. Sci. 6: 166.

Slide number 10. Two male and one female syntypes with label "Menopon tridens var. pacificum, From Urinator pacificus, Monterey Bay, Cal., V. L. Kellogg, Stanford." The correct host is *Fulica americana.*

Present status.—A synonym of *Pseudomenopon pilosum* (Scopoli, 1763).

Nirmus actophilus Kellogg and Chapman, 1899. Occ. Pap. Calif. Acad. Sci. 6: 78, pl. 6, fig. 4.

Slide number 248. One male syntype with label "Nirmus actophilus Kellogg and Chapman, From Calidris arenaria, Bay of Monterey, Cal., V. L. Kellogg, Stanford University." Lectotype designated by Carriker (1957), is on slide 494 in the Stanford University Collection.

Present status.—*Lunaceps holophaeus actophilus* (Kellogg and Chapman, 1899).

Nirmus fusco-marginatus americanus Kellogg and Chapman, 1899. Occ. Pap. Calif. Acad. Sci. 6: 69, pl. 5, fig. 9.

Slide number 4. Two female and one immature syntypes with label "Nirmus marginatus var. americana Kellogg and Chapman, From Colymbus nigricolis californicus, Bay of Monterey, Cal., V. L. Kellogg, Stanford University." Lectotype, designated by Carriker (1957), is on slide 460a in the Stanford University Collection.

Present status.—Aquanirmus americanus (Kellogg and Chapman, 1899).

Nirmus penisularis Kellogg, 1899. Occ. Pap. Calif. Acad. Sci. 6: 21, pl. 2, fig. 9.

Slide number 620. One male and one immature syntype with label "Nirmus penisularis Kellogg, From Phainopepla nitens, Baja California, V. L. Kellogg, Stanford University." Lectotype, designated by Carriker (1957), is on slide 441a in the Stanford University Collection.

Present status.—Bruelia penisularis (Kellogg, 1899).

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FIRST RECORD OF OPOMYZA PETREI MESNIL IN EASTERN NORTH AMERICA

(Diptera: Opomyzidae)

According to Vockeroth (1961, Can. Entomol. XCIII: 503–522), the family Opomyzidae in the Nearctic region consists of ten native and three introduced species. *Opomyza petrei* Mesnil, an European species, was recorded in North America only from southwestern British Columbia and Vancouver Island.

During the summers of 1962–1964 numerous specimens of *O. petrei* (det. Vockeroth) were swept from grasses growing in roadside ditches or in partially shaded marshes at scattered localities in Portage, Medina, Summit, and Wayne counties of northeastern Ohio.—B. A. Foote, *Kent State University.*

DISCOPYGIELLA, A NEW GENUS OF DOLICHOPODIDAE FROM MEXICO

(DIPTERA)

HAROLD ROBINSON, *620 So. Stewart St., Winchester, Virginia*

The genus and four species described in this paper were collected by the author during recent trips to Mexico. The small size and the habit of remaining close to moist rock surfaces might explain the apparent lack of previous collections.

Discopygiella, gen. nov.

Small, yellowish or brownish, with setae mostly dark. Face narrower below, wider in the female, bearing hairs below in the female and sometimes in the male; front broad, broader above; face and front with blackish ground color; antenna with all segments short, first bare above, second slightly produced in the middle of the distal margin, third segment short and broad, with the arista borne in a shallow apical or subapical sinus; setae of the lower orbit pale. Thorax rather flattened on the posterior slope; acrostichals small, biseriate; five large dorsocentrals; scutellum with a pair of large bristles and numerous marginal hairs; proepisternum bare above, a few pale setae below. Fore- and middle coxae with numerous hairs on the anterior surface, longer setae on the forecoxa distally, all coxae with a bristle toward the outer side; middle and hind femora with a preapical bristle; foretibia with short stout anterodorsals forming a crest along the distal two-thirds, hind tibia with short stout posterodorsals forming a crest along the distal three-fifths; tarsi plain. Wing rather oblong–oval, slightly tinged with brown, veins brown; third and fourth veins rather straight and parallel beyond the posterior crossvein, second vein usually slightly diverging; crossvein perpendicular to the last of the fourth vein, about two-thirds as long as the last of the fifth vein; sixth vein represented by a slight fold. Calypter pale with the margin and crest of long setae black; halter pale or slightly infuscated. Abdomen about as long as the thorax, stout, blunt, and rather compressed. Hypopygium discoid, capping the broad tip of the abdomen; tip bearing a short straight dark arm and a pale pubescent, short appendage.

Type species, *Discopygiella setosa* sp. n.

The genus closely resembles *Peloropeodes* Wheeler but is distinguished by the discoid hypopygium with only small appendages, the distinctly biseriate row of acrostichals, the somewhat produced distal margins of the second antennal segment, the setae on the lower part of the face, the lack of a modified claw on the last joint of the foretarsus, and the complete lack of specialized setae on the tip of the middle coxa.

The following key will distinguish the four known species:

1. Tibia II with two strong posterodorsals, tibia III with two pairs of dorsals and a ventral on the basal half; face with two pairs of setae on or above the suture, uppermost very small .... *D. setosa* new species

   Tibia II with only one strong posterodorsal, tibia III with anterodorsal and often the ventral near the middle lacking; face with only one pair of setae on or above the suture, face of male sometimes bare 2

2. Tibia III with a strong ventral near the middle; thorax, especially the pleura usually partly yellowish; third antennal segments of the male with a slight short point .... *D. discolor* new species
   Tibia III without strong ventral; thorax wholly dark; third antennal segment rounded apically 3
3. Antenna mostly yellowish; tibia II with a small posterodorsal near the middle, tibia III with a very indistinct ventral near the distal third; face of the male bare .... *D. xerophila* new species
   Antenna mostly blackish; tibia II without a posterodorsal near the middle, tibia III without a ventral; face of the male with a single pair of setae below .... *D. chiapensis* new species

Discopygiella setosa sp. n.

Male.—Length 1.7 mm; wing 1.8 mm by 0.7 mm.

Face about half as wide below as above, with two pairs of setae on or just above the suture, the upper pair very small, ground color nearly obscured by grayish-brown pollen; pollen on the front brown. Palpus black with a black apical seta; proboscis brownish-yellow. Antenna blackish, third segment blunt, bulging more below the subapical arista than above.

Thorax black with thin brown pollen, thicker grayer pollen on the pleura.

Legs mostly pale with the bases of the coxae and sometimes parts of the femora slightly infuscated, distal joint of the tarsi brownish; foretibia with crest of about nine short stout anterodorsals, a small posterodorsal near the middle; middle tibia with large antero- and posterodorsals paired near the basal fourth and just beyond the middle, with four apicals; hind tibia with a large antero- and posterodorsal paired near the basal fifth, a large antero- and posterodorsal and a ventral near the second fifth, crest from the second large posterodorsal to the tip rather prominent, four apicals. Length of the joints of the foretarsus from the base as 12-5-4-3-4; middle tarsus as 14-8-6-4-4; hind tarsus as 7-10-7-5-5.

Abdomen dark brown or black, usually slightly flaring on the lower hind margin; hypopygial capsule brown with grayish pollen.

Female very similar to the male with the face only slightly narrower below.

Holotype male and three male paratypes, from calcareous rock wet from seepage, partly shaded small ravine, a few miles south of Tamazunchale, San Luis Potosí, Dec. 22–23, 1961; allotype female, four male and three female paratypes, from wet rocks by small roadside waterfall, above Valle Nacional, Oaxaca, Dec. 20, 1962; seventeen male and eleven female paratypes, from wet rocks by various small roadside waterfalls, above Valle Nacional, Oaxaca, May 12–16, 1963; two male and two female paratypes; from wet rocks by waterfall about 20 miles south of Pichucalco, Chiapas, May 24, 1963. Holotype and allotype in the U.S. National Museum (No. 67151), two male and two female paratypes at the Instituto de Biologia, Ciudad Universitaria, Mexico, D.F., others in the author's collection.

The setae of the face and legs are more fully developed in this species than in the remaining three. Fortunately the distinctive chaetotaxy of the legs of each species is shared by both sexes.

Discopygiella chiapensis sp. n.

Male.—Length 1.7 mm; wing 1.7 mm by 0.6 mm.

Face about a third as wide below as above, with a single pair of setae just above the suture, ground color obscured by yellowish-gray pollen; pollen on the front brownish-gray. Palpus black with a black apical seta; proboscis brownish-yellow. Antenna blackish, third segment blunt, bulging more below the subapical arista.

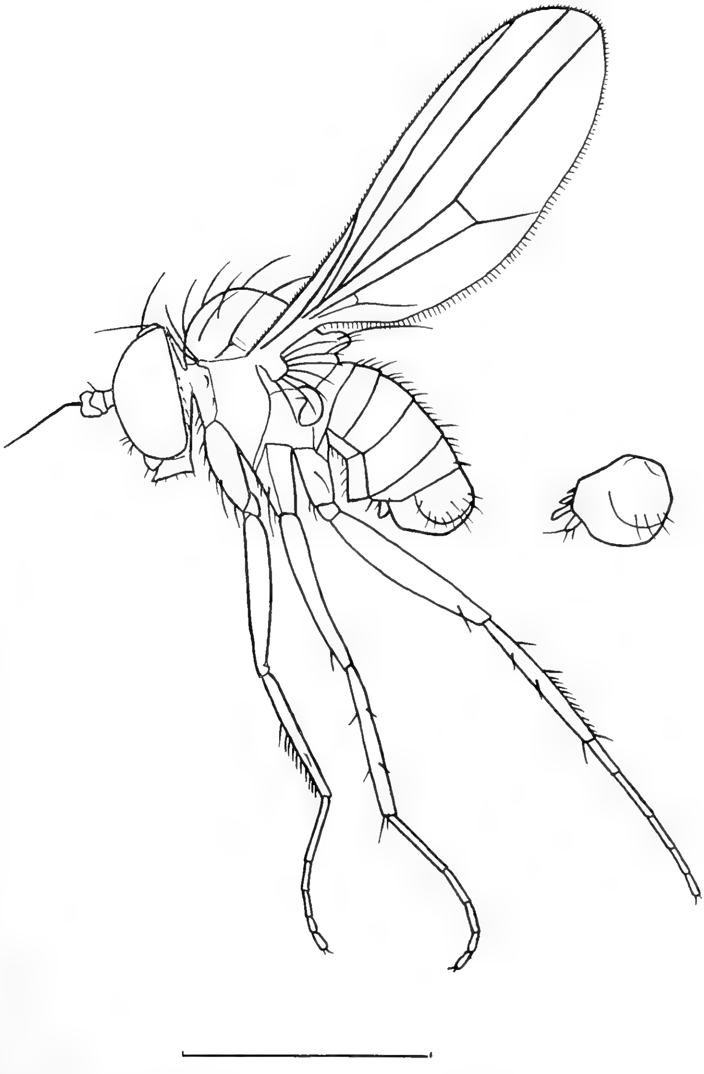


Fig. 1, *Discopygiella setosa* sp. n., male, with a hypopygium shown separately. Line represents 1 mm.

Thorax black with greenish tinges, with thin brown or gray pollen, thicker grayer pollen on the pleura.

Legs including coxae pale, distal joint of the tarsi appearing darker; foretibia with a crest of eight or nine anterodorsals, the second to fourth often very small; middle tibia with a large antero- and posterodorsal paired near the basal fourth, a large anterodorsal just beyond the middle, with four apicals; hind tibia with a small posterodorsal and a slightly larger anterodorsal paired near the basal fifth, a large posterodorsal near the second fifth, posterodorsal crest rather distinct, four apicals. Lengths of the joints of the foretarsus from the base as 11-5-4-3-4; middle tarsus as 13-7-6-4-4; hind tarsus as 7-11-7-5-4.

Abdomen dark brown or black, usually slightly flaring on the lower hind margin; hypopygial capsule brown with grayish pollen.

Holotype male, from moist cement in spillway of small sluice gate, in the Botanical Garden, Gutierrez Tuxtla, Chiapas, May 23, 1963; three male paratypes, on moist rock by shaded stream, near road above Arriaga, Chiapas, May 22, 1963. Holotype in the U.S. National Museum (No. 67152), one paratype at the Instituto de Biologia, Ciudad Universitaria, Mexico, D.F., others in the author's collection.

Discopygiella xerophila sp. n.

Male.—Length 1.6 mm; wing 1.7 mm by 0.6 mm.

Face about a fourth as wide below as above, without setae, ground color obscured by grayish-brown pollen; pollen on the front dense, brown. Palpus black with a black apical seta; proboscis brownish-yellow. Antenna mostly deep reddish-yellow, third segment rounded apically, arista subapical.

Thorax black with dense brown pollen, grayish pollen on the pleura.

Legs including coxae pale, distal joint of the tarsi appearing darker; foretibia with a crest of nine anterodorsals, the second to fourth very small; middle tibia with a large antero- and posterodorsal paired near the basal fourth, a large anterodorsal and a very small posterodorsal paired just beyond the middle, with four apicals; hind tibia with a small posterodorsal and a slightly larger anterodorsal paired near the basal fifth, a large posterodorsal near the second fifth, posterodorsal crest rather weak, a very small indistinct ventral near the middle, four apicals. Lengths of the joints of the foretarsus from the base as 11-6-4-3-3; middle tarsus as 13-7-5-4-4; hind tarsus as 7-11-7-5-5.

Abdomen dark brown or black, usually not flaring on the lower hind margin; hypopygial capsule brown with grayish pollen.

Female very similar to the male with the face near half as wide below as above, having a pair of large setae on or just above the suture and one or two small setae on the clypeus.

Holotype male and one male paratype, from cement at edge of stagnant pool, in shaded ravine behind large culvert, near km 660 on rt. 190, Oaxaca, Aug. 9, 1962; allotype female and one male paratype, from moist cement in spillway of small sluice gate, in the Botanical Garden, Gutierrez Tuxtla, Chiapas, May 23, 1963. Holotype and allotype in the U.S. National Museum (No. 67153), one paratype at the Instituto de Biologia, Ciudad Universitaria, Mexico, D.F., other paratype in the author's collection.

The two collection sites for *Discopygiella xerophila* are in the relatively dry valleys of central Oaxaca and Chiapas. This is in particularly sharp contrast to *D. setosa* which is apparently restricted to the moist slopes facing the eastern Gulf coast.

Discopygiella discolor sp. n.

Male.—Length 1.7 mm; wing 1.7 mm by 0.6 mm.

Face very narrow below, less than a fourth as wide as above, without setae, ground color obscured by grayish-brown pollen; front with thin brown pollen. Palpus brown with a dark apical seta; proboscis yellow. Antenna usually yellowish but sometimes brown, third segment with a short point, arista subapical.

Mesoscutum usually pale brown with thin brown pollen, usually sides of mesoscutum and most of pleura yellowish.

Legs including coxae pale, distal joint of the tarsi appearing darker; foretibia with a crest of seven or eight anterodorsals, second and sometimes third very small; middle tibia with a large antero- and posterodorsal paired near the basal fourth, a large anterodorsal and sometimes a very small posterodorsal just beyond the middle, with four apicals; hind tibia with a rather large anterodorsal and a small posterodorsal near the basal fifth, a large posterodorsal and a large ventral near the second fifth, posterodorsal crest weak and sometimes indistinct, four apicals. Lengths of the joints of the foretarsus from the base as 10-6-5-3-4; middle tarsus as 13-7-6-5-4; hind tarsus as 7-9-7-5-5.

Abdomen dark brown or black with the basal sterna usually paler, usually flaring on the lower hind margin; hypopygial capsule brown with grayish pollen.

Female very similar to the male, but the lower part of the face nearly half as wide as above, bearing a pair of setae near the suture, one or two smaller setae on the clypeus; the third segment of the antenna blunt.

Holotype male, allotype female, four male and seven female paratypes, from rock face moist from seepage, above roadside spring, just north of Chapulhuacan, Hidalgo, Aug. 13, 1962; one female, same site, Aug. 5, 1962; one male and one female, from wet rocks by small roadside waterfall, above Valle Nacional, Oaxaca, Dec. 20, 1962; eleven males and one female, from wet rocks by various small roadside waterfalls, above Valle Nacional, Oaxaca, May 13–16, 1963; one male and one female, on moist rock by shaded stream, near road above Arriaga, Chiapas, May 21, 1963; one male, on moist rock by stream, in shaded ravine, near Tierra Colorado, Guerrero, May 29, 1963. Holotype and allotype in the U.S. National Museum (No. 67154), two male and two female paratypes at the Instituto de Biologia, Ciudad Universitaria, Mexico, D.F., others in the author's collection.

The species shows the widest distribution of the four, occurring on both the eastern and Pacific slopes. The specimens from near Tierra Colorada and Arriaga on the Pacific slope have the thorax wholly dark and the posterodorsal crest of the hind tibia very indistinct, but show all essential characters of the species.

TECHNIQUES OF USE IN THE INSECT COLLECTION

Roy D. Shenefelt, *Dept. of Entomology, College of Agriculture, University of Wisconsin, Madison 6, Wisconsin*

Some simple techniques are proving their value in the insect collection.

A. Styrofoam Vial Holders

Styrofoam boards 2″ × 12″ × 36″ are sawed to the required size and drilled most of the way through at regular intervals. The holes are small enough so that the fit of the vials is fairly tight. The larger blocks shown in the photograph are used for general larval material and the smaller, used for different stages of a given species, are placed in USNM drawers immediately after the unit tray holding adults of the species.

The styrofoam holders have several advantages. They are lighter and cheaper than wood. Vials have their individual places, can easily be kept in order, and do not knock each other over. The ends of the blocks are readily labeled by writing the contents on a piece of stiff paper and pushing a couple of pins through it into the styrofoam.

One of the well-known disadvantages of styrofoam is its disintegration under the influence of paradichlorobenzene. It does not break down at all when placed directly on naphthalene in a closed container, nor is it affected by chlorocresol (4-chloro-3 methylphenol). Consequently, substitution of naphthalene flakes for paradichlorobenzene eliminates the problem.

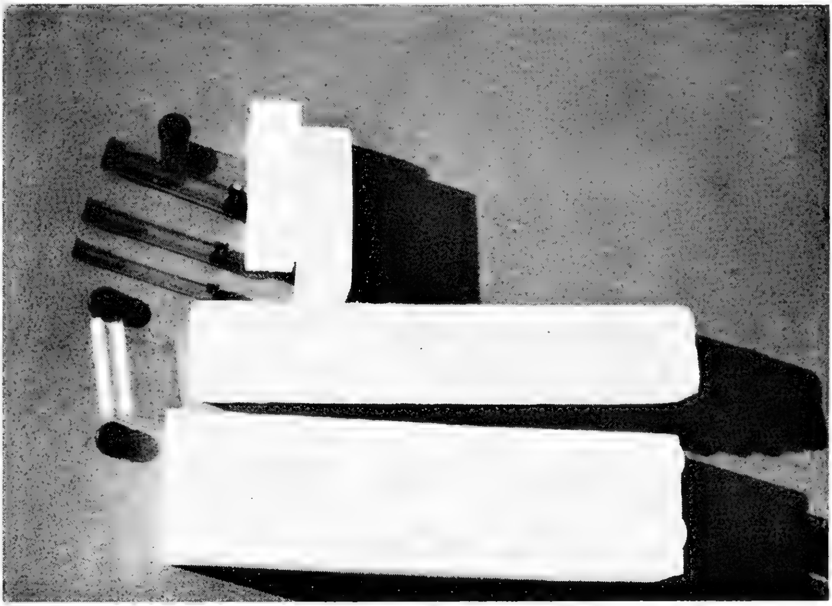
B. Vials

The best one-dram vial which we have thus far discovered for keeping small insects in liquid is the 15 × 45-mm White Top Vial manufactured by the Demuth Glass Works, Parkersburg, W. Va. The beads surrounding the neck of the polyethylene cap seem to aid in keeping the caps from blowing when temperatures rise, and the vial itself is a shell vial without a shoulder so items are easily removed.

Most larger-sized vials have a polyethylene cap with a solid bottom. Much less popping and better retention of liquids occur if the bottom of such a cap is cut off entirely. Merely puncturing the bottom appears to have little influence in reducing the problem.

C. Scale Insects and Small Damage Samples

For the handling of small samples of insect damage, scale insects *in situ* and comparable materials, the butyrate plastic tubes used by foresters for storing increment cores and other small things have numerous advantages. They may be cut with scissors to the length desired and sealed at both ends by inserting plastic plugs. A little cotton



is placed in one end and the plug inserted. The specimen is introduced from the other end and a wisp of cotton used to hold it in place. A label is placed between the cotton and the wall of the tube and the specimen dried. After drying is completed (which may be speeded considerably by means of vacuum, heat, or desiccator), the plug is placed in the other end. The tubes are then stored in the proper places in USNM trays. The butyrate tubes show no signs of being affected by either paradichlorobenzene or naphthalene, though kept resting on each for a year in a closed container, but are quickly broken down by chlorocresol.

Such tubes are much lighter than glass tubes, are much easier to prepare, and are not subject to breakage. They retain their transparency and are available in several diameters, those shown being 3/8, 9/16, and 3/4 inch.

D. Rearing Containers

Some of the Heinz baby food jars have a screw-on cap consisting of a ring and a separate lid. After the contents have been consumed and the jars washed, the lid may be pushed out from the ring, a piece of saran screen fitted in, and a very nice rearing jar results. This technique was learned from a couple of entomologists who have small children—and an ample supply can be obtained gratis from friends and graduate students.

THE CORRECT NAMES OF TWO PHLAEOTHRIPIDS ASSOCIATED WITH PINE

(THYSANOPTERA)

KELLIE O'NEILL, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

The following synonymies are presented for the benefit of those concerned with the biology and control of *Gnophothrips fuscus* (Morgan) on *Pinus* spp.

Gnophothrips fuscus (Morgan), n. comb.

Trichothrips fuscus Morgan, 1913, Proc. U.S. Nat. Mus. 46 (2008): 30–31, figs. 55–57. (Holotype from Florida, in USNM, No. 15734.)

Liothrips fuscus (Morgan), Hood, 1918, Queensland Mus. Mem. 6: 132; Stannard, 1957, Ill. Biol. Monog. 25: 61.

Gnophothrips piniphilus J. C. Crawford, 1938, Proc. Wash. Ent. Soc. 40(2): 39. (Holotype from New York, in USNM, No. 52231.) **New synonymy.**

C. Jacot-Guillarmod (in correspondence, 1963) called my attention to this synonymy, which he and I have confirmed by examination of the types. Crawford (1938) described the species under the name *piniphilus* from specimens damaging pine seedlings in New York and Rhode Island. MacNay (1957 : 138) reported damage by *piniphilus* to pine in eastern Canada, and I have identified specimens from damaged pine in Florida and Virginia. I have also received a long series collected "from wood of house," in Massachusetts in June, an occurrence I cannot explain, since the species undoubtedly feeds on living trees.

Studies on the biology of *Gnophothrips fuscus* have been complicated by the presence of a similar species, *Leptothrips pini* (Watson), which, although peculiar to pine, is certainly predatory, as its congeners are. *Gnophothrips* can readily be distinguished from *Leptothrips* species by its stouter body and somewhat shorter legs; it lacks the maxillary bridge and prepectus, which are present in *Leptothrips*; and its wings are often reduced, and when fully developed are parallel sided and lack accessory fringe cilia, whereas the wings of *Leptothrips* species are always fully developed and soleshaped, and those of *L. pini* have 4 or 5 accessory fringe cilia.

Leptothrips pini (Watson), n. comb.

Cryptothrips pini Watson, 1915, Ent. News 26(2): 49, pl. 2, figs. 1–4. (Type series from Florida, in the Watson and USNM collections.)

Haplothrips pini (Watson), Watson, 1923, Fla. Agr. Exp. Sta. Bull. 168: 61; Stannard, 1957, Ill. Biol. Monog. 25: 52.

Leptothrips mali (Fitch), Hood, 1927, Ent. News 38(4): 112. Misidentification.

Although Hood (1927) synonymized *Cryptothrips pini* Watson with *Leptothrips mali* (Fitch), he remarked that Florida specimens were not typical *mali* and might have to be recognized by another name. Most specimens of *Leptothrips* I have seen that were taken on *Pinus* spp. in eastern U.S., including those of Watson's type series in the National Collection, are *pini.*

Leptothrips pini differs from all other species of its genus except *L. singularis* Hood (1941: 149) in having 2 instead of 4 sense cones on antennal segment IV. It differs from *singularis,* also a pinicolous species, in color. *L. singularis* has a pale prothorax and orange internal pigment instead of the uniformly dark body and purple internal pigment typical in the genus. *Leptothrips pini* is represented in the National Collection by specimens from Florida, Georgia, South Carolina, Maryland, New Jersey, and New York; and I have seen a specimen from Michigan that is probably an example of this species.

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ECOLOGICAL NOTES ON TABANIDAE, RHAGIONIDAE, AND XYLOPHAGIDAE IN EUROPE

(Diptera)

Tabanidae

A mature larva of *Hybomitra schineri* Lyneborg (det. L. L. Pechuman) was found among emergent vegetation in a shallow, exposed marsh at Vdelaria, 23 km south of the city of Corfu, Corfu, on April 29, 1963. The larva killed and ate 37 second- and third-instar larvae of *Tetanocera ferruginea* Fall. (Diptera: Sciomyzidae) during the following 21 days. It did not feed during the next 12 days. The larva molted and pupated on June 1, and a male fly emerged on June 13.

A pupa of *Hybomitra nigricornis* (Zett.) (det. L. L. Pechuman) was found among dry leaf-litter in a dense hazel grove at Tvärminne, southern Finland, on July 13, 1963. A male fly emerged on July 18.

A larva of *Hybomitra distinguenda* (Ver.) (det. L. Lyneborg) was found among damp leaf-litter at the edge of a vernal swamp, Funkedam, at Hillerød, N. Sjaelland, Denmark, on May 29, 1964. The larva did not feed, and it pupated on May 30. A female fly emerged on June 15.

Rhagionidae

A pupa of *Rhagio annulatus* (Deg.) (det. L. Lyneborg) was found among damp leaf-litter between the edge of a beech forest and the shore of Tystrup Lake, S. Sjaelland, Denmark, on May 5, 1964. A male fly emerged on May 13.

A pupa of *Rhagio lineola* Fabr. (det. L. Lyneborg) was found among dead grasses in a dry, shady, fern-birch wood, Gribskov, north of Hillerød, N. Sjaelland, Denmark, on June 27, 1964. A female fly emerged on July 5.

Xylophagidae

A larva of *Xylophagus ater* Meig. (det. L. L. Pechuman) was found under loose bark of a birch log lying at the moist base of a southwest-facing cliff, Könkäänpahta, near Utsjoki, northernmost Finnish Lapland, on June 25, 1963. The fat bodies of the larva were well developed when it was collected. The larva was placed in a tube of damp, clean sand only and kept at room temperature for the following seven months. It did not feed or molt during this time. On February 10, 1964 the larva molted and pupated. A female fly emerged on February 16.—L. V. KNUTSON, *Department of Entomology and Limnology, Cornell University, Ithaca, N.Y.*

SYNONYMY OF THE GENERA ANTILLONERIUS AND IMRENERIUS

(DIPTERA: NERIIDAE)

Examination of several specimens of a Neriid recently received for determination from Puerto Rico and the comparison of material in the United States National Museum collection leave very little doubt that *Imrenerius cinereus* (Röder, 1885) and *Antillonerius solitarius* (Johnson, 1919) are synonymous and that one of the genera is therefore unnecessary. *Antillonerius* was erected in 1937 by Hennig (Stettin. Ent. Ztg. 98: 256) for *Nerius solitarius* Jns., type by original designation, with the remark "vielleicht = *cinereus* Röder." *Imrenerius* was erected in 1961 by Aczél (Studia Ent. 4: 276, 284), with the sole species and type by original designation *Nerius cinereus* Röder. The USNM material, including two from Orange Valley, Antigua, and several from Rio Grande and Mayagüez, Puerto Rico, exhibit the variability in the development of small stout bristles notorious in this family. A few of the specimens have a very small and fine anterior notopleural bristle (supposedly strong in *Imrenerius* and absent in *Antillonerius*) and one specimen has a well-developed anterior *ntpl* on one side and a barely distinguishable one on the other. A small male from Mayagüez has the short first antennal segment as in females. The species should be known as *Antillonerius cinereus* (Röder), the combination made by Hennig (*loc. cit.*: 257).—GEORGE C. STEYSKAL, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

HOSTS OF THE TACHINID TRIBE EUTHERINI

(DIPTERA)

The peculiarly distinctive tachinid tribe Eutherini appears to be an ancient group, with 9 widely-scattered known species (3 Nearctic, 1 Palaearctic, 1 Neotropical, 2 Ethiopian, 2 Australian) plus 2 undescribed species from the Oriental Region, all of which can be referred to a single genus, *Euthera.* Its taxonomic position has been somewhat uncertain, though commonly associated with the Phasiinae, a group characteristically parasitic on Hemiptera. Until quite recently the host relationships were completely unknown, but accumulation of recent records indicates that the species of *Euthera* are indeed true parasites of Hemiptera and supports the taxonomic assignment of the genus and tribe to the Phasiinae.

I can record the following from personal identifications, all from adult bugs of the family Pentatomidae:

Euthera mannii Mik: Host, *Halys dentatus* (Fabricius), New Delhi, India (Miss Swaraj Ghai).

Euthera tentatrix Loew: Hosts:

Euschistus ictericus (Linnaeus), Belle Glade, Fla., Aug. 27, 1953 (W. H. Thames).

Euschistus servus (Say), Scioto Co., Ohio, June 27, 1956 (Roy W. Rings); Worthington Springs, Fla., July 27, 1947 (P. W. Calhoun).

Euschistus tristigmus (Say), Wayne and Morrow counties, Ohio, June–July 1959 (G. M. Kelly).

Euschistus tristigmus var. *luridus* Dallas, Wooster, Ohio, July 1958 (G. M. Kelly). Ten per cent parasitism recorded.

Euschistus variolarius (Palisot de Beauvois), Wooster, Ohio, June 27 and 30, 1955 (Roy W. Rings); Wayne and Franklin counties, Ohio (G. M. Kelly).

Oebalus pugnax (Fabricius), Belle Glade, Fla., Aug. 31, 1953 (W. H. Thames); Baton Rouge, La., Oct. 13, 1962 (Travis Everett).

Three of the records have been published: that of *tentatrix* from *Euschistus servus* in Florida by Patton, 1958, Florida Ent. 41: 37, and from *E. variolarius* in Ohio by Rings and Brooks, 1958, Ohio Agr. Expt. Sta., Res. Cir. 50: 15, and that of *mannii* from *Halys dentatus* by Narayanan and Chai, 1960, Indian Jour. Ent. 22: 64–65.

Bezzi (1925, Proc. Linn. Soc. N.S. Wales 50: 277), writing of the most commonly recorded species, *Euthera tentatrix* Loew of the United States, commented that it was apparently not found before August. However, many of the recent records, both of reared and collected specimens, are in June and July.—CURTIS W. SABROSKY, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

BOOK REVIEW

Monographie der Scarabaeidae und Aphodiidae der palaearktischen und orientalischen Region (Coleoptera: Lamellicornia). Vols. 1 and 2. By Vladimir Balthasar. Verlag der Tschechoslowakischen Akademie der Wissenschaften, Prague. Vol. 1, pp. 1–391, 137 figs., 24 plates; Vol. 2, pp. 1–627, 226 figs., 16 plates. 1963.

The first two volumes of Dr. Balthasar's long awaited work are beautifully printed on fine quality paper, and well illustrated with line drawings, maps and photographs. They are magnificent books. A third volume on the Aphodiidae is in press.

These first two volumes cover that part of the Scarabaeoidea, usually designated as the Scarabaeinae or Coprinae. His introduction includes general remarks on the Scarabaeoidea, a list of all families and tribes in the greater group usually called Lamellicorina, which he breaks into two superfamilies—Lucanoidea and Scarabaeoidea, together with discussions of morphology, internal anatomy, larval morphology, biology, ecology, parasites, phylogeny (including fossils), and world geographical distribution. The introductory discussion, covering 104 pages, is followed by 23 pages of bibliographic references covering the literature of the Scarabaeoidea of the Palearctic and Oriental regions.

In his listing of the higher categories of the Lamellicornia, Dr. Balthasar departs from accepted classification in several places, without justification in my opinion. He has gone even beyond other recent authors in elevating previously accepted subfamilies to family rank. In earlier days, a scarab beetle was quickly and easily recognized by everyone, even the rankest amateur. Now the older Scarabaeidae, of equal rank with Lucanidae and Passalidae, is subdivided in this list into 16 separate families. Nearly all groups are elevated at least one rank above that accepted by most other specialists. One perhaps extreme example may be cited in the case of Aegialia. In place of elevation to family rank, also proposed by others previously, recent work by Jerath, Ritcher and Landin all indicate reduction to subtribal status under Aphodiinae would be nearer the true status.

The systematic part, covering the remainder of volume 1 and all of volume 2, presents keys to families, subfamilies, tribes, genera and species. Under each genus full bibliographic references are listed, the type of the genus is given, as well as notes on distribution and ecology. Each species is similarly treated after the key to the species of the genus, bibliography and synonymy are cited, the location of the type is given if known, the species is described, its distribution is listed and ecological and other notes presented.

While American coleopterists will not always agree with his views on classification or the maps showing distribution of various groups in the Western Hemisphere, Dr. Balthasar's two volumes, covering such a vast area so completely, are a most useful and extremely important reference for all coleopterists.

The many fine drawings and photographs add immeasurably to the text.—O. L. CARTWRIGHT, *Curator Division of Coleoptera, Department of Entomology, U.S. National Museum, Smithsonian Institution.*

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Vol. 67 JUNE 1965 No. 2

PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY of WASHINGTON

U.S. NATIONAL MUSEUM
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THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

Organized March 12, 1884

OFFICERS FOR 1965

MEETINGS.—Regular meetings of the Society are held in Room 43 of the U.S. National Museum 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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All manuscripts intended for publication should be addressed to the Editor. Acceptable papers submitted by members only will be published in the order received. Immediate publication may be obtained at a cost to the author of about $15.00 per printed page. Titles of papers should be concise but comprehensive and should indicate the systematic position of the subject insect. Bylines should indicate present mailing address of the author and his organizational affiliation, if possible. 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 in which author, year, title, name of publication, volume, and page are given in that order. In shorter articles, references to literature should be included in parentheses in the text.

Proportions of full-page illustrations should closely approximate $4\frac{5}{16} \times 6''$ (26×36 picas); this usually allows explanatory matter to appear on the same page.

Proofs and forms for the abstract and reprint order will be sent to authors.

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PROCEEDINGS OF THE

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STUDIES OF NEOTROPICAL LEAFHOPPERS I
(HOMOPTERA: CICADELLIDAE)

JAMES P. KRAMER, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D.C.*

This is the first in a projected series of papers which will supplement and update some of the recent works on leafhoppers of the American tropics. New taxa proposed will be related to keys in the most recent revisional studies or new keys will be proposed for them. New synonyms and new records of special interest will be included.

Included in this paper are a synopsis of *Orsalebra* Young, with one new species; two new genera and species of Nirvaninae; one new genus and species of Iassinae; and one new synonym in the genus *Agalliopsis* Kirkaldy.

Subfamily TYPHLOCYBINAE
Tribe ALEBRINI

The tribe Alebrini was revised by Young (1957); the genus *Orsalebra* included but one species at that time.

Genus **Orsalebra** Young

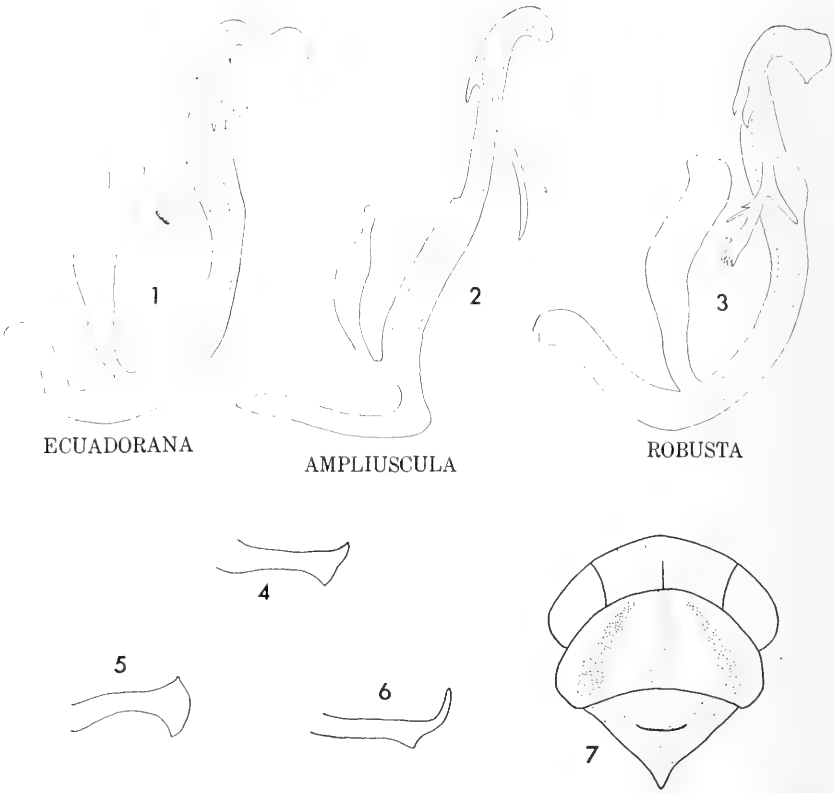
Type-species: *Orsalebra robusta* Young, 1952: 23–24.

Generic diagnosis.—The following combination of characters will separate *Orsalebra* from all other New World typhlocybine cicadellids: forewing with appendix extending around wing apex; hind wing with submarginal vein distinct from apical wing margin, extending beyond posterior branch of vein R, and curved basad along costal margin (Young 1957: fig. 2c). Head with anterior margin broadly rounded; anterior and posterior margins parallel; ocelli on broadly rounded margin between crown and face, closer to median line of head than to eyes. Aedeagus elongate, slender, and slightly asymmetrical in dorsal or ventral view, and with paired, variably-modified, preapical processes. Style elongate, narrow, and variably modified at extreme apex.

KEY TO SPECIES OF **Orsalebra**

1. Pronotum with distinct orange markings; forewings pale yellow with longitudinal orange stripes; preapical aedeagal processes at least in part toothed and either forked or not 2

   Pronotum without distinct orange markings; forewings yellow with a greenish cast, without stripes of any sort; preapical aedeagal processes smooth and forked (fig. 2) .... **ampliuscula** Ruppel



Figs. 1–7. *Orsalebra ecuadorana* n. sp. Fig. 1, aedeagus laterally; fig. 4, apex of style laterally; fig. 7, head and thorax dorsally showing color pattern. *Orsalebra ampliuscula* Ruppel. Fig. 2, aedeagus laterally; fig. 5, apex of style laterally. *Orsalebra robusta* Young. Fig. 3, aedeagus laterally; fig. 6, apex of style laterally.

2. Orange markings of dorsum either uniformly bright red orange or of two different shades; preapical aedeagal processes forked and irregularly toothed dorsally and distally (fig. 3); apex of style narrow and slender (fig. 6) .... **robusta** Young

   Orange markings of dorsum paler and all of the same shade; preapical aedeagal processes not forked but with a large tooth dorsally near base, a few irregular teeth ventrally near base, and minute peg-like teeth at apex (fig. 1); apex of style not narrow and slender (fig. 4) .... **ecuadorana** n. sp.

Orsalebra ampliuscula Ruppel
(Figures 2 and 5)

Orsalebra ampliuscula Ruppel, 1959: 369.

In addition to the color characters mentioned in the key, this species has a pair of vague pale orange markings on the crown, irregular yellow-green markings in the area of the posterior pronotal angles, and each forewing with a small dark spot at middle of corium, at claval apex, at apex of brachial cell, and at base of central apical cell. The greenish cast of the forewings, which is especially prominent in the clavi, produces a coloration much like that found in most species of the genus *Empoasca* Walsh. The male genitalia (figs. 2, 5) are distinctive. *O. ampliuscula* is known only from the holotype male, allotype female, and paratypes collected at Pasto, Nariño, Colombia.

Orsalebra robusta Young

(Figures 3 and 6)

Orsalebra robusta Young, 1952: 24–25 and 1957: 142–143.

This species is very close to *ecuadorana* in external appearance. The color characters used in the key may or may not prove useful with a long series of specimens. The male genitalia (figs. 3, 6) are distinctive. There is, however, a problem of orientation here; the preapical aedeagal processes extend at right angles to the shaft so that they must be flattened somewhat for illustration; the ventral fork as drawn (fig. 3) does not show one or two small teeth which are present on the upper margin. *O. robusta*, is known only from the holotype male and allotype female from Hacienda Talahua, Bolívar, Ecuador.

Orsalebra ecuadorana, new species

(Figures 1, 4, and 7)

Length of male and female 4.5 mm.

Coloration.—Entire venter including legs and most of face stramineous with tarsal claws darkened, area of face between antennal bases with a pair of vague pale orange spots; ground color of dorsum pale yellow to stramineous; crown (fig. 7) with a pair of moderately large, oval, orange spots at anterior margin; pronotum with three orange stripes, one longitudinal central and two oblique lateral; scutellum with all three angles broadly orange; forewing marked with two distinct longitudinal orange stripes, first central on clavus following curvature of posterior wing margin, second straight on corium near claval suture, costal margin sometimes with a very vague third longitudinal orange stripe, apex of clavus with a distinct dark brown spot, apical cells variably brown hyaline.

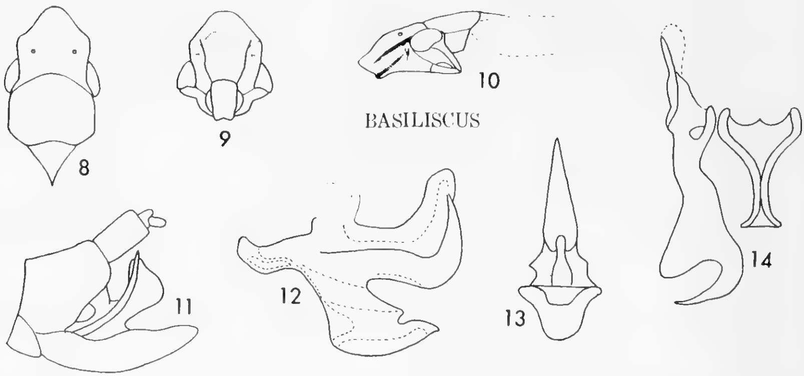
Male genitalia.—Aedeagus rather S-shaped in lateral view; with a single, large, preapical dorsal tooth; and a pair of long preapical, ventral, basally-directed processes; both processes with minute peg-like teeth at apex and a large tooth dorsally and smaller teeth ventrally near base (fig. 1). Style typical of genus with extreme apex as illustrated (fig. 4).

Female genitalia.—Posterior margin of pregenital sternum approximately transverse, slightly notched at center, and rounded on lateral margins.

Types.—Holotype male (USNM 67825), allotype female, and paratype male Quito, Ecuador, September 1962, J. C. M. Carvalho.

Subfamily Nirvaninae

The Neotropical Nirvaninae were revised by Kramer (1964b). Both



Figs. 8–14. *Tungurahuala basiliscus* n. g. and n. sp. Fig. 8, head and thorax dorsally; fig. 9, face in full view (Note: Line between eye and lorum on each side is a bend not a suture.); fig. 10, head and thorax laterally (Note: Line from venter of eye to clypellus is a bend not a suture.); fig. 11, male genital capsule laterally showing ventral process of pygofer and part of aedeagus (All setae have been omitted.); fig. 12, aedeagus laterally; fig. 13, aedeagus posteriorly; fig. 14, connective and style dorsally.

of the new genera and new species described below are vastly different from any previously described. For a subfamily description see Kramer (1964b: 113).

Tungurahuala, new genus

Type-species: *Tungurahuala basiliscus*, new species.

Form flattened elongate, moderately broad, and parallel-sided; crown strongly produced beyond eyes, median length and narrowest width between eyes subequal; in dorsal view crown subpentagonal in outline, without carina of any sort, ocelli anterior to eyes on disc, head wider than pronotum, median length of pronotum about equal to that of crown; in lateral view crown declivous anteriorly with depression before apex, carinate coronal margin obscure toward apex, second carina on face from antennal base to elevated area on clypeus; in facial view clypellus large and notched distally, lora relatively small and not attaining clypeus dorsally; pronotum laterally carinate; forewing with four apical and three preapical cells, cross vein between outer apical and outer preapical cell absent, all veins rather weakly delineated. Male genitalia: pygofer small and shorter than plates; in lateral view pygofer broadly setose distally in area of lower disc to posterior margin, in ventral view valve narrow and plates elongate with setae on outer edges; connective approximately Y-shaped; style in dorsal view long, broadest distally with apical hook; aedeagus complex with basal extension for union with connective.

Tungurahuala basiliscus, new species

(Figures 8–14)

Length of male 7.5 mm.

Structure.—Face with surface of clypellus finely scaly, a rough carina between distal portions of lateral frontal sutures (fig. 9), area below carina irregularly longitudinally rugose medianly and finely glareose laterally, area above carina finely glareose and scaly; crown with surface vermiculately rugulose and two small scaly areas at posterior margin in line with inner edges of ocelli, lateral margins produced in front of eyes, then concavely extending anteriorly and converging to rounded apex (fig. 8); pronotum with surface mesally transversely rugulose, rest variably vermiculately rugulose or finely scaly; scutellum with surface finely scaly basally and transversely rugulose distally; forewing subcoriaceous, appendix minute, and without extra cross veins.

Coloration.—Entire venter including most of legs and most of face black, all tarsi pale, pro- and mesothoracic tibiae and posterior tibial spines light brown, ground color of antennae, clypellus, lora, and adjacent portion of clypeus pale yellow brown, discal portion of clypellus broadly darkened with brown to black; dorsum of head and thorax shining black, eyes and ocelli reddish; forewings black, but appearing dark brown with transmitted light; face and crown variably touched with pruinose areas.

Male genitalia.—In lateral view pygofer rounded distally on dorsal and ventral margins, with a pair of slender upcurved processes, one on each side, arising from ventral margin (fig. 11), inner edge of each process finely setose on distal third (not shown in drawing), both pygofer and first segment of anal tube entirely sclerotized dorsally; in dorsal view connective widest basally, truncate apically and style with mesal lobe long, sharp and curved laterad, lateral lobe broad and blunt (fig. 14); aedeagus in lateral view broad and upturned apically, and with a distinct dorsally notched ventral portion (fig. 12); aedeagus in posterior view as illustrated (fig. 13) with gonopore at middle.

Female genitalia.—Female unknown.

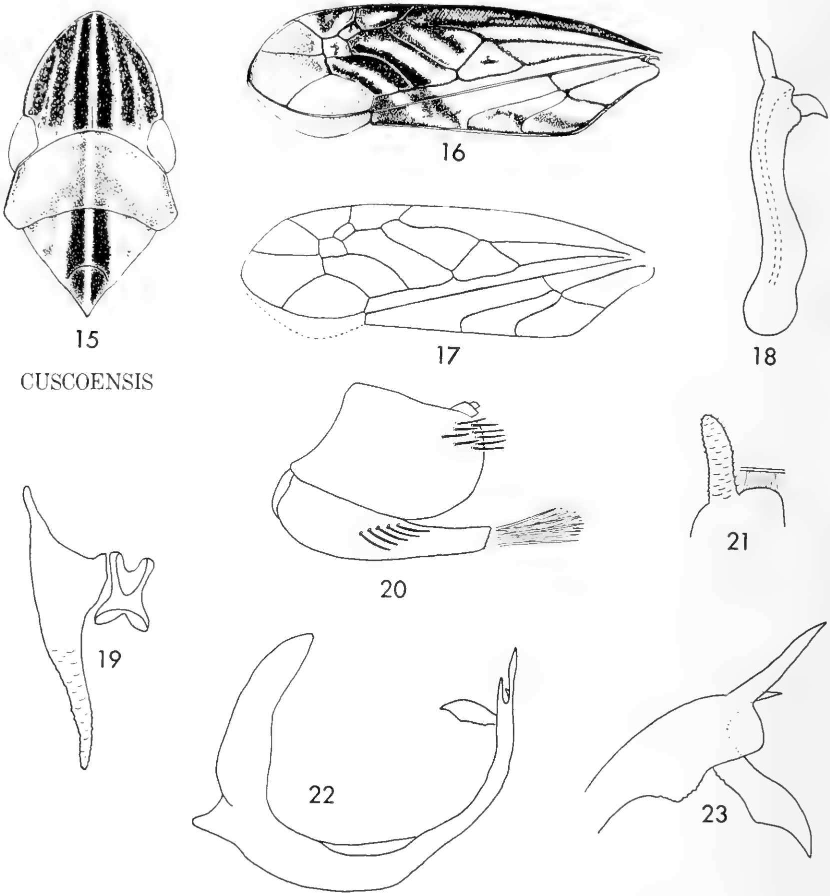
Type.—Holotype male (USNM 67826) Baños, Ecuador, Mt. Tungurahua, 2,500 m., August 20, 1937, W. Clarke-Macintyre.

Notes. Because *Tungurahuala basiliscus* lacks a median longitudinal carina at the clypeal apex, it will trace to couplet 2 in my key to the Neotropical genera and species of Nirvaninae (Kramer 1964b: 113–114). It differs from both members of this couplet by having two closed preapical cells in the forewing. It differs from *all* Neotropical Nirvaninae by any *one* of the following characters: the discally placed ocelli (fig. 8), the transverse carina on the upper portion of the face (fig. 10), and by the lora which do not reach the clypeus on their upper margin (fig. 9).

Perugrampta, new genus

Type-species: *Perugrampta cuscoensis*, new species.

Form elongate, moderately broad; crown strongly produced beyond eyes, median length greater than narrowest width between eyes; in dorsal view crown spade-shaped in outline, without carina of any sort, ocelli just anterior to eyes near lateral margins, head slightly narrower than pronotum, median length of pronotum much less than that of crown; in lateral view crown flat, carinate coronal margin sharp and distinct to apex, area in front of eyes and below carinate coronal margin foliaceous and concave, most of face flat in outline but concave in upper clypeal area, antennal base located just below anterior ventral margin



Figs. 15–23. *Perugrampta cuscoensis* n. g. and n. sp. Fig. 15, head and thorax dorsally showing color pattern; fig. 16, forewing showing color pattern; fig. 17, forewing showing venation; fig. 18, aedeagus ventrally; fig. 19, connective and style dorsally; fig. 20, male genital capsule laterally; fig. 21, apex of plate showing lobe; fig. 22, aedeagus laterally; fig. 23, three-quarters view of aedeagal apex ventrally.

of eye; in facial view clypellus constricted mesally, each lorum broad and as large as clypellus, suture between clypellus and clypeus highly obscure, margins of clypeus slightly overlapping antennal bases, lateral frontal sutures curving laterally above antennal bases to margin of head just in front of eyes, apex of clypeus with a distinct median longitudinal carina, area of face depressed above eyes to apex; pronotum laterally carinate; forewing with preapical cells oblique and some excess cells. Male genitalia: pygofer large, about as long as plates; in lateral view with setae on upper distal portion of pygofer and edge of plates, apices of plates with numerous long setae forming brushes; in ventral view each plate with membranous lobe at apex mesad of brush; connective short and approximately Y-shaped; style in dorsal view broadest mesally and with one apical lobe; aedeagus asymmetrical, slender, and with apical modifications or elaborations.

Perugrampta cuscoensis, new species
(Figures 15–23)

Length of male 7.8 mm.

Structure.—Face, crown, and scutellum with surface finely scaly, pronotum mainly smooth; venation of forewing complex (fig. 17), clavus with five open cells, appendix large, four apical cells and three oblique preapical cells, two small extra cells basad of third and fourth apical cells, a triangular cell basad of outer preapical cell.

Coloration.—Venter of abdomen and thorax dark brown; legs stramineous, pro- and mesothoracic tarsal claws darkened, metathoracic femora and tarsi variably darkened with brown or black, spines on hind femora brown and darker at bases; most of face stramineous, broadly marked with dark brown from inner margins of eyes to apex, margins of head from eyes to apex light brown; ground color of crown, pronotum, and scutellum yellow brown, all palest centrally, and marked with various shades of brown to black as in figure 15, crown with six longitudinal stripes, central pair darkest, each lateral pair lighter and converging apically, pronotum with light and scutellum with dark pair of central longitudinal stripes; forewing with veins brown and cells variably marked with brown (fig. 16), costal marginal area narrowly orange red from base to apical portion of outer preapical cell.

Male genitalia.—In lateral view pygofer broadly rounded distally, valve narrow, plate obliquely truncate apically, apical brush long (fig. 20), setae on plate closer to dorsal margin than shown; pygofer sclerotized dorsally; plates long and parallel-sided in ventral view, extreme apex of each (fig. 21) with wrinkled, slender lobe; in dorsal view connective notched basally and apically, and style with a single, long, slender, and somewhat wrinkled lobe (fig. 19); aedeagus in lateral view U-shaped, broadest basally, with three unequal points and fin-like proximal process at apex (fig. 22); aedeagus in ventral view rounded basally with shaft undulated (fig. 18); aedeagal apex in three-quarters view as shown (fig. 23) with gonopore apical.

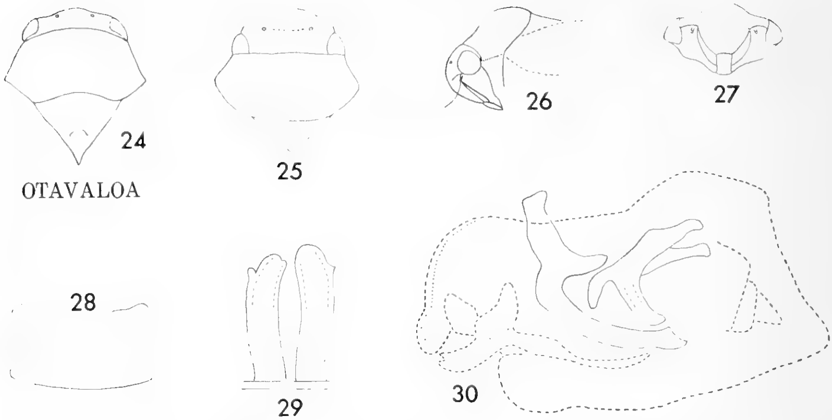
Female genitalia.—Female unknown.

Type.—Holotype male (USNM 67827) Santa Isabel, Dept. Cusco, Peru, December 28, 1951, Felix L. Woytkowski.

Notes. In my key to the genera and species of Neotropical Nirvaninae (Kramer 1964b: 113–114), *Perugrampta cuscoensis* will trace to couplet 4, *Jassosqualus* Kramer. It differs from that genus, as well as from *all* other Neotropical Nirvaninae, by the peculiar venation of the forewings (fig. 17) and by the brush of long setae at the apex of each male plate (fig. 20).

Subfamily Iassinae

The New World genera of Iassinae were discussed and keyed by Kramer (1963). The new genus described below brings the number of genera recognized for the Americas to seven.



Figs. 24–30. *Goblinaja otavaloa* n. g. and n. sp. Fig. 24, head and thorax dorsally; fig. 25, head and thorax fronto-dorsally; fig. 26, head and thorax laterally; fig. 27, face in full view; fig. 28, pregenital sternum of female; fig. 29, stylar apices ventrally; fig. 30, male genital capsule laterally showing all component parts. Note: the broken lines in figs. 25 and 27 represent the postfrontal suture.

Goblinaja, new genus

Type-species: *Goblinaja otavaloa*, new species.

Form convex and moderately stout; in dorsal view crown short, head narrower than pronotum, scutellum large; in lateral view pronotum humped posteriorly and declivous cephalad, head short with crown declivous anteriorly and rounded to face, a distinct ledge present above antennal base, lateral margins of pronotum carinate; in facial view with face short, clypellus quadrate, lora long and narrow, postfrontal suture often distinct; entire forewing subcoriaceous, vitreous, and punctate, punctures essentially asetose, a few extremely minute scattered setae discernible under high magnification in claval area, venation too obscure for generalization, some short and transverse supernumerary veins visible distally on costal margin. Male genitalia: pygofer largely withdrawn into abdomen, valve and plates absent, entirely open ventrally and only sclerotized distally on dorsum, basal portion with thickened sclerotized areas; connective membranous and amorphous; style in lateral view long, broadest mesally, with one apical lobe; aedeagus rather small, shaft simple, dorsal portion forked.

In my key to the genera of New World Iassinae (Kramer 1963: 38), *Goblinaja* will trace to couplet 3; it differs from *Scaroidana* Osborn by the humped pronotum, the obscure forewing venation, and the highly modified male genital capsule. It differs from the rest of the genera, couplet 4 to end, by lacking obvious fine setae on the forewings.

Goblinaja otavaloa, new species
(Figures 24–30)

Length of males 5 mm. and of females 5.5–6 mm.

Structure.—Outer edge of prothoracic tibia distinctly flattened; surface of face, crown, pronotum, and scutellum irregularly rugulose to rugose; clypellus paralleled sided (fig. 27); anterior margin of crown slightly concave on each side of apex (fig. 24) and with distance between ocelli about twice that between ocellus and eye; pronotum at times with poorly defined median longitudinal carina on distal half.

Coloration.—Somewhat variable, ground color yellow or pale yellowish green washed with brighter green especially on legs, pronotum, and edges of forewings, at times with a reddish wash on crown and pronotum.

Male genitalia.—Capsule in lateral view (fig. 30) with proximal ventral margin thickened longitudinally, pronged basal process, and distinct rounded lobe; style massive with apex as illustrated; aedeagal shaft more heavily sclerotized than rest of aedeagus, aedeagus with single simple ventral basal process, gonopore terminal. Apices of styles in ventral view as shown (fig. 29).

Female genitalia.—Posterior margin of pregenital sternum mesally concave (fig. 28) and more or less irregularly rounded laterally.

Types.—Holotype male (USNM 67828), allotype female, and five paratypes, one male and four females, Otavalo, Ecuador, March 14, 1950, S. W. Frost. One paratype female Quito, Ecuador, March 13, 1950, S. W. Frost.

Notes.—The last paragraph of the generic discussion fits *Goblinaja* into the existing key to the genera of New World Iassinae. The greatly swollen or humped pronotum (fig. 26) provides *G. otavaloa* with a superficially membracid-like habitus.

Subfamily Agalliinae

Agalliopsis superba Linnavuori, new status

Agalliopsis ornaticollis superba Linnavuori, 1956: 12.

Agalliopsis dracula Kramer 1964a: 146. **New Synonymy**

Linnavuori described *superba* as a subspecies of *ornaticollis* Oman from two females taken at Baños, Ecuador. I described the species as new from four males collected in Valle de Papas, Colombia. Additional material, associated males and females, has shown that my *dracula* is merely the opposite sex of Linnavuori's *superba*.

The color dimorphism shown by the sexes is more striking than that of any other member of the genus *Agalliopsis*. The facial markings (Kramer 1964a: fig. 4) are essentially alike in both sexes, but in females the black markings are less heavy. The three coronal spots may be distinct and black (Kramer 1964a: fig. 3), or in some females, less distinct and all or just the central spot red brown. The pronotum of males (Kramer 1964a: fig. 3) is most striking because of the pair of pale spots on the anterior black discal area; in females the anterior pronotal border is variably black to red brown, sometimes it is darkest at middle to form a spot, while the rest of the pronotum is usually uniformly stramineous or yellowish; in one female the pronotal markings are identical to the males except the pattern or color surrounding the spots is red brown instead of black. The scutellar markings (Kramer 1964a: fig. 3) are essentially the same in both sexes, but the markings are black in the male and usually red brown in the female; in one female the basal angles and the disc are blackened. The ground color of the forewings of males is darker than in females; and the veins are distinctly dark brown except distally, while in females the veins are almost all pale. While variable in both sexes, the forewing usually has white or yellow spots in the clavus, one basally near the scutellar apex and one marginally-embrowned distally in preapical area, and a third spot of the same hue on the second sector of the corium approximately in line with the midpoint of the claval vein.

The male genitalia (Kramer 1964a: fig. 21) provide many unique features of which the most striking is the two-segmented plate. The posterior margin of the female pregenital sternum is produced mesally as a more or less rounded lobe.

New Records.—One male and three females, Papallacta, Ecuador, Napo-Pastaza Prov., January 29, 1958, R. W. Hodges, 10,500 ft. elevation; one female, Baños, Ecuador, Mt. Tungurahua, August 20, 1937, W. Clarke-Macintyre; one female, Narino Volcan Galeras, Colombia, 2,900 m., January 13, 1959, J. F. G. Clarke.

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TWO NEW SPECIES OF THE GENUS CHEYLETIELLA (ACARINA: CHEYLETIDAE)

ROBERT L. SMILEY, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

In April 1963, Dr. J. H. Whitlock, Department of Parasitology, Cornell University, sent two specimens of the mite genus *Cheyletiella* Canestrini for identification. These mites proved to be undescribed. They were collected by Isidor Yasgur, D.V.M., of Mamaroneck, New York, who stated: "I am sending a slide containing mites and eggs removed from the tail of some Schnauzer pups. Many of the mite eggs can be found when the fecal samples are checked and can be quite disconcerting until the source of the egg is realized. I do not know exactly how pathogenic these mites may be, but they do produce a superficial scurf at the base of the tail, and in the three separate instances in which I have found them, they seem to have some effects on the general welfare of the pups."

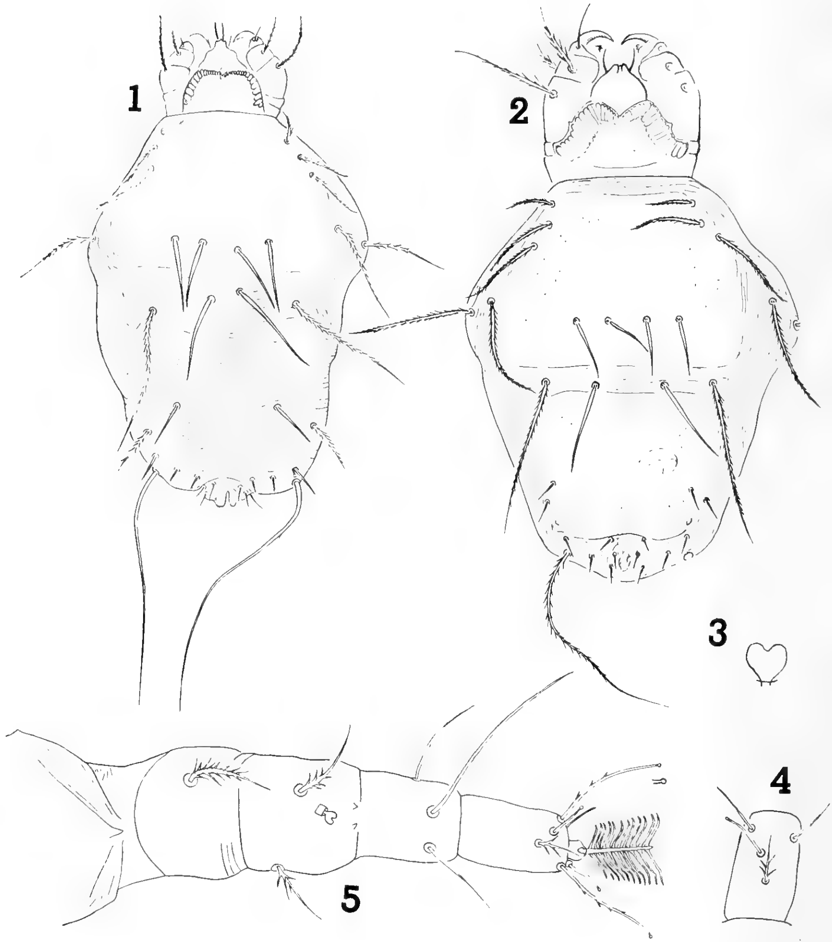
While this paper was being written, Dr. R. K. Strickland, Animal Disease Eradication Division of the U.S. Department of Agriculture brought in the same species which he had collected from a mangy dog at Cornell University in 1962.

During the study of the above specimens, I located another undescribed species of *Cheyletiella* in the U.S. National Museum collection.

Very little is known about the biology of the mites belonging to *Cheyletiella* and the effects they have on their mammalian hosts. Banks (1915) reported that *Cheyletiella parasitivorax* (Mégnin) is predaceous on other mites which are found on rabbit fur. An European worker, Pillers (1925), reported *C. parasitivorax* to be the causative agent for skin lesions and mange in man. Cooper (1946) stated there is no evidence to date which can be held to demonstrate that *C. parasitivorax* attacks its mammalian host, or that it can cause mange in man. However, Olsen and Roth (1947) reported that *C. parasitivorax* has caused eczema in man. Kutzer (1963) reports of a case of mange in a dog caused by *Cheyletiella parasitivorax*. However, this mange could be caused by the species here described.

Volgin (1960) presented a comprehensive report on this genus. Until now, all known species of this genus were described from rabbit hosts.

In the genus *Cheyletiella*, the sense organ of genu I appears to be of specific value and is illustrated here for each of the three species represented in the U.S. National Museum collection. These are *Cheyletiella johnstoni* and *C. yasguri*, the two new species, and *C. parasitivorax* (Mégnin). The palpus is another character which will separate *C. johnstoni*, new species, from *C. takahasii* Sasa and Kano.



Figs. 1–5. *Cheyletiella yasguri*, new species. Fig. 1, dorsum, female; fig. 2, dorsum, male; fig. 3, sensory organ of genu I; fig. 4, venter of tarsus I; fig. 5, leg I, female.

The palpus of *C. johnstoni* differs in each sex, whereas the palpus of *C. takahasii* has been reported to be the same in both sexes.

Cheyletiella yasguri, new species
(Figs. 1–5)

Although the legs of the female are similar to those of *Cheyletiella parasitivorax* (Mégnin), the sensory organ on genu I is different in shape. Also, the setae on the propodosoma and hysterosoma are wider and longer than in *C. parasitivorax*.

Female.—Palpi short and strong; palpal femur with a long, serrate, dorsal seta; genu with a long serrate seta, about three-fourths as long as femoral seta; tibia with a simple seta, about three-fourths as long as genual seta; palpal claw curved downward, with weak teeth. Rostrum short and broad; peritreme with lateral branches composed of large segments, the anterior transverse segments gradually becoming smaller. Propodosomal shield with three pairs of short, serrated, anterior lateral setae, and a posterior row of four large, simple setae; two pairs of long subequal, serrate propodosomal shoulder setae; first pair of anterior propodosomal setae about two-thirds the length of the second pair, second pair about two-thirds the length of the third pair, third pair longest; propodosomal simple setae equal in length, inner pair slightly thicker. Hysterosoma without shield; with an anterior transverse row of four setae, the outer pair serrate, about one-third longer than inner simple setae; a pair of simple serrate setae and a pair of simple setae posterior to the first row of serrate and simple hysterosomal setae, the simple setae slightly anterior to (or above), and one-third shorter than, the serrate ones; second serrate seta about one-fourth the length of first serrate seta; posterior margin of the hysterosoma with a pair of long, simple setae, about one-third as long as body, a pair of short, simple setae slightly above the long, simple seta, two pairs short, simple setae, anterior to the genital opening, and two pairs of simple setae laterad to the anal opening. Legs short; tarsus of each leg without claws but with empodium. Body 587 μ long by 338 μ wide.

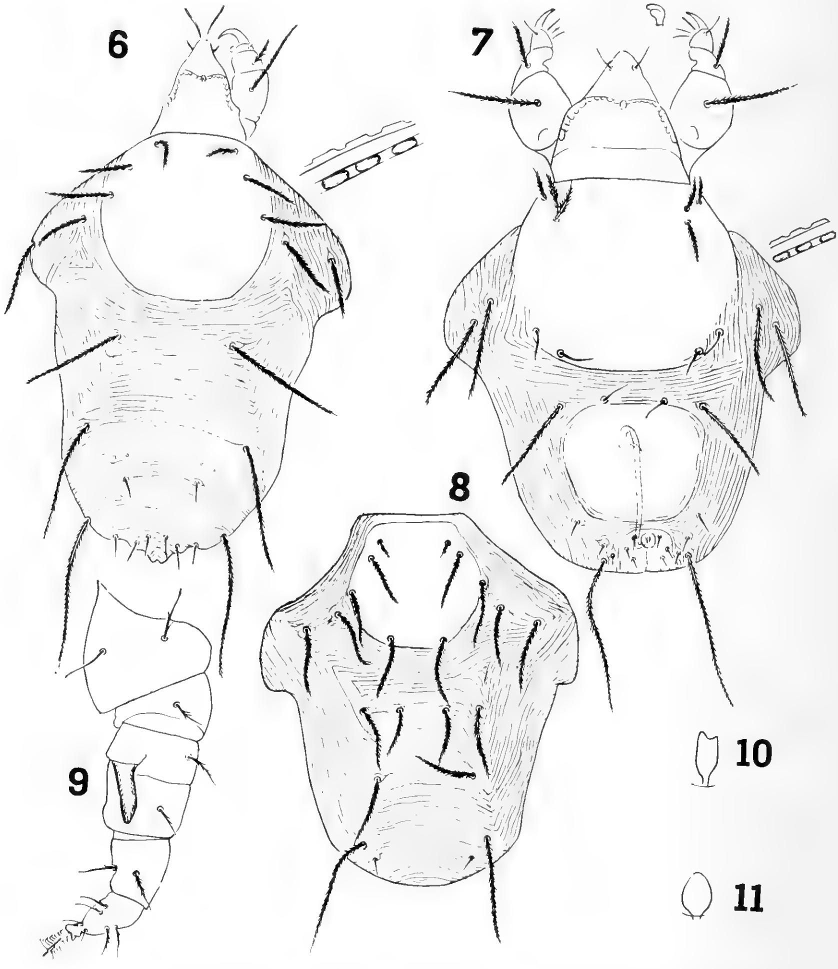
Male.—Similar to female, but with two dorsal shields. Palpi short and strong; femur with a long, serrate dorsal seta; genu with long dorsal serrate seta, about two-thirds as long as femoral seta; tibia with simple seta equal in length to genual seta; palpal claw curved downward, with many weak teeth. Rostrum short and broad; peritreme M-shaped, with lateral branches composed of large segments. Propodosomal shield longer than wide, with three pairs of serrated anterior lateral setae; first pair of propodosomal setae about two-thirds the length of the second pair, second pair about two-thirds the length of third, third pair longest; with a posterior median row of four large simple setae; two propodosomal serrate setae, subequal in length, adjacent to the shield. Hysterosoma with shield about as long as wide; a pair of long strong simple median setae near anterior margin, about one-third longer than the propodosomal simple setae and with two pairs of short simple posterolateral setae. One pair of long, strong serrate setae located adjacent to anterior lateral margins of shield. Posterior margin of hysterosoma with a pair of long serrate setae, about one-third as long as the body; three pairs of subequal simple setae, and two pairs simple subequal anal setae. Legs, short; tarsi without claws but each with rayed empodium. Body 472 μ long by 268 μ wide.

The female holotype, U.S. National Museum No. 2956, and a female paratype were collected from Schnauzer pups, Mamaroneck, New York, April, 1963 by I. J. Yasgur. Males and females were also collected on dog, Cornell University, Ithaca, New York in 1962 by Dr. R. K. Strickland, Animal Disease Eradication Division, United States Department of Agriculture.

This species is named for Isidor Yasgur, D.V.M., Mamaroneck, New York.

Cheyletiella johnstoni, new species
(Figs. 6–10)

This species resembles *Cheyletiella ochotonae* Volgin, but the shape and size



Figs. 6–11. *Cheyletiella johnstoni*, new species. Fig. 6, dorsum, female; fig. 7, dorsum, male; fig. 8, dorsum of nymph; fig. 9, ventral view of leg III, nymph; fig. 10, sensory organ of genu I. *Cheyletiella parasitivorax* (Mégnin). Fig. 11, sensory organ of genu I.

of the dorsal shields of the male will separate the two species. Also, the propodosomal shield of the female of this species is wider than long, being longer than wide in the female of *C. ochotonae*. The propodosomal shield of the male of *C. johnstoni* is longer than wide, whereas that of *C. ochotonae* is wider than long. This species differs from *C. takahasii* Sasa and Kano in that the palpi differ between the sexes, whereas in *C. takahasii* they are similar.

Female.—Palpi short and strong; palpal femur with a long, serrate, dorsal seta; genu with a long serrate seta, about two-thirds as long as the femoral seta; tibia with a simple seta, about one-third as long as genual seta; palpal claw curved downward, with weak teeth. Rostrum short and broad; peritreme with lateral branches composed of large segments, the anterior transverse segments gradually becoming smaller in size. Propodosomal shield with three pairs of short, serrated, anterior lateral setae; first pair of propodosomal setae about two-thirds the length of the second pair, second pair about two-thirds the length of the third pair, third pair longest; two subequal propodosomal serrate setae adjacent to the shield. Hysterosoma without shield; with three pairs of long, serrate setae and two pairs of simple setae; first and second pairs of serrate setae equal in length, third pair on the posterior margin of the body, longer than the first and second pairs; simple setae equal in length, first pair located on the dorsal surface of the body, second pair located on the posterior margin of the body. Legs short; tarsus of each leg without claws but with empodium. Body 478 μ long by 287 μ wide.

Male.—Similar to the female, but with two dorsal shields. Male differs from female in the arrangement and number of setae. The propodosomal shield of the male has three pairs of serrate setae and two pairs of simple setae, whereas the female has only three pairs of serrate setae, and no simple setae. Body 453 μ long by 287 μ wide.

Nymph.—As figured, and without genital opening. The nymph of this species differs from the nymph of *C. ochotonae* by the number and length of the setae on the propodosomal shield.

The holotype female, U.S. National Museum No. 2957, and 4 paratype females, 2 males, and 3 nymphs were collected from *Ochotona princeps*, Santa Fé, New Mexico, August 5, 1955, by H. B. Morlan.

This species is named for Donald Johnston, Institute of Acarology, Ohio Agricultural Experiment Station, Wooster, Ohio, in appreciation of his suggestions and assistance.

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BIONOMICS OF THE SUGARCANE BORER DIATRAEA SACCHARALIS (FAB.) I. A DESCRIPTION OF THE MATING BEHAVIOR. (LEPIDOPTERA: CRAMBIDAE)

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Introduction—Detailed studies of the mating behavior of *Diatraea saccharalis* have not been reported, although it is stated that mating undoubtedly occurs at night (Holloway, 1928). Courtship behavior of *Heliothis zea* (Boddie) is described in considerable detail by Callahan (1958) and of *Tineola bisselliella* (Hum.) by Roth and Willis (1952).

In the course of investigations into sterilization induced by gamma irradiation, it has been possible to observe and study mating behavior in this species.

Materials and Methods—The adults used for observations were obtained from field corn grown at Lajas, Puerto Rico. Larvae and pupae were removed from the corn stalks, placed into petri dishes and small glass jars, separated to sex in the pupal stage, and adults were collected upon emergence. Most observations were made on one-day-old virgin adults.

After emergence male and female virgin adults were placed together in 8-quart, transparent polyethylene bags each containing a small wad of cotton previously soaked in 10 percent sugar or honey solution. The polyethylene bags were inflated with air blown from a fan and then suspended by clothes pins on a wire out-of-doors, where they were visually examined in red light. The females laid eggs on the interior of these bags as well as on wax paper or Kraft parchment paper. After mating, females were either removed to individual bags or kept in the same bag to observe if they would mate a second time with newly emerged virgin adult males.

No attempt was made to control humidity nor temperature during the mating period nor during the adult life span, although these were relatively constant inside the bags.

Wing movement during courtship was observed by means of a variable frequency stroboscopic light.

Results and Discussion—In general this species is nocturnal or crepuscular in activity, being definitely inhibited by white light or light of many wave lengths. Light in the red and orange range did not interfere with activity.

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[1] The author is indebted to Dr. Murray Blum of Louisiana State University and Dr. Fred Legner of the University of California at Riverside for valuable suggestions in setting up these observations, as well as his assistants, Adela Vidal de Alemañy, Miguel Figueroa, and Francis Milord.

TIME OF NIGHT WHEN MATING BEGAN[2]

2000 to 2030	2031 to 2130	2131 to 2230	2231 to 2330
4	9	4	3
2331 to 0030	0031 to 0130	0131 to 0230	0231 to 0330
3	3	1	1

$\Sigma = 28$

DURATION OF MATING TIME

30 to 40 minutes	40 to 50 minutes	60 minutes	90 minutes
3	1	11	3
120 minutes	>120 minutes		
1	1		

$\Sigma = 20$

The female initiates courtship behavior. After sunset she will begin movements up and down the sides of the polyethylene bag, beating her wings. Her activity increases to longer wing beats and movements to all sides of her enclosure. Later she may lay a few clusters of unfertile eggs of 5 to 20 eggs per cluster, with rest periods after each egg laying. A greater burst of activity begins later, varying from 15 minutes to 2 hours after egg laying. The female climbs the bag wall in short, rapid bursts of beating her wings while walking upwards. Occasionally there is some flight associated with this activity, but flight appears to be incidental at this time of courtship behavior. She continues this activity usually from one to two hours. Similar wing beating activity is reported by Callahan (1958) and Willis and Roth (1952).

Finally she climbs to the top third of the bag, remains stationary, and beats her wings at a frequency of 5,000 beats per minute. Initially the frequency is somewhat irregular and of short duration; but later the time increases to 15 seconds, and finally to as long as two minutes with a constant 5,000 beats per minute immediately prior to mating. Wingbeat during flight is variable in frequency and usually below 4,500 beats per minute.

The female ultimately rests quietly on the side of the bag and moves her antennae posteriorly and anteriorly while holding them at an angle of 90 degrees from the head. This wing activity is normally associated with premating activity by the female, and the male also starts, a similar activity of wing beats on the side of the bag. His wing beat frequency initially is variable, and at this point his movements will be much more erratic and rapid than the female. Eventually, however, he will locate himself about three inches directly above the female, beating his wings vigorously. The frequency of the male's wingbeats is never as constant as the female's, but tends to converge at a little higher than 5,000 per minute. The female usually remains stationary,

[2] Observations made under artificial conditions in 8 quart polyethylene plastic bags with reared adults taken from corn grown in Lajas, Puerto Rico.

curving her abdomen only slightly upward; the male may change his position from above the female to below her, but usually he remains an inch away from her at this stage of courtship.

Both male and female then continue to move their antennae vigorously between short bursts of wing beating, the male particularly when he is below the female. Eventually the male moves below the female and usually to one side. He has been observed on the left side about one inch below the female more frequently than on the right side.

In a very rapid movement requiring approximately one and a half seconds, the male mounts the female with his head upward the same as the female, but with the body axes unaligned. The female retains the vertical position, while the male gradually attains an angle of about 30 degrees to the vertical with his head to the right of hers. There may be a contact of antennae at this point. Then the male moves his head further downward. An actual union of the genitalia prior to his downward movement may take place. Finally the male moves into a vertical position with his head pointed downward or slightly at an angle to the right or to the left, and locks his genitalia with that of the female.

During the initial phase of copulation, the male may move both antennae anterior to posterior in unison or independently. The female antennae are usually held stationary extending laterally from the head during the early phase of copulation. Later the female holds her antennae directly over her thorax or lays them on the dorsum of the thorax.

If there is any change of position during copulation, the female moves pulling the male with her. Copulating pairs have been stimulated to flight while copulating. When this occurs the female flies and the male is carried with her.

After seizing the female abdomen ventrally the male moves his claspers vigorously stimulating the female to move her abdomen in a peristaltic-like movement.

The copulating process requires from one-half to two hours for completion. The average length of time for copulation after sexual union has been one hour.

Adult behavior is very distinctive prior to mating due to two behavior patterns. First, distinct frequency of wing beat movement, and second, the carriage of the tip of the abdomen. Prior to mating and when viewed from the side, the female holds her abdomen in a sabre-shape with the tip extending upwards. The wings are sufficiently unfolded or are carried vertically over the abdomen so that the tip of the abdomen is clearly visible. The form of the abdomen of the female when she is ready to mate is somewhat **J**-shaped with the long side of the **J** on the vertical surface and with the long axis of her body. She extrudes a bulb-like structure, apparently from the ovipositor prior to mating.

The male forms his abdomen in the shape of a **J** in early stages of courtship. Often, however, while resting; his abdomen has the shape of the diget **5**, with the bar of the **5** representing the first three segments of the abdomen. The rest of the digit **5** represented by the terminal end of the abdomen when viewed from the lateral aspect. Both sexes carry the tip of the abdomen upward when prepared to mate. While flying prior to mating the male carries the abdomen in a position similar to that of the female when she is at rest.

Upon completion of mating, the female remains stationary, and the male moves downward two to three inches and seeks a quiet place for rest. He will not perform a second time in the same night after copulating; however, he may mate the next night. Males have been observed to mate twice during their adult life span and there is the possibility that they may mate more often. It has not been observed that females mate more than once in a single night. Long and coworkers (Personal communication, 1963) report some females mating more than once.

The fertilized female usually lays fertile eggs within 7 to 8 hours after mating. Typically she mates at 9:00 or 10:00 in the evening, and lays fertile eggs before dawn the next morning.

Information on the behavior during the mating process could give valuable clues for the control of this species. It would be highly desirable to have an attractant for one or both sexes which would serve as a lure to selectively eliminate one or both sexes of this species.

Preliminary investigations of this nature are underway. However, insufficient data are presently available to discuss this work in detail, other than to mention that wingbeat frequency, light, temperature, relative humidity and olfactory responses are all potential factors of importance.

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THE GENUS POECILOTRAPHERA HENDEL
(DIPTERA: PLATYSTOMATIDAE)

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The flies of this genus are of at least potential economic importance, since, as noted below, they have been reared from guava, sugar cane, rice, and maize in southern Asia. Correction of a long-standing misidentification of the type of the genus is here made and two new species, *P. diaereta* and *P. honanensis*, are described.

Although the genus has been referred to the family Platystomatidae and the subfamily Trapherinae, the male postabdomen shows characters which recall the subfamily Ulidiinae of the Otitidae. The aedeagus (Figs. 3, 4, a), instead of being furnished with a specialized and often complex tip or glans, is simple and tubiform or band-like in the present genus and the African genera *Traphera* and *Lule.* The sperm pump (Fig. 3, sp) is wholly membranous, lacking the sclerotized cap found in the Platystomatinae.

Genus **Poecilotraphera** Hendel

1914. Abhandl. Zool.-Bot. Ges. Wien 8 (1): 5, 21 ("typ. *taeniata* Macqu."); Genera Insectorum, fasc. 157: 11, 33 ("typus: *taeniata* Macquart").

The genus may be distinguished from related genera by the following characters: eyes bare; face convex and shining in nearly whole length; pterostigma well developed, veins *Sc* and R_1 well separated apically; *ta* distad of middle of discal cell; vein closing 2d basal cell much shorter than basal section of 4th vein; 2d vein in apical half gently bowed forward.

KEY TO SPECIES OF **Poecilotraphera**

1(2). Wing without complete transverse hyaline band, with 2 narrow whitish or hyaline costal triangles beyond pterostigma and 1 beyond *tp* on posterior margin; femora and tibiae wholly black; fore basitarsus dark brown to black; wing length, 4.14 to 4.7 mm .... **P. diaereta**, n. sp.

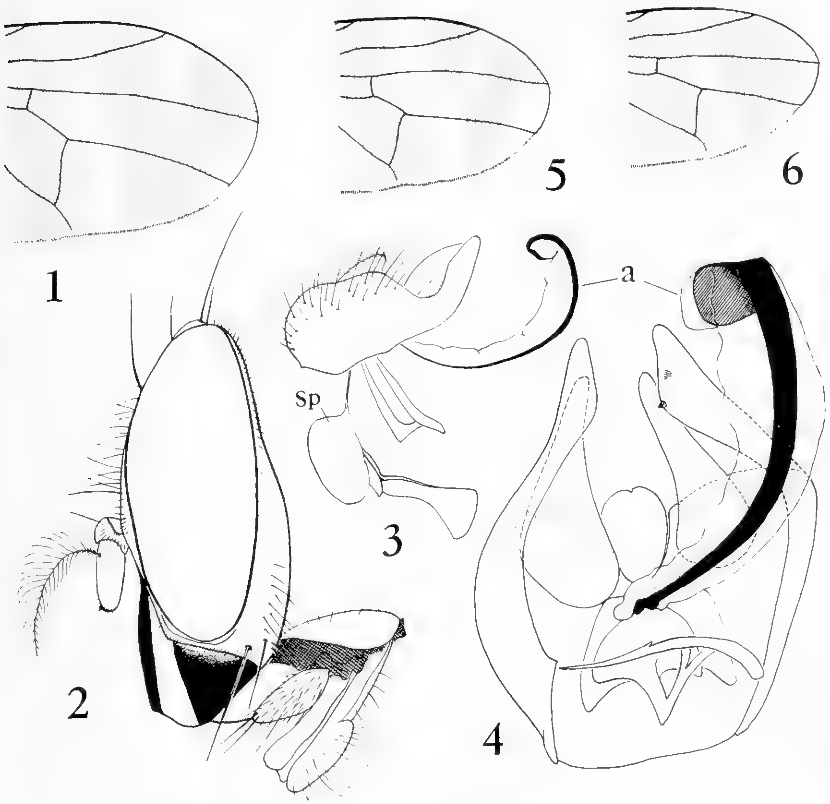
2(1). Wing with complete hyaline crossband just beyond crossveins; fore basitarsus brown to yellow.

3(4). Fore femur yellow; hyaline wedge from apex of 2d vein extending to posterior margin of wing and fusing with transverse band (fig. 5); abdomen heavily pruinose .... **P. comperei** (Coquillett)

4(3). Fore femur black; hyaline wedge from apex to 2d vein ending in 1st posterior cell; abdomen nearly shining; wing length, 3.0 to 4.0 mm.

5(6). Black midfacial stripe broad, much broader than yellow stripes at each side of it; hyaline transverse band of wing (fig. 6) quite oblique .... **P. honanensis**, n. sp.

6(5). Black midfacial stripe narrower, only slightly wider than yellow stripes at each side of it; hyaline transverse band of wing nearly at right angles to longitudinal axis of wing (fig. 1) .... **P. taeniata** (Macquart)



Figs. 1–6. *Poecilotraphera taeniata* (Macquart). 1, apical half of wing; 2, lateral view of head; 3, lateral view of male copulatory apparatus; 4, anterolateral view of same, more enlarged (a, aedeagus; sp, sperm pump). *P. comperei* (Coq.). 5, apical half of wing. *P. honanensis*, n. sp. 6, apical half of wing.

Poecilotraphera comperei (Coquillett)
(Fig. 5)

Ortalis comperei Coquillett, 1904, Proc. Ent. Soc. Wash. 6: 138.
Poecilotraphera comperei (Coq.) Hendel, 1914, Abhandl. Zool.-Bot. Ges. Wien 8 (1): 22; Gen. Ins. 157: 33.

The types of this species in the United States National Museum, two males from Bangalore, India, reared from guava, have been examined. No further records are available.

Poecilotraphera diaereta, n. sp.

P. taeniata (Macquart) Hendel, 1914, Abhandl. Zool.-Bot. Ges. Wien 8 (1): 21; Gen. Ins. 157: 33, pl. 3, figs. 53, 54.

This is obviously the species that Hendel referred to *P. taeniata*

(Macq.) for which he presented figures of the head and wing, with the exception of the two specimens he mentioned as having a complete transverse wing band, considering them "spezifisch nicht verschieden." I would consider that Hendel had two distinct species, distinguished as in the key and the following descriptive notes supplementing the description given by Hendel.

Length of wing: 3.0 mm. Face shorter than in *P. taeniata*, antennae extending a little more than halfway to midoral margin; palpi yellow, blackish apicoventrally. Fore basitarsi dark brown to black, scarcely paler than tibiae and femora; abdomen with uniform very light whitish pruinosity, except at tip.

Holotype, male, and allotype, female; Burnihat, Assam, May, 1962; paratypes, females: 2, Torabet, Assam, 1962, from larvae inside tunnel of maize; 1, Baidyabati, West Bengal, September 11, 1963, from larva found in dead heart of winter paddy; all in United States National Museum, Type No. 67322. Hendel cited specimens from Bengal (Berhampur, Murshidabad) and Java, but it is not known which are the ones with the complete wing band.

Poecilotraphera honanensis, n. sp.
(Fig. 6)

Male. Wing length, 3.4 mm. Very similar to *P. taeniata* (Macq.), differing as in above key and as follows. Face with black longitudinal central stripe much broader than yellow stripes at each side of it, as short as in *P. taeniata*, the antennae extending a little more than halfway to midoral margin; palpi wholly yellowish testaceous; legs black, tarsi yellowish, a little brownish on apical segments, wings very similar to those of *P. taeniata*, but somewhat narrower, the complete transverse hyaline band quite oblique (fig. 6), the vermiculate pale markings at base of wing reduced, the two spots in anal cell nearly fused and the line directly posterior to whitish pterostigmal wedge reduced to 3 small spots; abdomen nearly wholly shining bluish black, pruinosity very slight.

Holotype, male, Honan Island, P'an-yu district, Canton, South China, December 5, 1933 (F. K. To), No. 67323 in United States National Museum.

Poecilotraphera taeniata (Macquart)
(Figs. 1–4)

Urophora taeniata Macquart, 1843, Mem. Soc. Roy. Sci. Agric. Arts Lille 1843: 379 [Dipt. exot. 2 (3): 222], pl. 30, fig. 6.

Poecilotraphera taeniata (Macq.) Hendel, 1914, in part, Abhandl. Zool.-Bot. Ges. Wien 8 (1): 21; Meijere, 1924, Tijds. Ent. 67: 204; 67, suppl.: 61; Enderlein, 1924, Mitteil. Zool. Mus. Berlin 11: 100.

Macquart's type was from Java. His figure is inaccurate with regards to the basal part of the wing, since as E. Séguy (personal communication) remarked "l'aile est collée contre le corps de l'insecte par des moisissures" (the wing has been stuck against the body by wetting) and also stated that the type is "un débris" without head, the thorax is broken, and half of the abdomen is missing, but nevertheless it shows that the complete transverse wing band is as Macquart illustrated it and that the fore basitarsi are yellow. The Meijere and Enderlein citations refer only to locality records, which should be checked, since it is likely that the specimens on which they were based were determined from Hendel's description and may therefore actually concern either *P. taeniata* or *P. diaereta*.

The United States National Museum possesses a series from Occidental Negros, Philippine Islands (Saravia, dead heart of cane; Victorias, bred cane; Maao millsite, sugar cane). The drawings and the following descriptive notes are made from these specimens.

Length of wing: male, 4.14 to 4.7 mm; female, 4.3 to 4.8 mm. Face (fig. 2) longer than in *P. diaereta*, antennae extending less than halfway to midoral margin, black longitudinal central stripe equal or only slightly broader than the yellow stripes at each side of it; palpi wholly yellowish; base of wing with vermiculate hyaline markings as shown by Hendel (cf. *P. diaereta*), apical part of wing (fig. 1) with complete hyaline transverse band almost at right angles to longitudinal axis of wing; legs black, tarsi yellowish basally, brownish on apical segments; abdomen with very light whitish pruinosity, apical segment nearly wholly and apicomedian area on intermediate segments shining.

Male postabdomen (figs. 3, 4) with epandrium furnished with 2 long digitate retrorse ventral processes, each mesally near tip with 2 minute but stout denticles; surstyli gently tapering from broadly rounded bases and well separated from epandrial processes; hypandrium simple, U-shaped; aedeagus (a) tubiform, largely membranous, but with apically expanded sclerotized anterior strip; aedeagal apodeme with head broadly expanded before attachment to aedeagus; stem with rectangular bend to hypandrium, before which it is bifurcate; epiphallus a roughly trapezoidal plate; sperm pump (sp) ovoid, wholly membranous, its apodeme as figured.

A DESCRIPTION OF THE LARVA OF METHOCHA STYGIA (SAY), WITH NOTES ON OTHER TIPHIIDAE
(Hymenoptera)

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In recent years much progress has been made in the study of the larvae of the higher Hymenoptera. Workers interested in the modifications of larval characters in the Aculeata have, however, been handicapped by the fact that few larvae of the more primitive families have been described in detail. To the best of my knowledge, no larva of the family Tiphiidae has ever been described in more than a superficial manner, although the tiphiids are believed to be close to the ancestral stock of the other groups of Aculeata.

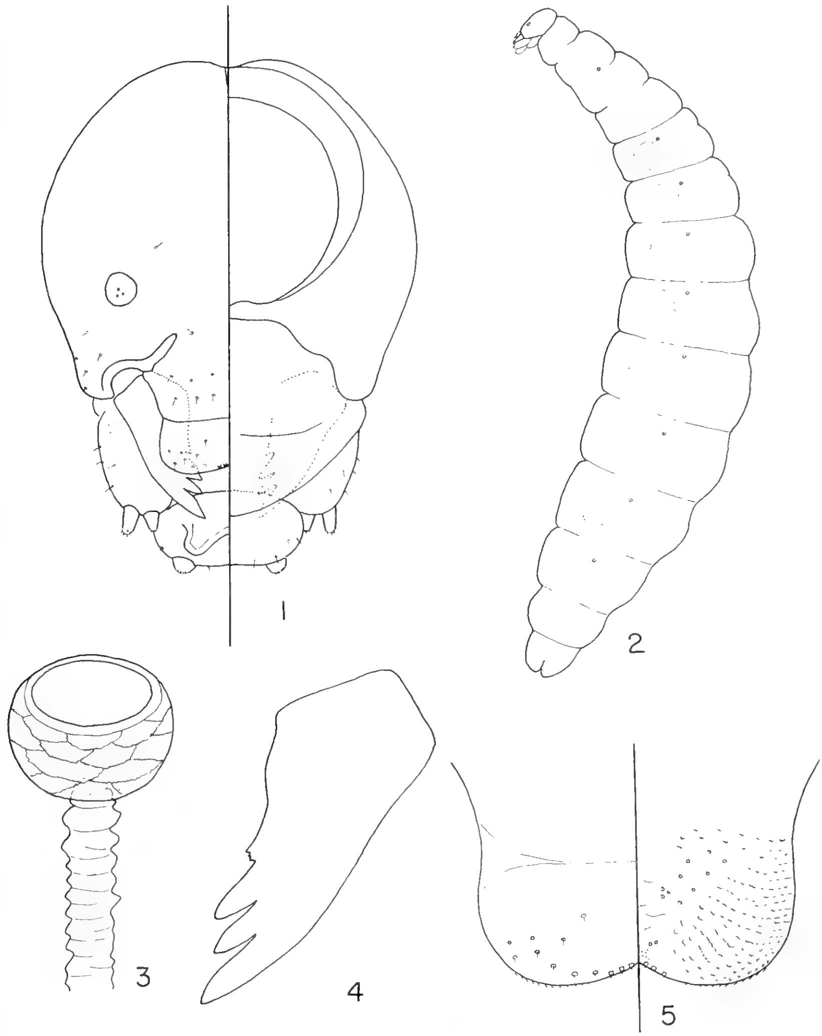
A few years ago I was able to rear two mature larvae of *Methocha stygia* (Say) (Tiphiidae, Methochinae), from eggs collected at Lexington, Massachusetts, by marking the holes of tiger beetle larvae from which females of this wasp were seen emerging. Williams (1916) discussed the biology of this species briefly, and included notes on other species which had been studied up to that time. A few years later Williams (1919) described at somewhat greater length the behavior of two Philippine species, *M. striatella* Williams and *M. punctata* Williams. He presented a small sketch of the larva of the former species, but did not describe it in detail.

The larva of *Methocha* has certain unexpected features, and since this genus is not regarded as one of the more generalized Tiphiidae, I have felt it wise to study other tiphiid larvae and published accounts, insofar as available, in an effort to define the family characters. The results of this study are presented following the description of the larva of *Methocha stygia.*

Methocha stygia (Say)

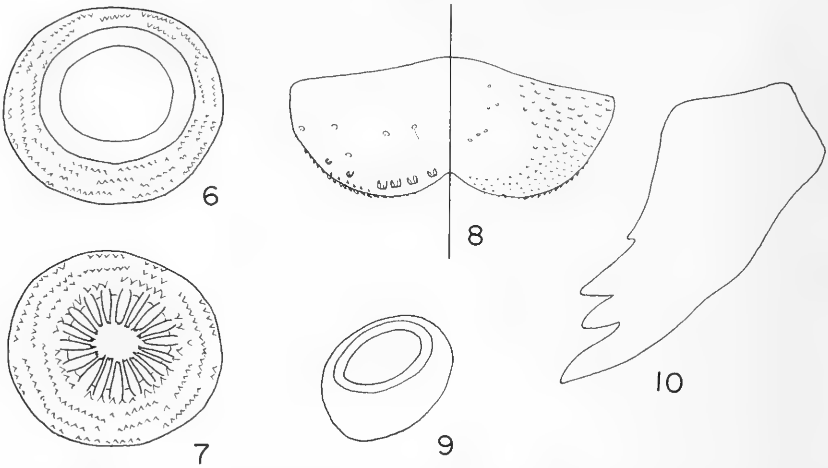
Length 10 mm.; maximum width (abdominal segments 3–5) 2.2 mm. Elongate-fusiform, more gradually tapered anteriorly than posteriorly; pleural lobes present on first eight abdominal segments, rounded; anus terminal, slit-like; anterior abdominal segments showing indistinct division into anterior and posterior dorsal annulets (fig. 2). Nine pairs of small, circular, lightly pigmented spiracles present, the second pair of thoracic spiracles being wholly absent; spiracular peritreme narrow; atrium lined with weakly spinose ridges which form elongate cellules; opening into atrium simple, not armed (fig. 3). Integument apparently smooth, but under high power seen to be partially covered with extremely minute spinules, also with a few very minute setae, the longest of which measure only about 10 μ.

Head .5 mm. wide, .46 mm. high (exclusive of labrum and mouthparts), essentially unpigmented except for light pigmentation of the mandibles, anterior tentorial arms, hypostomal thickenings, and palpi (fig. 1). Vertex weakly depressed medially; parietal bands absent; antennal orbits circular, very large, about 55 μ in diameter, with three minute sensilla near the center. Head with a few scattered setae as figured; clypeus with eight setae and a few additional pores.



Figs. 1–5. *Methocha stygia* (Say). Fig. 1, head, anterior aspect on left half, posterior aspect on right half; fig. 2, lateral view of larva; fig. 3, spiracle; fig. 4, mandible; fig. 5, labrum, anterior aspect on left half, posterior aspect (epipharynx) on right half.

Labrum measuring .21 mm. wide, .05 mm. in median height, with a fairly strong median emargination which is flanked by six fairly strong sensory cones; surface with a few setae and sensilla as figured; epipharynx with numerous sensory pores, its sides wholly covered with very small spinules most of which are arranged in irregular rows or small clusters (fig. 5). Mandibles twice as long as their basal width, without setae or irregularities, with four apical teeth, the most basal of



Figs. 6–10. *Tiphia micropunctata* Allen. Fig. 6, anterior thoracic spiracle as seen in plane of peritreme; fig. 7, spiracle as seen on a lower plane, showing spines guarding entrance to subatrium; fig. 8, labrum, anterior aspect on left half, posterior aspect (epipharynx) on right half; fig. 9, vestigial spiracle, believed to be the second thoracic (drawn to same scale as Figs. 6 and 7); fig. 10, mandible.

which is small and either entire or divided into small denticles as figured (on the other mandible of this same specimen this tooth was simple and acute) (fig. 4). Maxillae with some spinules basally similar to those on the epipharynx, also with a few lateral setae, but the mesal margin apparently smooth; palpi 40 μ long, nearly that wide at the base, terminating in five minute sensory pegs; galeae 25 μ long, not longer than their basal width. Labium broad; labial palpi broader than long, with several apical sensory pegs; spinneret broad, bluntly protuberant on each side; labium with a few apical setae, but the oral surface smooth, wholly without spinules or papillae.

Larvae of other Tiphiidae

Clausen (1940) reviewed knowledge of tiphiid larvae briefly as of that date, but pointed out that no detailed descriptions had been published. He noted that in *Tiphia* the mandibles have three large teeth and a "small supplementary tooth at the basal margin of the third of the main teeth." He also stated that "according to T. R. Gardner, there are nine pairs of spiracles, situated on the first thoracic and first eight abdominal segments, in all instars."

If this information is correct, then *Tiphia* and *Methocha* are much alike in these characters. In order to check this, I recently borrowed several *Tiphia* cocoons from the U.S. National Museum and have been able to extract cast larval skins from some of them. Unfortunately none of them are in outstandingly good condition, but I have been able to glean some information from them. The following description is a composite, based principally upon two specimens of *T. micropunctata* Allen, one from Gays Mills, Wisconsin, and the other from White Co., Indiana, also a specimen of *T. intermedia* Malloch from Caldwell, N.Y. These two species appear identical so far as I can judge from the available material. The drawings were made from *T. micropunctata.*

Characters of the larva of Tiphia (Tiphiinae).—The body form is not determinable from the available material. I am able to count eighteen large spiracles in one specimen, one pair well separated from the others and doubtless representing the anterior thoracic spiracles; between these and the other eight pairs I am able to find a pair of vestigial spiracles about half the size of the others (fig. 9), presumably representing the second pair of thoracic spiracles. Little structure is discernible in these aside from a peritreme and simple atrium; the other nine pairs have a darkly pigmented peritreme, a strongly spinose atrium, and a crown of large spines guarding the opening into the subatrium (figs. 6, 7). Portions of the integument (apparently chiefly the sides and venter) are covered with small granules, some of them acute; a few very small setae are present on parts of the dorsum.

The antennal orbits are circular and much as figured for *Methocha,* and there are a few setae on the head as in that genus. The labrum is transverse, emarginate, and bears twelve darkly pigmented subapical sensory cones as well as a few setae; the epipharynx is spinulose on the sides but apparently mostly bare along the midline (fig. 8). The mandibles have three large teeth and a small fourth tooth, as described by Clausen and as shown in figure 10. The maxillae and labium are supported by heavily pigmented bands bearing much resemblance to the stipital and labial sclerites of Ichneumonidae (Short, 1959) and possibly homologous with those structures. The maxillae appear smooth and have the palpi and galeae well developed, much as in *Methocha,* although the galeae are more slender and are not exceeded by the palpi. The labium is not well preserved in any of the specimens, but it appears that the labial palpi are short and broad, shaped much as in *Methocha*; the spinneret appears to be transverse, with a tendency to be produced on the sides, also as in *Methocha.*[1]

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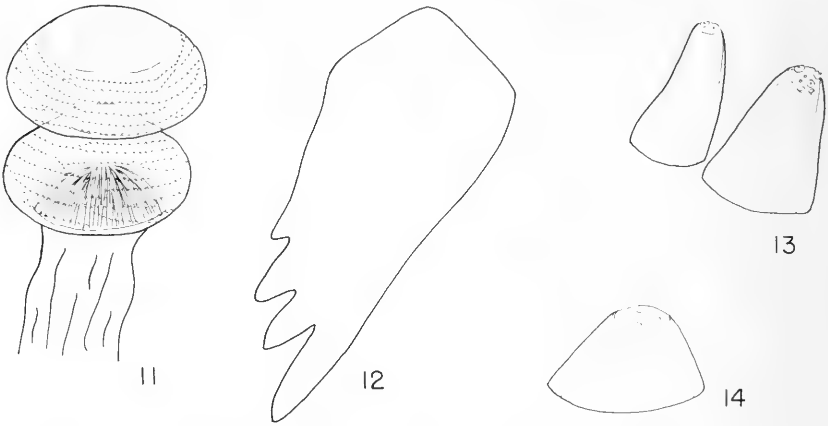
[1] Since the above was written, I have received two *Tiphia* larvae in alcohol from the U.S. National Museum. One is apparently full-grown and in fair condition, the other not of full size and in poor condition. Neither is determined to species. In both specimens the second thoracic spiracles are extremely minute, only about one-third the diameter of the others; the structure of the spiracles is essentially as described above. The larger specimen (from Ottawa, Canada, collected by C. E. Palm) is 14 mm. long and is very much as figured for *Methocha stygia* except that it is more robust and has a pair of low, transverse, dorso-lateral welts on each body segment except the first and last. In this specimen the integument is minutely wrinkled but without granules; the body setae are sparse and exceedingly small (10–15 μ long). The antennal orbits are large, as in *Methocha,* and measure about 100 μ in diameter. The labrum and mandibles are essentially as shown in figures 8 and 10. The maxilla and labrum are also similar to those of the *Tiphia* described above, but the galeae are quite slender and considerably exceed the maxillary palpi (galeae about 90 μ long, palpi about 70 μ); the spinnerets are much more prominent laterally than medially.



Figs. 11–14. *Myzinum quinquecinctum* (Fabricius). Fig. 11, abdominal spiracle; fig. 12, mandible; fig. 13, galea (left) and maxillary palpus (right); fig. 14, labial palpus.

The larva of Myzinum (Myzininae).—There are numerous cocoons of *Myzinum quinquecinctum* (Fabricius) in the U.S. National Museum, and I have been able to extract cast larval skins from several of them. The following description is based upon three larval skins from cocoons from Merrillville and Cutler, Indiana.

Body with nine pairs of large spiracles and one pair of very small, vestigial spiracles, the latter resembling those of *Tiphia* (fig. 9) but still smaller, their diameter only about .3 × that of the other nine pairs (these vestigial spiracles appear to be the second thoracic spiracles). The larger spiracles are of unusual structure, each being double, the inner portion containing a crown of unusually large spines (fig. 11). Integument with fine wrinkles and on parts of the thorax with fairly numerous small setae, the longest setae measuring about 20 μ.

Antennal orbits as figured for *Methocha* but relatively smaller, about 90 μ in diameter. Labrum emarginate, much as in *Tiphia* and *Methocha*; surface with somewhat more than 20 setae and apical margin with a roughly equal number of sensory cones; epipharynx strongly spinulose latero-apically. Mandibles quadridentate (fig. 12). Maxillae and labium supported by heavily pigmented rods, as in *Tiphia*. Maxillary palpi much wider than the galeae, but not exceeding them, both measuring about 90 μ long (fig. 13); labial palpi wider than long (fig. 14).

The larvae of *Myzinum* appear to differ from those of *Tiphia* and *Methocha* in having more sensory cones on the labrum, a stronger inner mandibular tooth, and quite different spiracles. Whether these characters will hold up when more species are known remains to be seen.

The larva of Anthobosca (Anthoboscinae).—Janvier (1933) presented a few notes on the larva of *A. chilensis* (Guérin). According to him, the larva is well segmented, the abdomen but not the thorax bearing strong pleural lobes. He does not mention or figure the spiracles. Janvier speaks of the "appendices antennaires aréolés et aigues," which may or may not mean that antennal papillae are present. The labrum is emarginate and has a pair of translucent lateral lobes which overlie the tridentate mandibles. The maxillae and labium appear essentially the same as I have figured for *Methocha stygia.*

In the collections of the Museum of Comparative Zoology there are two cocoons of an undetermined Australian species of *Anthobosca* (Croydon, Victoria, collected by B. B. Given). Unfortunately, the cast larval skins are in poor condition. The integument is partially covered with small, blunt spinules and also has a few small setae. The spiracles resemble those of *Tiphia* except that the opening into the subatrium has only a few very small, blunt spines around it. Both specimens are incomplete and the number of spiracles therefore cannot be determined. The mandibles have three large teeth plus a very small additional tooth, exactly as figured for *Tiphia* except that the basal tooth is even smaller, a mere angulation. I was unable to recover any other parts of the head capsules.

The larva of Elaphroptera (Thynninae).—Janvier (1933) presented notes and sketches of the larvae of several species of this genus. The body is in every case well segmented, with strong pleural lobes on the abdominal segments, but these lobes are weak or absent on the thorax. He shows the spiracles of two species, *E. erythrura* Spinola and *E. atra* Guérin, as occurring on the first nine abdominal segments, with none on the thorax. Clausen (1940) pointed out that this arrangement of spiracles is not found elsewhere in the Hymenoptera, and suggested that this feature may serve to distinguish the larvae of this group from those of other wasps. Actually, I am not aware that any insect larvae have nine pairs of abdominal spiracles, and it seems to me probable that Janvier's figures are in error as to the position of the nine pairs of spiracles.

The features of the head are apparently similar to those of *Anthobosca.* It is unclear from Janvier's descriptions and figures as to whether antennal papillae are present or absent. The labrum is more or less bilobed, the lateral lobes overlying the bases of the tridentate mandibles. (It will be recalled that Janvier considered the mandibles of *Anthobosca* tridentate, although in an Australian species, at least, a weak fourth tooth is present.) The features of the maxillae and labrum apparently do not differ in any important way from those of *Methocha*; the spinneret is a transverse slit, although Janvier's descriptions and figures are again not entirely clear on this point.

Discussion

Obviously the available information is too uneven to permit many conclusions regarding familial characters. Evidently one pair of spiracles has been lost or at least greatly reduced in members of at least three subfamilies, and the mandibles are very similar in examples of four subfamilies. There also appear to be no gross dissimilarities in the integument, labrum, maxillae, and labium. It appears that the family Tiphiidae, construed in its current broad sense, holds together rather well on the basis of larval characters and is readily separable from other families of Scolioidea. Representatives of the families Scoliidae and Mutillidae described by Grandi (1961) both have ten pairs of well developed spiracles, two on the thorax and eight on the abdomen. In both cases the mandibles are of the same general form as in Tiphiidae; in *Scolia hirta* Schrank there are only three teeth, but in *Smicromyrme rufipes* (Fabr.) (Mutillidae) there is a small fourth tooth, almost exactly as in *Tiphia* and *Methocha*. Both appear to have sclerotic rods supporting the maxillae, as in *Tiphia*. In *Scolia*, as in the Tiphiidae (also the Pompilidae and Ampulicidae), the spinneret is more prominent laterally than medially. On the whole the resemblances among the described larvae of the superfamily Scolioidea are impressive. It is surprising to find the spiracles reduced in the Tiphiidae, which are in many ways the most generalized members of this complex. I would venture to predict that *Anthobosca* possesses a full complement of well developed spiracles and that for separation of the families we will ultimately have to rely upon a combination of subtler characters.

The larvae of Pompilidae also have the second thoracic spiracles greatly reduced (Evans, 1959). However, pompilid larvae have antennal papillae, a somewhat trilobed labrum in most species, stout mandibles with the teeth tending to surround a concavity, a spinulose inner margin of the maxillae, and several other features which distinguish them readily from the Tiphiidae. It may be found convenient to place the Pompilidae and Tiphiidae together in keys, although doubtless the second thoracic spiracles were reduced independently in the two groups.

Knowledge of the larvae of the more primitive families of Aculeata remains very inadequate, and it is to be hoped that persons who have an opportunity to rear these insects will deposit well-preserved larvae in a major museum where they will be available to future workers.

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BOOK NOTICE

Household insect pests. By Norman E. Hickin. 23.5 cm, 172 pp., 4 col. pls., 76 figs. 1964. Hutchinson & Co., 178–202 Great Portland St., W. 1, London, England. Price: 30 shillings (about $4.20).

This well-printed little volume is by Norman E. Hickin, an entomologist who is Scientific Director of the Rentokil Laboratories, which organization has published two earlier volumes, "The Woodworm Problem" and "The Dry Rot Problem," and has works in preparation on "The Cockroach," "Stored Products Entomology," "Rodents and Hygiene," and "The Termite Problem." The author is known for his writings on British wood borers and other pests, also, probably due to an avocation, for papers on Trichoptera.

In the words of the subtitle, the aim is to provide "an outline of the identification, biology and control of the commoner insect pests found in the home." About 75 species or groups of insects and other arthropods are mentioned in the text, and about 50 species, some not pests though commonly encountered, are illustrated and discussed in some detail. Many, but not all, of the species occur in America as well as in Britain. There is also explanatory general material about insects, with adequate illustrations, to introduce entomology to the housewife or other reader. There is a section on control methods applicable to different classes of pests, and the emphasis is on accurate identification, followed by carefully planned methods or an inquiry from better informed people. The text is clearly written, and the book should make a convenient guidepost for the general reader, as well as an occasional reference for exterminators or others needing to refresh their knowledge of household arthropods.—Ashley B. Gurney, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

HETERAGRION EBORATUM, A NEW SPECIES OF DAMSELFLY FROM GUATEMALA
(ODONATA: MEGAPODAGRIONIDAE)

THOMAS W. DONNELLY, *Dept. of Geology, Rice University, Houston, Texas*

The high, pine-covered hills of southeastern Guatemala were found during a brief trip in the summer of 1963 to have a limited Odonate fauna that was quite distinct from that of the largely farmed, adjacent lower elevation countryside. The most interesting Odonate found during that trip was a singularly beautiful, large new species of *Heteragrion*, which is most closely related to *H. majus* Selys. The following description is based partially on criteria discussed by Williamson (1919) in his important revision of the genus.

Heteragrion eboratum, n. sp.

Holotype male. *Head.*—Entire face shining white, ranging from opaque to translucent and transparent; rear of vertex velvet black. Frons and clypeus acutely angled. Labium and maxilla pale brown; hooks dark brown; mandibles white laterally with dark dorsal and anterior edging; teeth shining black. Labrum and anteclypeus opaque white; postclypeus transparent white; frons translucent white; gena, front of vertex, first and basal two-thirds of antenna opaque white. Fine black hairs on front margin of labrum and clypeus. Rear of vertex velvet black, this color extending forward to envelope all three ocelli. Tip of second segment and remainder of antenna black. Rear of head pale.

Prothorax.—Fore lobe and dorsum of medial lobe velvet black, the fore lobe with a posterolateral elongate yellowish spot. Sides of medial lobe and propleuron obscure yellow-brown, the margins of the sclerites edged with darker brown. Hind lobe prominent, entire, black.

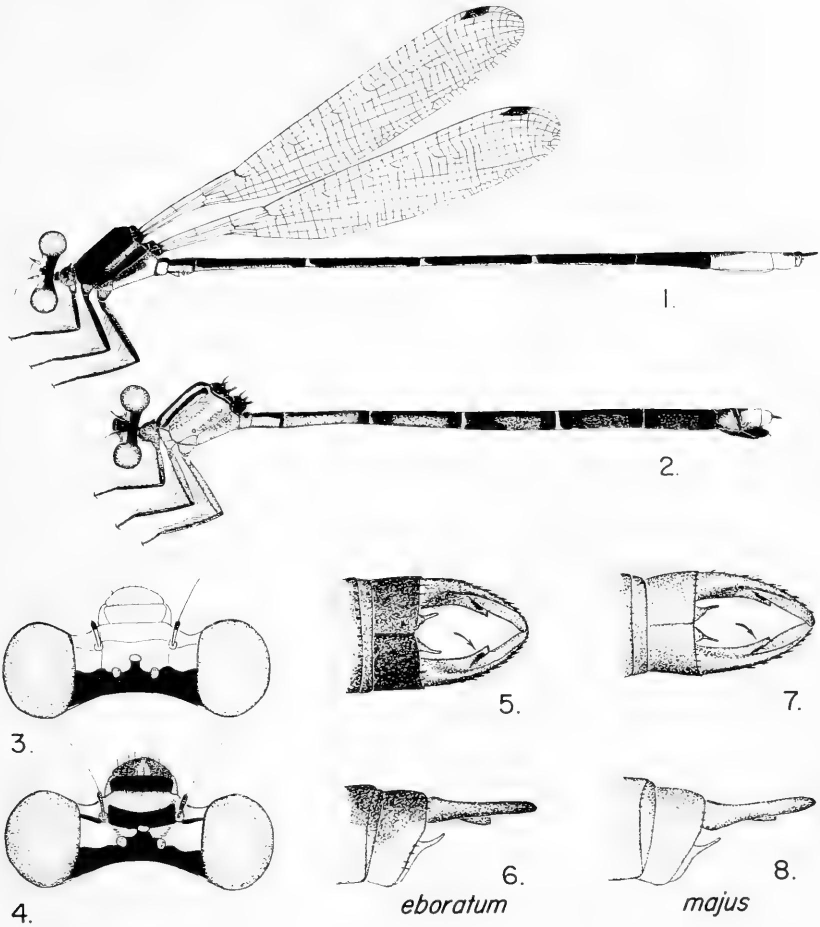
Pterothorax.—Entire mesopleuron velvet black except for obscure yellow-brown spot on mesinfraepisternum. Dorsal half of metepisternum with an obscure yellowish line extending forward to spiracle. Ventral half of metepisternum and dorsal half of metepimeron obscure brown. Ventral half of metepimeron and sterna yellow. Metinfraepisternum with obscure yellow spot. Wing bases largely yellow with black edging.

Venation.—Veins black, stigmae dark brown, covering three cells. Postnodal crossveins 25 in fore wing, 22 in hind wing. Arculus 0.5 mm. distal from cubital-anal crossvein in both wings. Two post-quadrangular cells in each wing.

Legs.—Completely black, except for obscure yellow on coxal bases and dark brown on dorsum of hind femur.

Abdomen.—Black, except as follows: sides and apical ring of 1; sides of 2, except for line along ventral margin; ventral line on all but apical fifth of 3; basal ring and obscure ventral line from basal third to apical fifth of 4–6; obscure subapical mark on sides of 7; all of 8 except for obscure dark dorsal triangle extending apically about two-thirds the length of the segment; all of 9, except for dorsal black mark on apical half; sides of 10. Pale color yellow on 1–2; obscure yellow-brown on 3–6; reddish yellow on 7–10. Terminal segments expanded noticeably.

Appendages.—Dorsal appendages black, except at very base, of usual sub-



Heteragrion eboratum, n.sp. and *Heteragrion majus* Selys

Figs. 1–8. *Heteragrion eboratum*, n. sp. Fig. 1, color pattern and venation, male; fig. 2, same, female; fig. 3, dorsum of head, male; fig. 4, same, female; fig. 5, male appendages, dorsal view; fig. 6, same, lateral view. *H. majus* Selys. Fig. 7, male appendages, dorsal view; fig. 8, same, lateral view.

cylindric, forcipate style of genus. Mesal-ventral tooth prominent; sinus between this tooth and small, black mesal denticulate ridge well developed (arrow of figure 5). Ventral appendage very reduced, thin, cylindrical, pale.

Dimensions.—Abdomen 47 mm; hind wing 32 mm.

Variations among type series.—The nine males show little variation, except for size. The extent of obscure black on the dorsa of the terminal abdominal segments varies from two-thirds of 8 and 9 to one-third of 8 and none of 9 pale.

Two males have a very obscure pale line on the posterior third of the humeral suture. The abdomen ranges from 46 to 51 mm; the hind wing from 31 to 33 mm.

Allotype female. *Head.*—Labium and maxilla pale yellow with dark brown hooks; mandibles yellow laterally with brown teeth; labrum dark brown with pale medial triangle; anteclypeus and postclypeus brown, this color shading into gleaming black along the clypeal angle; frons, gena, and vertex dull yellow, except as follows: brown on frons between antenna bases, black transverse dash behind antenna bases, black subrectangular mark on top of frons between antennae, and black transverse mark occupying entire posterior half of vertex and enveloping the ocelli. An obscure brown mark extends from lateral ocelli to antennae. Basal segment of antenna yellow, remainder brown. Rear of head pale.

Prothorax.—Obscure yellow-gray, shading to yellow below; velvet black as follows: central half of fore lobe, tapering to rear; central third of hind lobe, forming a rounded spot. Hind lobe entire, with lateral extremities and rear border yellow.

Pterothorax.—Obscure yellow-gray shading to gray below, black as follows: middorsal line 0.5 mm wide, central third of mesepisternum, this line widened abruptly to rear to touch humeral suture. Obscure brown line on dorsal half of mesepimeron, obscure gray covering ventral half of metepisternum. Ventral half of metepimeron and sterna yellow.

Venation.—As in male.

Legs.—Obscure gray, darker on ventral surfaces of tibiae and apices of fore femora.

Abdomen.—Obscure yellow-gray, black as follows: dorsal dash on 1 and stripe on 2, these marks interrupted by a medial yellow line which does not reach apex of 2; dorsa of 3–8, except basal rings on 3–7 which are interrupted on 4–7 and medial yellow line extending five-sixths the length of 3–6. Black of 3–7 encircles apical sixth to fourth of segment, obscure brown encircles basal sixth to third, enclosing ventral pale stripe which is increasingly darker on posterior segments. 8 with pale postero-lateral dash; 9 and 10 completely yellow except for basal dorsal black spot on 9.

Ovipositor.—Dark brown to black; genital valves with a single row of denticles. Indistinguishable from Williamson's (1919) figures for *H. majus*.

Dimensions.—Abdomen 34 mm; hind wing 42 mm.

Variations among type series.—The principal variations among the the five females of the type series involve extent of dark coloration, which appears to reflect maturity of the imago. The allotype is the darkest of the five, and, hence, is probably the most mature. The other four females have the brown mark between the ocelli and the antennae absent or obscure. One female, evidently the least mature, has the black color of the rear of the vertex interrupted laterally to form indistinct marks which resemble the postocular spots of the family Coenagrionidae, though in the present specimen the marks are confluent with the pale color of the rear of the head. Two paratype females have a distinct black line on the mesepimeron, whereas the allotype and two other paratypes have obscure gray here. The abdomen ranges from 31 to 33 mm and the hind wing from 38 to 40 mm; hence, the allotype is the largest of the series.

Material examined.—Holotype male: Socorro (abandoned silver mine), 3 km. northeast of Ermita and about 5 km. east of Concepción las Minas, Dept. Chiquimula, Guatemala, 13 July 1963. The elevation of this locality is 1,100 meters. Allotype: same locality, 14 July 1963. Paratypes: 8 males, 4 females, all from the same locality, 13–15 July 1963, except for three males from Mina San Vincente, about 1 km. north of previous locality, elevation 1,200 meters, 15 July 1963. An additional male collected at this last locality was prepared for cytogenetic examination and sent to Mr. Robert Cumming; it has not been included in the type series. The holotype and allotype will be deposited in the University of Florida collection. Paratypes will be deposited in the U.S. National Museum, The Academy of Natural Sciences, Philadelphia, and the University of Michigan Museum of Zoology.

The new species is closely related to *H. majus*, which has been previously reported from Costa Rica, Panama, and Peru. The principal distinction between the two species is in the color and the color pattern—the characters which are of the greatest taxonomic utility in the genus as a whole, according to Williamson. *Eboratum* is a very dark species with a shining white face; *majus* is much less dark, especially on the thoracic dorsum, and has a golden yellow face. Other respects in which the male of *majus* differs are as follows: the frons has a transverse black dash behind the antennae (as in the female of *eboratum*), the hind lobe of the prothorax has lateral pale lines, the pterothorax has a yellow antehumeral line and a broader yellow stripe on the humeral suture, the legs are brown, the abdomen has a thin dorsal line on 1–3 (except for apical fifth), all of segments 8–10 and the dorsal appendages are pale, except for a small dorsal black mark on 8. There is also a structural distinction that is probably consistent: the dorsal appendage of *majus* has a smaller mesal-ventral hook, a less prominent denticulate mesal ridge above this hook (arrow in figure 7), and a less prominent sinus between the ridge and the hook.

The female of *majus* is distinguished by the greater extent of black on the head, especially the transverse markings behind the antennae, a black mark in front of the antennae, contrasting pale outer extremities of the anteclypeus, and pale color of the hind lobe of the prothorax confined to a posterior line and postero-lateral lobes (Williamson, 1919, figures 43, 157). There appears to be no structural distinction between the two species.

After this paper had been submitted, Prof. Minter Westfall located a male and female specimen of *H. majus* from Costa Rica in the Calvert collection that had been studied by Williamson. The male is substantially identical to the Panamanian specimen described above. The female differs from *H. eboratum* as stated, except that the anteclypeus of the two species is identical in appearance. The females of *H.*

eboratum, however, possess a central contrasting pale mark on the labrum, whereas *H. majus* is uniformly obscure here.

The area in which the new species was collected is a beautiful pine-forested hill district on the frontier between Honduras, El Salvador, and Guatemala. The district is a colonial silver mining area of which only one mine is being operated currently, and that on a very limited basis. The author's visit was primarily for the purpose of investigating the geology of this remote area.

Most of the Odonates of this hill country live in small, shaded streams that hug the precipitous hill slopes. Three Odontes found here were found nowhere else in the district (*Brechmorhoga rapax* Calvert, *Argia chelata*, Calvert, *A. variabilis* Selys), and three were decidely more common here than at lower elevations (*Epigomphus subobtusus* Selys, *Brechmorhoga vivax* Calvert, and *Hetaerina capitalis* Selys). Other Odonate species include *Paltothemis lineatipes* Karsch, *Hetaerina cruentata* (Rambur), *Cora marina* Selys, *Argia pocomana* Calvert, *A. extranea* (Hagen), *Anisagrion lais* (Selys), and *Palaemnema angelina* Selys. The new *Heteragrion* was found in the densest shade along the stream course, generally perched on the tip of a dead twig, where with its very dark coloration it would have been totally invisible were it not for its brilliant, almost luminescent white face, for which the specific name is proposed.

Acknowledgment.—I am very appreciative of the loan of the Staudinger specimen of *H. majus* from Chiriquí, Panama, by Dr. Howard Evans of the Museum of Comparative Zoology. I am also grateful to Prof. Westfall for the loan of the Costa Rica specimens.

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FOURTEEN NEW CHRYSOMELID BEETLES FROM THE WEST INDIES (COLEOPTERA)

DORIS H. BLAKE, *U.S. National Museum, Washington, D.C.*

Of the following new species of West Indian Chrysomelid beetles, four came from Jamaica, mostly collected by Dr. T. H. Farr. Five came from Hispaniola, mostly collected by Dr. P. J. Darlington, Jr. The other five consist of one from Cat Island in the Bahamas, two from Puerto Rico, one from St. Thomas, in the Virgin Islands, and one from St. Lucia.

Galerucella hexarhabdota, new species

(Figure 11)

About 3.4 mm. in length, oblong-oval, the prothorax depressed on the sides, the elytra with a slight ante- and postmedian transverse depression, closely punctate and with short appressed pubescence, pale yellowish brown, the antennae, breast and abdomen dark, the elytra dark brown, each with three pale vittae.

Head closely punctate with appressed pubescence, a dark line down occiput to antennal sockets, little evidence of a carina on the short lower front, occiput and labrum dark, lower front yellowish brown. Antennae short and rather stout, not reaching the middle of the elytra, the base of the first four joints pale, rest entirely dark. Prothorax with slightly angulate sides, the usual basal tooth and deep cut angle at base, disk widely depressed on the sides and also in the middle anteriorly and at base, finely punctate and with short appressed pale pubescence, entirely pale. Scutellum brownish. Elytra widely rounded at apex and transversely depressed before and after the middle, surface contiguously, coarsely and shallowly punctate and with short close pubescence, pale over the pale vittae and brownish over the brown; three pale vittae on each elytron becoming narrower towards apex, one lateral, one from the intrahumeral sulcus and the last between that and the suture. Body beneath with the breast and abdomen piceous, legs yellowish brown. Length 3.5 mm.; width 1.7 mm.

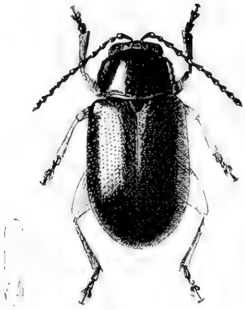
Holotype male (USNM Type No. 67334), Mandeville, Jamaica, collected in April 1906 by Van Duzee, from the Wickham collection.

Remarks.—This species has shorter elytra than *G. jamaicensis* and differs from the other vittate West Indian species of *Galerucella* in having the vittae of approximately the same width.

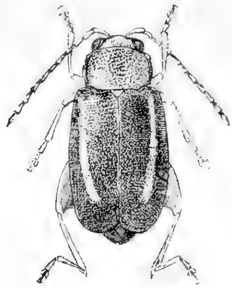
Galerucella jamaicensis, new species

(Figure 14)

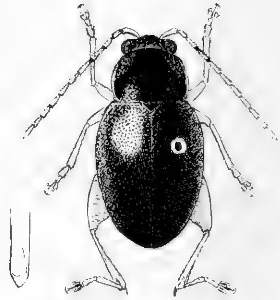
From 4 to 5 mm. in length, elongate oblong oval, densely and moderately coarsely punctate and with short appressed pubescence, the prothorax pale and irregularly depressed, the elytra dark brown to piceous with a narrow pale sutural vitta and a wider pale vitta from the intrahumeral sulcus downward, and a narrow and in some specimens nearly obliterated pale line between the sutural and intrahumeral vittae, the apex and margin pale, the legs yellowish brown, antennae dark brown, breast and abdomen piceous.



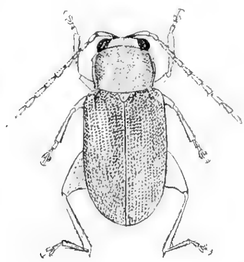
1. Hermaeophaga maldonadoi n.sp.



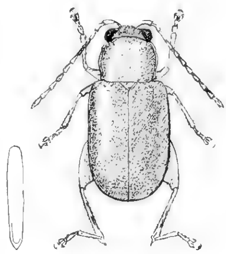
2. Longitarsus rhabdotus n.sp.



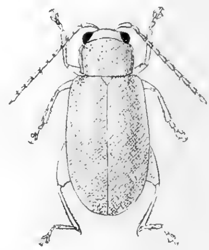
3. Longitarsus photinus n.sp



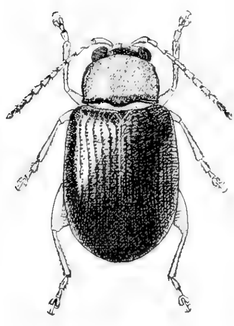
4. Longitarsus felis n.sp.



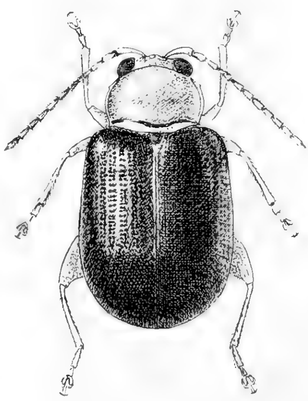
5. Longitarsus hoffmani n.sp.



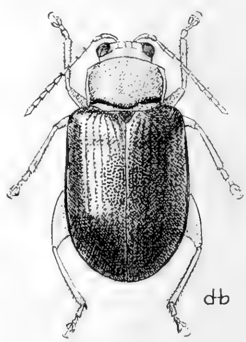
6. Longitarsus portoricensis n.sp.



7. Hermaeophaga constanzae n.sp.



8. Hermaeophaga darlingtoni n.sp.



9. Hermaeophaga punctata n.sp.

Head with interocular space half width of head, a depressed line down occiput to antennal sockets, occiput densely and shallowly punctate and with appressed pubescence, a carina down the short lower front, occiput and mouthparts dark, lower front reddish brown. Antennae with the three basal joints pale or partly pale, the rest dark brown, not reaching the middle of the elytra. Prothorax pale yellow with somewhat angulate sides, the disk depressed on the sides, in the middle at base and anteriorly; surface densely punctate with fine appressed pubescence. Scutellum brownish. Elytra dark brown or piceous, with very narrow and inconspicuous pale sutural vitta, a wider one from intrahumeral sulcus, and a narrow and inconspicuous one not visible in some specimens between these and the margin and apex pale; surface with contiguous and moderately coarse punctures and with a fine pubescence that is pale over the pale areas and dark and inconspicuous over the dark parts. Body beneath with breast and abdomen dark, legs yellowish brown. Length 4–5.2 mm.; width 1.6–2 mm.

Holotype male (USNM Type No. 67335) and 9 paratypes, 4 of which are in the Institute of Jamaica, collected at Grove Place, Manchester, Jamaica (type locality) June 23, 1960 by T. H. Farr on *Cordia macrophylla*; St. James, Montego Bay, Feb. 3, 1960 by T. H. Farr; Trelawny, Windsor Estate, Aug. 21, 1955 by T. H. Farr.

Remarks.—This differs from the other species of West Indian *Galerucella* by its unusual elytral vittation and also by the exceptionally long elytra. It most closely resembles *G. venustula* Suffrian from Cuba in which there are three pale elytral vittae besides the sutural one on each elytron. In the present species the lateral pale vitta is not visible and there is only a remnant of a pale vitta between the sutural and the intrahumeral vittae.

Diabrotica farri, new species

(Figure 10)

About 5 mm. in length, oblong-oval, shiny, nearly impunctate, pale yellow with the elytra having a greenish tinge (? pale green in life), the antennae and mouthparts dark, the elytra with a dark piceous humeral covering and dark about the scutellum, a median roundish dark spot between humeral and sutural darkening, a large dark lateral spot below, and near the apex a median and a lateral spot more or less united and the apex with a dark spot, these elytral spots frequently coalescing; breast dark, apex of femora, tibiae and tarsi dark.

Head with interocular space half width of head, occiput shiny, impunctate, a carina down the lower front, pale with dark mouthparts. Antennae entirely dark, third joint shorter than fourth, remainder subequal. Prothorax with nearly straight sides, disk smooth and without depressions, shining, impunctate, entirely pale. Scutellum pale. Elytra shiny, nearly impunctate, probably in life greenish but faded to yellowish brown in dried specimens, with piceous markings; a large dark humeral spot, area about scutellum dark, a median spot between; on the side extending to the middle a large dark area, and near the apex two spots, one median, one lateral, often united, a round spot at apex of each elytron united at the suture; all these spots often coalescing. Body beneath pale with the breast dark, outer half of femora, tibiae and tarsi dark. Length 4.5–5.5 mm.; width 2.3–2.6 mm.

Holotype male (USNM Type No. 67336) and 6 paratypes, 3 of which are in the Institute of Jamaica, Kingston, Jamaica, all collected at Port Henderson Hill, St. Catherine, Jamaica, July 7, 1958 by T. H. Farr.

Remarks.—This is closely related to *D. hispaniolae* Blake from Haiti and the Dominican Republic. The elytral markings are similar but a little different. The head in the Jamaican species is always pale and it is dark in the other, and in the Jamaican species the elytra are very indistinctly punctate, whereas in the other they are densely punctate.

Diabrotica luciana, new species

(Figure 12)

Between 6 and 7 mm. in length, elongate oval, nearly impunctate, shining, the head on occiput yellowish brown, paler in lower front, the mandibles tipped with brown, the antennae yellowish, prothorax faintly greenish in some specimens, elytra possibly greenish yellow in life but in most dried specimens yellowish brown, each elytron with three short pale green bands, not meeting at suture; undersurface and legs pale, with the breast deeper brown at least on the sides; tibiae also sometimes deeper brown on the outside.

Head polished and rounded over occiput, yellowish brown becoming paler in lower front; a small median depression over the frontal tubercles, lower front with a well developed carina, the mouthparts edged with brown. Antennae pale yellowish, deepening in color somewhat in terminal joints but not always, the third joint not much longer than second, and fourth joint longer than succeeding ones. Prothorax smooth, shining, impunctate, pale yellow in most specimens but in two specimens with a faint greenish tinge, possibly faded from brighter green in life. Scutellum reddish brown. Elytra wider below the middle, and with well marked humeri that are slightly deeper reddish brown; pale yellow and some specimens with a slightly greenish tinge, possibly pale greenish yellow when living, each elytron with three short bands, one before the middle, and two after it, none meeting at the suture. Body beneath pale yellow with the sides of the breast reddish brown, the femora sometimes with a greenish tinge and tibiae often on the outside darker brown. Length 6–7 mm.; width 3.4–3.8 mm.

Holotype female (USNM Type No. 67337), St. Lucia, B.W.I., collected July 5, 1931, from the S. T. Danforth collection. Also collected at St. Lucia by Chapin and Blackwelder in April 1934, by H. A. Ballou Sept. 29, 1904, and by R. G. Fennah October 1939.

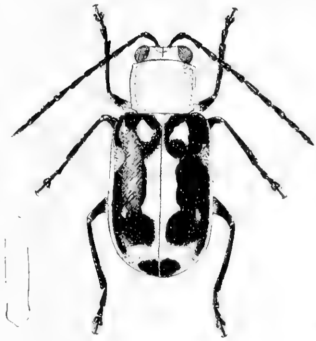
Remarks.—This is very close to *D. fucata* (Fabr.) and may be only a subspecies. Except for the elytral markings which are paler as well as consisting of three short pale greenish bands instead of two dark bluish green (described by Fabricius as *cyaneus*) spots on each elytron, it resembles *fucata*.

Longitarsus rhabdotus, new species

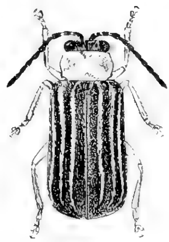
(Figure 2)

About 1.5 mm. in length, elongate oblong-oval, somewhat shiny, densely and moderately coarsely punctate, dull reddish brown, the elytra with a paler yellowish brown vitta from the humerus curving gradually inwards till it reaches the middle of the elytron before the apex; elytra truncate at apex with the abdomen showing.

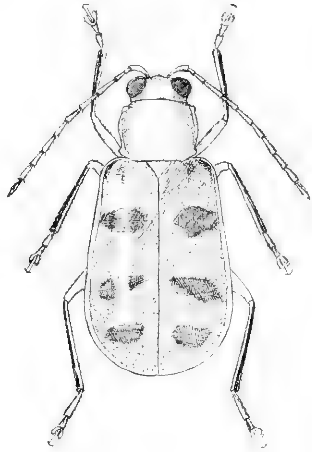
Head with the interocular space a little more than half width of head, occiput shining, a group of punctures near each eye, tubercles small but swollen and well defined, interantennal area produced; head on occiput and mouthparts darker brown, the lower front yellowish brown. Antennae extending about to the middle



10. Diabrotica fairi n.sp.

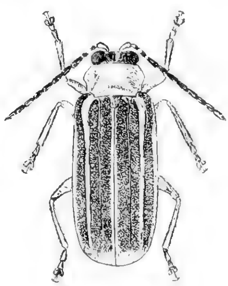


11. Galerucella hexarhabdota n.sp.

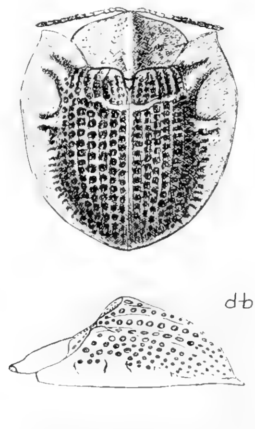


12. Diabrotica luciana n.sp.

13. Psalidonota jamaicana Spaeth



14. Galerucella jamaicensis n.sp.



15. Psalidonota dentata n.sp

of the elytra, second, third and fourth joints subequal and paler, rest deeper brown and widening towards apex. Prothorax moderately convex, with rounded sides, shining, densely and rugosely punctate, deep reddish brown. Scutellum brown. Winged elytra truncate at apex, with abdomen protruding below; humeri distinct with a little intrahumeral sulcus; surface densely and rugosely punctate, shiny, reddish brown with a paler and rather inconspicuous vitta on each elytron, extending from the humerus downwards and inwards to the middle and ending not far from apex. Body beneath deep reddish brown, the legs yellowish brown. Length 1.6 mm.; width 0.8 mm.

Holotype female (USNM Type No. 67338), St. Thomas, Virgin Islands, collected June 4, 1917 by Harold Morrison.

Remarks.—Only a single specimen of this is known, but the rugose punctation together with the vittate elytra sufficiently differentiate it from other species. It is one of the species of *Longitarsus* having the elytra truncate with the end of the abdomen exposed.

Longitarsus portoricensis, new species

(Figure 6)

About 1.3 mm. in length, elongate oblong-oval, shining, not at all alutaceous, the pronotum finely and densely punctate, the elytra a little more distinctly and as densely punctate, winged, with small humeri, entirely pale yellowish brown.

Head polished over occiput, a group of punctures near the eye, frontal tubercles small and inconspicuous, interantennal area prow-like and protruding, entirely pale yellowish brown. Antennae extending to the middle of the elytra, third joint shorter than second or fourth, entirely pale yellowish brown. Prothorax moderately convex with slightly rounded sides, shining, finely and densely punctate, yellowish brown. Scutellum yellowish brown. Elytra with small humeri and with short wings beneath, surface shiny and with distinct and moderately dense punctation, yellowish brown. Body beneath and legs entirely yellowish brown. Length 1.3–1.4 mm.; width 0.8 mm.

Holotype female (MCZ Type No. 30836) and 4 paratypes (MCZ), 4 paratypes, all females in USNM, all from L. Guanica, Puerto Rico, collected May 31, 1938 by P. J. Darlington, Jr.

Remarks.—Unfortunately all the specimens known are females. The elytra are longer than in the Cuban *L. seminulum* Suffrian, as well as the Haitian species, *L. hoffmani*, described in this paper.

Longitarsus felis, new species

(Figure 4)

About 1.5 mm. in length, elongate oblong-oval, somewhat alutaceous, especially on the pronotum, finely and densely punctate, the elytra densely and more coarsely punctate than the pronotum, dark yellowish brown.

Head with the interocular space half width of head, occiput polished down to the interantennal region, with little trace of frontal tubercles, carina projecting like a keel down the front, a few punctures near the eye, entirely yellowish brown. Antennae extending to the middle of the elytra, joints two to four subequal, the outer joints a little thicker. Prothorax moderately convex, with only slightly rounded sides, surface alutaceous, densely and finely punctate. Scutellum yellowish brown. Winged, although probably the wings are not very long; elytra with small humeri with a trace of intrahumeral sulcus, surface coarsely and densely punctate becoming somewhat finer towards apex, dark yellowish brown, somewhat shiny. Body beneath the legs dirty yellowish brown. Length 1.5 mm.; width 0.8 mm.

Holotype female (MCZ Type No. 30837), and 1 paratype (MCZ), 2 paratypes in USNM, collected on Cat Island, Bahamas, in July and August 1935 by W. J. Clench.

Remarks.—This is similar to *L. perforatus* Horn, but unlike that species it is winged and not so narrow. The elytral punctation is not so coarse and the pronotum is more distinctly punctate and alutaceous.

Longitarsus hoffmani, new species
(Figure 5)

About 1.5 mm. in length, oblong-oval, feebly shining, the pronotum and elytra finely and inconspicuously punctate, dirty yellowish brown, with the antennae except the three basal joints dark brown.

Head with the interocular space more than half width of head, occiput shining, smooth, a group of punctures near each eye, frontal tubercles poorly defined, interantennal area produced in a pronounced carina, entirely deep yellowish or reddish brown. Antennae with the three basal joints pale, the rest dark brown, not extending below the middle of the elytra. Prothorax smoothly rounded without depressions, the sides arcuate, surface feebly shining; finely punctate, dark yellowish brown. Scutellum triangular, yellowish brown. Winged (in some specimens underwings appear only rudimentary); elytra finely and moderately densely punctate, feebly shining, yellowish brown. Body beneath and femora reddish brown, the tibiae and tarsi yellowish brown. Length 1.2–1.6 mm.; width 0.7–0.8 mm.

Holotype male (USNM Type No. 67339) and 5 paratypes, collected on Mt. Cabrite, Haiti, on *Heliotropum parviflorum* by W. A. Hoffman on October 12, 1924.

Remarks.—The small size and relatively fine punctation distinguish this species. It is similar to a small species from Cuba that corresponds to Suffrian's description of *L. seminulum*, but the aedeagus is longer and more slender.

Longitarsus photinus, new species
(Figure 3)

Between 1.5 and 2 mm. in length, oval, wingless, shining, densely and moderately coarsely punctate, piceous with the pronotum sometimes with a reddish tinge; antennae and legs yellowish brown, undersurface deep reddish brown.

Head with the interocular space a little more than half width of head, occiput alutaceous with a group of coarse punctures on each side near the eye; a prominent carina between antennal sockets and extending down the lower front; usually deep reddish brown or piceous. Antennae yellowish brown, reaching the middle of the elytra, second and third joints about equal and shorter than the fourth. Prothorax convex with curved sides, shining, densely and moderately coarsely punctate, piceous, sometimes deep reddish brown. Scutellum piceous. Wingless; elytra without humeral prominences and widest before the middle, tapering towards apex, convex, shining, densely and coarsely punctate, deep piceous. Body beneath deep yellowish or reddish brown, legs yellowish brown. Length 1.5–2 mm.; width 0.8–1 mm.

Holotype male (MCZ Type No. 30838) and 14 paratypes, 7 of which are in the USNM, Loma Rucilla, 8,000–10,000 ft. alt., Dominican Republic, collected in June 1936 by P. J. Darlington.

Remarks.—*L. solidaginis* Horn from Florida is also black with "rufotestaceous" legs, and also coarsely punctate, but it is smaller and duller and without the lustre that is characteristic of this tiny species.

Hermaeophaga constanzae, new species
(Figure 7)

About 1.5 mm. in length, oblong-oval, shining, the prothorax deeply sulcate across the entire base, the elytra strongly and striately punctate, yellowish brown, the occiput of head dark brown, the elytra dark green, the breast and abdomen piceous.

Head with the interocular space half width of head, occiput smooth except for a few punctures near the eye, the frontal tubercles clearly cut, a carina down lower front, top of head dark, lower part yellowish brown. Antennae reaching below humeri, the two basal joints swollen, the succeeding joints narrower, and towards the apex becoming wider and darker. Prothorax convex with rounded sides and a sinuous basal sulcus extending across entire pronotum, finely punctate, yellowish brown. Scutellum dark. Elytra with strong striate punctation becoming finer after the middle, shining dark green. Body beneath with the breast and abdomen piceous, the legs entirely pale. Length 1.7 mm.; width 0.9 mm.

Holotype male (MCZ Type No. 30839), one female paratype in USNM, Constanza, Dominican Republic, 3,000–4,000 ft. alt., collected in August 1938 by P. J. Darlington.

Remarks.—This is slightly smaller than *H. punctata* and less brightly green with more regular elytral striation and a dark occiput. There is no confused mass of punctures in the middle of the elytra.

Hermaeophaga darlingtoni, new species
(Figure 8)

About 2.5 mm. in length, oblong-oval, shining, the prothorax with a sinuous basal sulcus across base, the elytra with geminate striate punctation, yellowish or reddish brown with the elytra bright green, the breast, abdomen and terminal antennal joints deep reddish brown.

Head with the interocular space half width of head, occiput polished down to the antennal sockets with little evidence of frontal tubercles, a very short knob of a carina between antennal sockets, lower front short, entirely pale yellowish brown. Antennae extending to the middle of the elytra, the two basal joints wider than the succeeding ones, the three terminal joints wider and deeper brown. Prothorax smoothly convex with slightly rounded sides and a deep, sinuous sulcus across entire base, surface densely and not coarsely punctate, shining yellowish brown. Scutellum dark. Elytra broad and convex with a transverse depression below the basal callosities; the punctation moderately coarse and in double rows becoming dense and confused towards the apex, shining bright green. Body beneath with the breast and abdomen dark brown, the legs pale yellowish brown, tibiae rather short. Length 2.3 mm.; width 1.4 mm.

Holotype female (MCZ Type No. 30840), Desbarriere, Mf., La Hotte, near 4,000 ft. alt., Haiti, collected in October 1934 by P. J. Darlington.

Remarks.—The three species of *Hermaeophaga* described here from Hispaniola are all of very similar coloring, but they all differ from each other in their elytral punctation. *H. darlingtoni*, the largest of the three, has a quite different face, also, with little sign of frontal tubercles and a very short lower front. The elytral punctation is in double rows.

Hermaeophaga punctata, new species
(Figure 9)

About 2 mm. in length, oblong-oval, shining, the prothorax with a sinuous basal sulcus extending the entire width, the elytra striately punctate, with a mass of irregular punctures near the suture in the middle, pale yellowish brown with the elytra bright green, the breast and abdomen dark piceous.

Head with the interocular space a little more than half width of head, occiput rounded, smooth, a group of punctures near the eye, tubercles clearly cut, a carina down lower front, entirely yellowish brown. Antennae not reaching much below the humeri, yellowish brown, the two basal joints wider than the succeeding, the outer joints also a little wider. Prothorax smoothly convex with a sinuous basal sulcus extending the entire width, finely punctate, pale yellowish brown. Scutellum brown. Elytra strongly striate punctate, the punctures near the middle and suture becoming very dense and confused, shining bright green or blue green. Body beneath with the breast and abdomen dark piceous, legs entirely yellowish brown. Length 2–2.1 mm.; width 1 mm.

Holotype female (MCZ Type No. 30841), San José de las Matas, Dominican Republic, 1,000–2,000 ft. alt., collected in June 1938 by P. J. Darlington.

Remarks.—One other specimen, also a female, of what is probably the same species was collected by Darlington on Mt. Trou d'Eau, Haiti, in November 1934. This specimen has almost costate elytra with the elytral striae deeply sunken, and the punctation near the suture is quite dense and confused as in the specimen from the Dominican Republic.

Hermaeophaga maldonadoi, new species
(Figure 1)

About 2.5 mm. in length, oblong oval, lustrous, the prothorax finely and the elytra more coarsely and densely punctate, the punctures tending to be striate, blue green or violaceous, the head dark on occiput and shining with a metallic lustre but reddish brown in lower front, antennae and legs deep reddish brown.

Head with interocular space approximately half width of head, occiput of head down to frontal tubercles shining dark bluish green, frontal tubercles clearly cut, a prominent carina down the lower front which is reddish brown. Antennae extending below humeri, fifth joint longest after the basal, all joints widened and rounded at apex, especially from the 6th to 11th, deep reddish brown. Prothorax smoothly convex with fine punctures and a sinuate groove across at base, an oblique angle anteriorly and a small tooth at base, lustrous blue green or violaceous. Scutellum dark. Elytra shining blue, green or even violaceous, with dense and distinct punctation that tends to be striate in basal half becoming less so on sides and at apex. Body beneath metallic blue or green except the abdomen which is reddish brown. Legs also reddish brown with the front tibiae sometimes slightly metallic. Length 2.3–2.6 mm.; width 1.2–1.9 mm.

Holotype male (USNM Type No. 67340) and 8 paratypes, four of which are in the College of Agriculture, Mayaguez, Puerto Rico, collected at St. Thomas, Virgin Islands, March 27–30, 1961, by J. Maldonado Capriles.

Remarks.—This is close to the Puerto Rican species, *H. cylindrica* Weise, but differs from it by the more strongly punctate elytra, by the reddish brown legs and abdomen and lower face, and also by the differently shaped aedeagus.

Psalidonota dentata, new species

(Figure 15)

About 12 mm. in length, nearly as broad as long with rounded sides, head completely concealed by the prothorax, prothorax with a convex median area leveling out in a broad explanate margin on the sides and anteriorly, basal margin sinuate over scutellum, elytra with a hump behind the scutellum, a widely explanate margin extending forwards and outward in a curvature with a tooth at the end, the surface very coarsely and striately punctate, deep reddish brown with irregular golden areas, margin paler in color, antennae and legs golden brown.

Head concealed from above by prothorax, with very large eyes close together, a deep median groove down front, tubercles inconspicuous, mouth declivous. Antennae extending to the width of the elytra in front, pale yellow brown, a little darker towards apex. Prothorax curving forwards over head in the middle, widest anteriorly, narrowed almost in a straight line towards base, basal margin deeply sinuate over scutellum, surface uneven with a median convexity down the middle and on the sides flattening out with irregular depressions and scattered punctation, shiny, alutaceous, reddish brown. Scutellum shield-shaped, reddish. Elytra strongly convex in basal half with a rounded hump below the scutellum and explanate margin on the sides widest in the anterior half and projecting forwards and outwards with a tooth at the anterior angle; the convex portion of the elytra with very large contiguous and deep striate punctures in eight or nine rows, a little confused on the sides; shiny although alutaceous, deep reddish with irregular golden brown areas, probably in life much more golden, margin a lighter red. Body beneath and legs yellow brown. Length 12.5 mm.; width 11.5 mm.

Holotype (sex undet.) (USNM Type No. 67341), Christiana, Manchester, Jamaica, collected July 18, 1955 by Mrs. J. C. Stephens.

Remarks.—*Psalidonota obtusa* Boh. from Brazil is described as being "rufotestacea," the only one approaching in color the present species. All the rest are paler yellow brown. Besides being unusual in its coloration, this species is also a little larger, the majority of the others varying from 7 to 11 mm. and being not so coarsely and densely punctate. The shape of the anterior projection of the humeri is different from any of them in that instead of being smoothly rounded there is a small but distinct tooth. In the matter of this sharply produced humeral projection, the beetle somewhat resembles *Plagiometriona gibbifera* (Champ.) but the prothorax is differently shaped and the whole beetle is broader proportionately. It is unlike any other cassid beetle found up to this time in the West Indies and may be sufficiently different to warrant generic standing.

A NOTE ON THE OCCURRENCE OF NERTHRA RUGOSA (DESJ.) IN BRAZIL.

(HEMIPTERA: GELASTOCORIDAE)

Nerthra rugosa (Desjardins), the most widely distributed gelastocorid, has been reported from Mauritius, the Indo-Australian region, Pearl Island, Panamá and Florida. It is now recorded from two localities in São Paulo, Brazil.

Mr. Reinhart Schuster, the collector, Zoologisches Institut der Technischen Hochschule, Braunschweig, Germany, has sent six specimens to Dr. C. J. Drake for his collection. One adult male and three nymphs were collected in algae (*Bostrychia* sp.) in the intertidal zone of the rocky sea coast near São Sebastião in December, 1960. Two nymphs were captured in the same kind of habitat near Ubatuba in July, 1960.—E. L. TODD, *Falls Church, Virginia.*

NOTICE

SNODGRASS REPRINT COLLECTION

The Robert E. Snodgrass library of reprints on insect anatomy and morphology is now housed in the U. S. National Museum, Department of Entomology, and is being perpetuated as a memorial to Dr. Snodgrass. Contributors to the field of insect morphology are invited to send copies of their papers, to be included in the library, to: **Snodgrass Reprint Collection, Department of Entomology, U. S. National Museum, Washington, D. C. 20560.**

NOTES ON SOME SMALL MAMMAL ECTOPARASITES FROM NORTHWEST TERRITORIES, CANADA

(ANOPLURA, SIPHONAPTERA, AND ACARINA)

Recent investigations in the Far North concerning the epizootiology of parasites in Arctic nesting birds, under the direction of Dr. E. L. Schiller of Johns Hopkins University, School of Hygiene and Public Health, have provided the opportunity for collecting limited numbers of mammal ectoparasites as well. In view of the paucity of information available regarding the occurrence, host relationships, and distribution of small mammal ectoparasites from this area the following records may be of general interest to biologists.

We would like to express our sincere appreciation to Dr. Schiller for allowing us to study this material, and to thank Dr. Cluff E. Hopla, University of Oklahoma, and Dr. R. W. Strandtmann, Texas Technological College, for assisting us in identifying the fleas and mites.

The following ectoparasites were collected near Reindeer Station, approximately 68° N lat. and 134° 10′ W long., Northwest Territories, Canada, during August 1963, from several red-backed voles (*Clethrionomys rutilus*), by Dr. Reza Behin.

ACARINA

Laelaptidae. *Laelaps clethrionomydis* Lange, 1955 (5 ♀♀ and 1 ♂).

Dermanyssidae. *Hirstionyssus isabellinus* (Oudemans), 1913 (4 ♀♀).

Haemogamasidae. *Haemogamasus ambulans* (Thorell), 1872 (4 ♀♀, 2 nys., and 1 ♂).
Haemogamasus alaskensis Ewing, 1925 (5 ♀♀).

Listrophoridae. *Myocoptes* sp. (1 ♀ and 1 ny.).

ANOPLURA

Hoplopleuridae. *Polyplax alaskensis* Ewing, 1927 (8 ♀♀ and 1 ♂).

SIPHONAPTERA

Hystrichopsyllidae. *Catallagia dacenkoi fulleri* Holland, 1951 (7 ♀♀ and 2 ♂♂).

Ceratophyllidae. *Malaraeus penicilliger dissimilis* Jordan, 1929 (6 ♀♀ and 5 ♂♂).
Megabothris calcarifer gregsoni Holland, 1950 (1 ♀).

One additional ceratophyllid, *Monopsyllus vison* (Baker), 1904 (2 ♀♀ and 1 ♂), was collected at Aklavik, Northwest Territories, Canada, June 22, 1959, from the red squirrel (*Tamiasciurus hudsonicus*), by Dr. E. L. Schiller.

The above record of *Laelaps clethrionomydis* is apparently the first from North America. This mite is very similar to *Laelaps alaskensis* Grant, 1947, and the two are separated in Tipton's key (1960. *The genus Laelaps.* Univ. Calif. Publ. Ent. 16(6): 233–356) on the basis of the length of the adanal and ventral setae. All of the specimens from the present collection have the postanal seta less than twice as long as the adanal setae and the ventral setae adjacent to the epigynial plate are approximately ½ as long as the epigynial setae.—CARL J. MITCHELL AND REZA BEHIN, *Department of Pathobiology, Johns Hopkins University, School of Hygiene and Public Health, Baltimore, Md.* This study supported in part by U.S. Public Health Service Grant A1-01915-05.

A NOTE ON MEGACHILE MENDICA CRESSON IN TRAP-NESTS IN WISCONSIN

(HYMENOPTERA: MEGACHILIDAE)

J. T. MEDLER,[1] *Department of Entomology, University of Wisconsin, Madison*

Trap-nests consisting of holes drilled in sumac stems have been used in Wisconsin to learn about the biology of certain native bees that construct nests in holes in wood. The most common species of bee occupying the traps is *Megachile relativa* Cresson, reported on by Medler and Koerber (1958). A closely related bee also utilizing traps is *Megachile centuncularis* (Linn.), as noted by Medler (1959). Another bee with similar nesting habits is *Megachile mendica* Cresson. No information on the biology of this species has been published, other than a preliminary report on its distribution in Wisconsin by Koerber and Medler (1959).

Fifty-seven nests of *mendica* were collected during 1952–1962. The nests were found mostly in southern Wisconsin, except one nest which was obtained in 1959 at Council Grounds State Forest, Lincoln County, in the north-central part of the state. The species was not collected in trap-nests in the northern part of the state where *relativa* and *centuncularis* were common.

The species of *Megachile* in the trap-nests were determined by laboratory rearings. The cells were identified by code numbers and transferred singly to 10×35 mm glass vials plugged with cotton. Cells from summer generation nests were reared at room temperatures. The cells from nests collected in late summer or fall were placed in 4.5° C to break the larval diapause. Following various periods of cold treatment, the cells were incubated at a warm temperature, mostly 21° C, until emergence of adults.

Ninety-nine males and 100 females of *M. mendica* were reared successfully from a total of 325 cells placed in incubators. The contents of twenty-two cells were found unsuitable for rearing as they were molded (8), empty (13), or had been crushed in handling (1). Larvae in 71 cells were discarded when pupation and emergence did not follow various time-temperature treatments used to break diapause. Twenty-one *Coelioxys sayi* Robertson and two *Coelioxys octodentata* Say were reared. Ten cells contained *Melittobia chalybii* Ashmead. This small parasite may have entered cells in the field, but more likely the records represented contamination which took place in the incuba-

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[1] Professor of Entomology, University of Wisconsin, Madison. This work was supported in part by a grant-in-aid by the Research Committee of the Graduate School from funds supplied by the Wisconsin Alumni Research Foundation. The author acknowledges the generous aid of T. B. Mitchell in identification of specimens.

tors. In early rearings, the wasp penetrated the corks used for the vials. Such contamination was prevented subsequently by using cotton plugs.

M. mendica nested mostly in holes ¼-inch in diameter, but also used 3/16- and 5/16-inch holes. The foundress bee constructed a linear series of thimble-shaped cells each 10–14 mm long, using several pieces of oblong-oval green leaf. Circular leaf pieces were used to cap the cells, and to plug the hole orifice. The orifice plug was usually 3–4 mm thick, but sometimes much thicker. A vestibule of variable length was left between the last cell and the plug. Usually the vestibule space was empty, but occasionally the space was packed loosely with fragments of leaves. Summer generation nests had 5.3 ± 2.8 cells per nest, range 1–11, whereas overwintering nests had 6.1 ± 3.4 cells, range 1–13. The mean of all nests was 5.7 ± 3.1. The difference in means between summer and overwintering nests was not significant.

The rearing data (table 1) showed that normally the females preceded males in cell sequence, but that nests were sometimes constructed with either all females or all males. The sex ratio of reared specimens was 1 : 1. The out-of-sequence female in cell 5 of nest 12 had a head width of 3.5 mm. Females obtained from cells in normal sequences had an average head width of 4.3 mm. The small female in a series of male cells was of interest, and suggests that a female egg had been laid in a cell provisioned for a male. Possibly the quantity of food provided for males is less than for females, and such a deficiency was responsible for the small size of the female.

With regard to *Coelioxys* parasitism, there was no consistent pattern. A high percentage of cells were parasitized in nests 13 and 15. One or two parasites were reared from the other nests. The parasites occurred either in first-made or last-made cells; or in the middle of a series as in nest 18. About 25 percent of the total cells in nests 13–22 contained *Coelioxys*, with all specimens being *C. sayi* Robt. except 2 specimens of *C. octodentata* Say in nest 18. Fifteen of the 57 *mendica* nests contained *Coelioxys*.

Mixed nests of *mendica* and aculeate wasps (*Trypoxylon, Dipogon, Rygchium*, and *Ancistrocerus*) were found in ten of the traps. The wasps superseded the bee five times, and entombed 23 cells. Six of the mixed nests represented overwintering generations.

The life cycle consisted of two generations. A summer generation was completed in July and August. The adults emerging from these nests proceeded to provision nests in August and September. Many such nests were found with fully developed larvae in cocoons. A few nests were brought in from the field in early October which contained early-instar larvae. These insects were maintained at room temperature, and several completed their development, pupated, and emerged as adults without being subjected to cold treatment. The results suggested that an obligatory diapause may not occur. However, most of

Table 1. Rearing records of *Megachile mendica* Cresson in trap-nests, showing the sequence of females and males in cells, and parasitism by *Coelioxys*.

Nest Number	Cell Number 1	2	3	4	5	6	7	8	9	10	11	12	13
1	♀												
2	♀	♀											
3	♀	♀	♂										
4	♀	♀	♀	♀	♀	♀							
5	♀	♀	♀	♀	†	♂	♂	♂					
6	♂	♂	♂	♂	♂	†	†	♂					
7	♀	♀	♀	♀	♀	♀	♀	♂	†				
8	♀	†	♂	♂	♂	♂	♂	♂	♂				
9	♂	♂	♂	♂	♂	♂	♂	♂	♂				
10	†	♀	♀	♀	♀	♀	♀	♀	♀	♂	♂		
11	♂	♂	♂	♂	♂	♂	♂	♂	♂	†	♂	♂	
12	♂	♂	†	Mc	♀	♂	†	†	♂	♂	†	♂	♂
13	♀ Cs	♀	♂ Cs										
14	♀	♀	♀	♂ Cs									
15	♀	♀ Cs	♀ Cs	♀ Cs									
16	♀	Mc	♂	♂	♀ Cs								
17	♀	♀	♀	♀ Cs	♀	♀							
18	♀	†	♀ C8	♀ C8	†	♀							
19	♀	♀ Cs	♀	♀	♂	♂	♂						
20	♂	♂	♂	♂	♂	♂	♂	♂ Cs					
21	♀	♀	♀	♀	♀	♀	♀	♀ Cs	♂ Cs				
22	†	♂ Cs	♀ Cs	*	†	♂	†	♂	♂	†	†	†	♂

Explanation of symbols: Cs = *Coelioxys sayi* Roberston; C8 = *Coelioxys octodentata* Say; Mc = *Melittobia chalybii* Ashmead; † = larva died during rearing; * = spoiled provisions.

the fully developed larvae taken in the fall were successfully reared to adults after being held at 4.5° C for periods of 10–30 days, as this treatment was thought necessary to break a diapause.

At 21° C, *mendica* completed its cycle from egg hatch to larval maturity in about one week. The opaque-brown cocoon was spun in one day. Approximately 3 weeks were required for pupal development and emergence of the adult. *Coelioxys* had a 3–4 days shorter life cycle than *mendica*.

The inside diameters of cocoons were 4.5–5 mm. All cocoons contained bees with their head directed toward the orifice. The head-outward position occurred at the time the larva finished spinning the cocoon. Possibly, the concave bottom of the cell constructed by the mother bee provided the "digital communication" necessary to properly orient the larva, as has been shown for certain wasps by Cooper (1959).

The *mendica* nests usually were found in traps hung in isolated trees in meadows, or in trees at the edges of woods bordered by large fields. These were in rather open and dry environments.

The University of Wisconsin Collection contains specimens of *mendica* collected at Gays Mills, Madison, Oshkosh, Racine, Reedsville and in Iowa County. None of these specimens give information on flower hosts. However, R. E. Fye collected a male on mustard, *Brassica nigra* (L.) Koch, May 30, 1953, at Madison. Flower records of this species were summarized by Mitchell (1962).

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THE NORTH AMERICAN SPECIES OF METACOLUS
(Hymenoptera, Pteromalidae)

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The genus *Metacolus* Foerster includes a small number of species that are parasitic on scolytid beetles in forest trees. In the Palearctic region it includes *M. unifasciatus* Foerster and *M. varicolor* (Foerster), but it has long been thought that only one species, *M. fasciatus* Girault, exists in North America. On the basis of published descriptions alone, there would be considerable justification for considering our *fasciatus* to be the same as the Palearctic *unifasciatus*. However, Dr. Bouček of the National Museum of Prague has recently sent us identified male and female specimens of *unifasciatus*. When I compared the two species, it was quite evident that *unifasciatus*, in which the male forewing lacks a sclerotic spot behind the marginal vein and has a prominent marginal crossband, is different from *fasciatus*, in which the male forewing has a sclerotic spot and lacks the marginal crossband. The females of the two differ most obviously in the coloring of the forewings, the submarginal crossband of *fasciatus* being absent in *unifasciatus*. Dr. Hedqvist of the Swedish Museum of Natural History, Stockholm, has sent us an identified female specimen of *varicolor*, which also proves to be different from our species. In *varicolor* the forewing has the marginal vein relatively narrower, and there are no colored crossbands.

There has long been a second, undescribed, species of a North American *Metacolus* in the U. S. N. M. collection. It is described here, along with a recharacterization of *fasciatus*.

Metacolus Foerster

Metacolus Foerster, 1856, Hym. Stud., v. 2, p. 65; Thomson, 1878, Hym. Scand., v. 5, p. 36; Dalla Torre, 1898, Cat. Hym., v. 5, p. 174; Ashmead, 1904, Carnegie Mus. Mem., 1: 315, 316, 381; Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 316, 317; Girault, 1917, Descr. Stell. Nov., p. 14; Mercet, 1924, Rev. Fitopat., pt. 1, p. 2; Ferrière, 1948, Schw. Ent. Ges. Mitt., 21: 519, 529; Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog., 2, p. 549; Burks, 1953, Ent. Soc. Washington Proc., 55: 44; Bouček, 1957, Acta Faun. Ent. Mus. Nat. Prag., 2: 76; Burks *in* Krombein *et al.*, 1958, U.S. Dept. Agr. Monog. 2, Suppl., p. 76; Peck, 1963, Canad. Ent. Suppl. 30, p. 655; Hedqvist, 1963, Stud. Forest. Suecica, No. 11, p. 97.

Type.—*Metacolus unifasciatus* Foerster; monotypic.

Pterosema Foerster, 1878, Naturh. Ver. Preuss. Rheinl. Verh., 35: 44; Dalla Torre, 1898, Cat. Hym., v. 5, p. 200; Ashmead, 1904, Carnegie Mus. Mem., 1: 331, 332, 387; Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 375, 376, 382; Bouček, 1957, Acta Faun. Ent. Mus. Nat. Prag., 2: 76 (= *Metacolus* Foerster).

Type.—*Pterosema varicolor* Foerster; monotypic.

The following combination of characters will distinguish the members of the genus *Metacolus* from all other genera of the family Pteromalidae:

Head in anterior aspect slightly wider than high, subquadrate; antennae inserted in center of frons, well above level of ventral margins of compound eyes; antennal formula—1 : 1 : 2 : 6 : 3, second ring segment longer than first; club wider than funiculus; pronotum subconic, immargined anteriorly; parapsidal grooves weak anteriorly, wanting posteriorly; marginal vein of forewing short and greatly thickened, stigmal and postmarginal veins much shorter than marginal; all femora enlarged, hind tibia with one apical spur; propodeum almost or quite smooth, median and lateral carinae absent, spiracles small and removed from anterior propodeal margin; gaster sessile and longer than thorax in female, subequal to thorax in male; apex of gaster conically produced and slender in female, subtruncate in male. Antigeny not great, sexes differing chiefly in shape of gaster.

Key to Nearctic Species

Thorax tan with metallic green shading dorsally and with faint lavender metallic sheen laterally; apex of antennal scape exceeding level of vertex .... **fasciatus** Girault

Thorax uniformly purplish-black; apex of antennal scape not quite reaching level of anterior ocellus .... **keeni**, new species

Metacolus fasciatus Girault

Metacolus fasciatus Girault, 1917, Descr. Stell. Nov., p. 14; Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 549; Burks, 1953, Ent. Soc. Washington Proc., 55: 44; Burks *in* Krombein *et al.*, 1958, U.S. Dept. Agr. Monog. 2, Suppl., p. 76; Peck, 1963, Canad. Ent. Suppl. 30, p. 655.

Metacolus bifasciatus Girault, 1917, Descr. Stell. Nov., p. 14; Peck *in* Muesebeck *et al.*, 1951, U.S. Dept. Agr. Monog. 2, p. 549; Burks, 1953, Ent. Soc. Washington Proc., 55: 44 (= *fasciatus* Girault).

Tan, with strong metallic blue-green shading on head and dorsum of thorax; weaker metallic lavender shading on thoracic pleura, coxae, and femora; propodeum and gaster usually with faint metallic green or lavender shading. Female forewing with a dark brown crossband at apex of submarginal vein and another behind marginal vein; male wing with a large, rounded and sclerotized spot behind marginal vein, submarginal crossband faint or wanting, marginal crossband absent.

Female.—Length 2.0–2.75 mm. Face shagreened, mat; parascrobal areas and frontovertex faintly sculptured and shining; apex of antennal scape exceeding level of vertex; basal 4 funicular segments longer than broad, fifth segment as broad as long, sixth broader than long; malar space ⅔ as long as compound eye; ocellocular line ½ as long as postocellar line. Thoracic dorsum with strong, alveolate sculpture; fore and hind femora each ⅓ as wide as long, mid femur slightly narrower; prepectus and metepisternum faintly sculptured, almost smooth; mesepisternum with uniform alveolate sculpture, densely hairy; mesepisternum without hair, dorsal sector smooth and shining, ventral sector with fine and relatively weak alveolate sculpture; forewing with marginal vein ½ as broad as long; stigmal and postmarginal veins subequal in length and each ½ as long as marginal; stigmal knob not enlarged, but pigmented. Propodeum almost smooth, with fine and faint alveolate sculpture; spiracles circular. Gaster twice as long as thorax.

Male.—Length 1.9–2.1 mm. Fore femur ⅓ as wide as long, mid femur $\frac{3}{10}$ as broad as long, hind femur ⅖ as broad as long; gaster 1¼ times as long as thorax.

Type locality.—Las Vegas Hot Springs, N. Mex. (Montezuma, N. Mex., of present-day maps.)

Type.—USNM No. 19787.

Distribution.—North Dakota south to New Mexico, west to Washington and California.

Host relationships.—This species presumably is a primary parasite of scolytid beetles in coniferous trees. It usually is reared, however, in association with a variety of other parasites which makes its exact host relationships difficult to establish. It has been reared from *Pinus ponderosa*, *P. monophylla*, and *P. jeffreyi* and from *Juniperus deppeana pachyphloea*, all infested with scolytids.

Metacolus keeni, new species

Black with dark iridescent purple sheen; face metallic green, basal 2 or 3 segments of mid and hind tarsus white; forewing with marginal vein, and a broad band crossing wing behind it, black.

Female.—Length 2.0–2.3 mm. Face shagreened and mat, parascrobal areas smooth and shining, frontovertex faintly sculptured, shining; antennal scape short, its apex not quite reaching anterior ocellus; all funicular segments broader than long; malar space ⅗ as long as compound eye; ocellocular line ½ as long as postocellar. Thoracic dorsum with weak alveolate sculpture; hind femur ⅓ as broad as long, fore and mid femora slightly narrower; prepectus and metepisternum smooth and shining; mesepisternum faintly sculptured and sparsely hairy at margins, mesepimeron smooth and shining; forewing with marginal vein ⅓ as wide as long, stigmal and postmarginal veins subequal in length and each ½ as long as marginal; stigmal knob greatly enlarged and hyaline. Propodeum smooth and shining; spiracles short oval. Gaster 1½ times as long as thorax.

Male.—Length 1.5–1.8 mm. Gaster 1¼ times as long as thorax.

Type locality.—Big Bear, San Bernardino National Forest, Calif.

Types.—USNM No. 65001.

Described from 4 ♀ and 3 ♂ specimens as follows: Type ♀, allotype ♂, and 2 ♀ paratypes reared under Hopkins No. 18137-j, at Big Bear, San Bernardino National Forest, Calif., Sept. 1, 1928, from *Pinus monophylla* infested with *Pityophthorus* sp., F. P. Keen; 1 ♀ paratype, Hopkins No. 32542-C, Mt. Laguna, Calif., Nov. 1940, from *Pinus coulteri* infested with *Cylindrocopturus* sp. and *Pityophthorus* sp., D. M. DeLeon; 1 ♂ paratype, Hopkins No. 33856-d, Mt. Laguna, Calif., April 1952, reared from *Pinus jeffreyi,* R. Z. Callahan; 1 ♂ paratype, Capulin, N. Mex., Dec. 27, 1934, reared from *Pinus edulis,* D. M. DeLeon.

Host relationships.—This species apparently is a primary parasite of scolytid beetles in pines.

THREE EXAMPLES OF INSECT TERATOLOGY

Abnormalities in insects have been reported in all stages from embryos to adults. Five recent issues of Zoological Record list 113 titles on the subject. The following three examples seem worthy of record.

Phyllophaga bruneri Chapin, the Cuban May beetle (Coleoptera: Scarabaeidae). One male from Miami, Florida, September, 1963, D. S. Jackson, has four extra segments in the middle of the left antenna, hence the appendage has 13 segments instead of the usual 9. Two of the extra segments are asymmetrical, a third is short and ring-shaped. The usual segments 1–3 and 4–9 (now 8–13) of this antenna are normal in size and shape. Figure 1A shows the abnormal antenna, with segments 3–5 of a normal antenna in comparison.

Lispe consanguinea Loew (Diptera: Muscidae). A male of this species from Lake Aquelmare Azigza, 21 miles N.E. of Khenrifa, Morocco, July 10, 1962, E. C. Trivette, has six segments in both fore tarsi, the extra segment being formed by division of the second segment. Figure 1B shows this tarsus, with a normal second segment in comparison. The middle and hind legs are lost, so it is not known if the other tarsi were similar in this respect.

Eurytoma species (Hymenoptera: Eurytomidae). A male reared from mealy leaf galls on *Rosa*, Pullman, Wash., Aug., 1964, has no hind legs. The thorax seems normally shaped but there are no vestiges of hind coxae. Attention to this specimen was drawn by the fact that, though it had successfully emerged from the gall, it had not completely sloughed its pupal exuvium. Without the hind legs it could not reach the apices of the wings and abdomen.—H. RODNEY DODGE, *Department of Entomology, Washington State University, Pullman, Washington.*

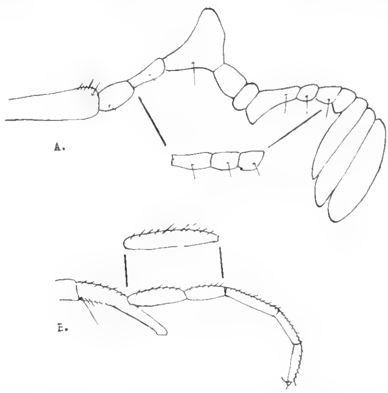

Figure 1. A. *Phyllophaga bruneri* Chapin, 13-segmented antenna, with segments 3–5 of a normal antenna; B. *Lispe consanguinea* Loew, 6-segmented fore tarsus, with a normal second segment.

LEWIS H. WELD

1875–1963

Lewis Hart Weld, a member of the Entomological Society of Washington since 1920 and an Honorary member since 1960, died on April 22, 1964.

He was born December 30, 1875, on a farm near Medina in Orleans County, New York, the only child of John and Fedelia Hart Weld. He passed his childhood on the farm, beginning primary school at the nearby community of Ridgeway in 1882. In 1889 he transferred to the schools in Medina to finish his grade schooling and to go to high school. In the spring of 1896 he graduated from the Medina High School, and that fall he entered the University of Rochester.

As an undergraduate he showed such exceptional ability that he was chosen as an assistant in science to Professor C. W. Dodge for his junior and senior years. He took his A. B. degree in 1900, with Phi Beta Kappa, and that fall he entered the University of Michigan to do graduate work in Zoology. He remained at Michigan for two years, serving as an assistant to Professor Jacob Reighard, and receiving his M. A. in June, 1902. He spent the summer of 1902 photographing freshwater mussels for Dr. Bryant Walker of Detroit. That fall he went to Syracuse University as a graduate student and remained there one academic year before transferring to Cornell University. He spent the academic year of 1903–04 at Cornell, and while there he formed life-long friendships with O. A. Johannsen and J. C. Bradley. At Cornell he studied entomology under Comstock and mycology under Atchinson. He did not take a degree at Cornell, but left there in 1904 to become an instructor at Evanston Academy, a secondary school associated with Northwestern University. He remained at Evanston Academy from 1904 until 1917.

While at Evanston Academy he took an active part in entomology and in biological science in general. In 1907 he became a charter member of the Entomological Society of America. He also joined the American Association for the Advancement of Science in 1907, becoming a Fellow in 1913. In 1909 he was elected to membership in Sigma Xi by the University of Michigan. In 1915 he married Clara O. Jamieson, of Moline, Illinois.

During his early years at Evanston he began the study of cynipid galls. He soon found that he got very little help from the available literature. So he spent his spare time for several years at the John Crerar Library in Chicago compiling an exhaustive bibliography on Cynipidae. He also began a rearing program that was eventually to give him an enormous collection of gall wasps. He taught biology in Evanston during the fall, winter and spring, but the summers were his to use for field work on cynipids. In 1906 and 1908 he went to Colorado, and in 1909 he made a trip to Yellowstone National Park. In 1910 he collected in King's Canyon, California, and in northern Mexico.

In the summer of 1911 he went to Friday Harbor, Washington, to study marine biology, combining this project with an extended collecting trip for cynipid galls in the Pacific Northwest. He took a year's leave during 1913–14 in order to go to the American Museum, Cornell, and the U.S. National Museum and identify the cynipid galls and gall wasps he had accumulated during the preceding nine years. During this year of study he also managed to get in a collecting trip to Florida in the spring of 1914. The summer of 1916 found him again in the field, collecting cynipid galls in New Mexico, Arizona and the Pacific Coast States. The Evanston Academy closed in June 1917, and in the fall of that year he was free to make another collecting trip, this one through Missouri, Arkansas and Texas. In the spring of 1918 he collected on the West Coast for the U.S. Bureau of Entomology. That fall he became an assistant to Professor W. A. Locy of Northwestern University, and he remained at Northwestern for the academic year 1918–1919. In the summer of 1919 he came to Washington to work on Cynipoidea for the Bureau of Entomology, in the U.S. National Museum. He took leave that fall to make a collecting trip in Florida and Alabama with Mrs. Weld. Afterward, he returned to Washington and remained there until September of 1921.

In late September 1921 Mr. and Mrs. Weld acquired a Dodge truck and set off on a really grand-tour collecting trip for cynipid galls. This expedition lasted from September 1921 until December 1922 and covered 17,000 miles. They collected all the way from Illinois to New Mexico and Arizona (passing two winter months in Phoenix pinning specimens), then through California, Oregon and Washington. They then returned south, through California again and on to Arizona, New Mexico, Kansas, and finally through Illinois back to Washington, D.C. This trip yielded an enormous collection of galls and gall wasps.

On January 1, 1923 Mr. Weld again took up his work for the Bureau of Entomology in the National Museum, but he resigned June 1, 1924 to spend the rest of his life working independently. He was not wealthy but he had adequate independent means, and he preferred to work entirely unhampered by any sort of official responsibilities, supervision or restraint. He did, however, remain a collaborator with the Department of Agriculture for the remainder of his life. He performed all the routine identifications of cynipid material received by the Insect Identification Branch for almost forty years. He did this without receiving any compensation other than the satisfaction he derived from studying the material and being helpful.

During 1924 and early 1925 he built a home on a four-acre tract in East Falls Church (now Arlington), Virginia. He designed this as a combination home and laboratory, with good north light for his study and ample outdoor facilities for rearing cynipids. (Most cynipids can be reared successfully only if the galls are exposed to the weather, many species requiring more than a year's exposure to the elements.)

Mr. and Mrs. Weld attended the Fourth International Congress of Entomology at Ithaca, N.Y., in 1928. In January of 1929 he sailed for Europe, to study the types of Cynipoidea deposited in the collections in London and Vienna, and in 1931 he went to Europe again, this time to study the types at Lund, Berlin, Munich and Paris. He attended the Fifth International Congress of Entomology in Paris in 1932, in a party organized by J. C. Bradley.

In 1952 Mr. Weld published at his own expense a large work entitled "Cynipoidea, 1905–1950." This was ostensibly a supplement to the *Das Tierreich* volume on cynipids by Dalla Torre and Kieffer, which covers the world literature up to 1905. Mr. Weld's work is, however, much more than a supplement to Dalla Torre and Kieffer. It not only lists all the genera and species for the world that were described between 1905 and 1950, but it also includes keys, with profuse illustrations, to all categories in Cynipoidea down through genera, with keys to the species for some genera. Unfortunately the work was published in a very small edition. It was a rare book the day it appeared, and it has long been out of print.

In 1957, 1959 and 1960 he published illustrated manuals for the identification of the cynipid galls of the Pacific Slope, the Eastern United States and the Southwest, respectively. These were also published privately but in larger editions, and copies of all are still available.

All told, Mr. Weld published 37 papers on cynipids and there are now two others in manuscript, awaiting publication. He described 11 genera and 198 species.

He was an avid gardener, and one who made his garden flourish without chemical fertilizers or insecticides. No one is known ever to have seen a can of insecticide on his shelves of plant supplies, and he was a strict advocate of green manures. He was also an authority on Chinese cooking, and he and Mrs. Weld frequently dined in Chinese restaurants. Other interests included music, art and travel. He and Mrs. Weld seldom missed one of the better concerts given in Washington; they frequented the art galleries, and they regularly attended travel lectures of the National Geographic Society. In the late fifties they made two long ocean voyages which they enjoyed greatly. Both were on freighters, one to the Eastern Mediterranean and the other to South America.

Mr. Weld died suddenly, but peacefully, at his home in Arlington. His body was cremated and his ashes were interred at Medina, N.Y. He leaves no direct descendants, being survived only by Mrs. Weld.—B. D. Burks, *Chairman*, C. F. W. Muesebeck and Louise M. Russell.

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1962. New synonymy in Cynipoidea. Proc. Ent. Soc. Wash. 63: 279–280.

In addition, Mr. Weld prepared the manuscript for the Cynipoidea section of the forthcoming Second Supplement to the Catalog of Hymenoptera of America North of Mexico. He completed this shortly before his death. He also left a manuscript supplement to "Cynipoidea 1905–1950," covering the literature through 1960.

HERBERT J. CONKLE

1905–1965

Herbert James Conkle, Custodian of the Washington Entomological Society's publications from 1953 through 1964, died January 7, 1965, after a fall at his home at 9203 Limestone Place, College Park Woods, Maryland. He was a Chief Staff Officer of the Plant Quarantine Division, Agricultural Research Service, U.S. Department of Agriculture, stationed at Hyattsville, Md.

Herb was born February 26, 1905, at Bellevue, Ohio. He received a B.S. degree from Ohio State University in 1929. He was first employed as a Junior Plant Quarantine Inspector by the Agricultural Department in January 1930 and was stationed in Cincinnati. In Cincinnati and in subsequent assignments in Louisville, Memphis, Washington, Boston, New York City, Alexandria, Va., and Chicago, he was engaged in transit inspection of mail and freight to detect violations of plant quarantines. In September 1939 he was transferred permanently to the Washington headquarters of the Division of Domestic Plant Quarantines to have general supervision of transit inspection throughout the United States. When the Division of Domestic Plant Quarantines was abolished in 1951, the transit inspection work was assigned to the Division of Plant Quarantines. On July 15, 1954, he was promoted to head the Division's Special Programs Section, a unit redesignated in 1959 as Export Certification and Transit Inspection. In his export certification work he maintained liaison with plant quarantine officials throughout the world and publicized their phytosanitary requirements affecting United States exports.

Herb resided in Arlington, Va., for many years, but purchased a new home in College Park Woods about three years ago. In Arlington he served as Troop Committeeman and Assistant Scoutmaster of a local Boy Scout Troop. Having been an Eagle Scout in his youth, he was adept at taking the scouts on nature hikes along the C & O Canal and the Appalachian Trail. He was a member of the Community Methodist Church, Arlington, and served on its Official Board. He was also a member of the Masonic order in Worthington, Ohio. Stamp collecting was one of his hobbies.

He was a member of the former American Association of Economic Entomologists and was active in the Entomological Society of Washington. He was good natured, friendly, and an energetic worker on projects that stimulated his interest.

He is survived by his wife, the former Mary Marcella Pinney; two sons, James P., San Antonio, Texas, and Joseph R., of the home address; a granddaughter, Bonnie J.; as well as a brother and sister in Ohio.

Private funeral services were held on January 11 in Arlington, Va.—RALPH W. SHERMAN, *Chairman*, H. IVAN RAINWATER and PAUL X. PELTIER.

SUMMARY REPORTS OF SOCIETY OFFICERS FOR 1964

CORRESPONDING SECRETARY

(For the fiscal year 1 November 1963 to 31 October 1964)

Membership on 1 November 1963		481
Reductions:		
Resigned	13	
Dropped	0	
Deceased	4	
Total	17	
Increases:		
Elected to membership	11	
Reinstated	2	
Total	13	
Membership on 31 October 1964		477
Classes of Membership:		
Dues paying	452	
Life	5	
Retired	18	
Honorary	2	
Total	477	

The membership is distributed among 45 states, the District of Columbia, 2 territories, and 19 foreign countries.

Circulation of the Proceedings (September 1964 issue):

States	479	
District of Columbia	79	
U. S. Possessions	10	
Foreign Countries	164	
Total		732

Distribution of the Proceedings (September 1964 issue):

To members	459	
To subscribers	273	
Total		732

The *Proceedings* goes to members and subscribers in 50 states, the District of Columbia, 2 Territories and 51 foreign countries.

Respectively submitted, PAUL J. SPANGLER, *Corresponding Secretary*.

TREASURER

(For the period Nov. 1, 1963 to Oct. 31, 1964)

	General Fund	Publications Fund	Total
Cash on Hand Nov. 1, 1963	$ 436.98	$8,719.85	$ 9,156.83
Receipts	6,646.53	633.18	7,279.71
Totals	7,083.51	9,353.03	16,436.54
Expenditures	5,571.52	–	5,571.52
Cash on Hand Oct. 31, 1964	1,511.99	9,353.03	10,865.02
Totals	$7,083.51	$9,353.03	$16,436.54

Copies of the complete Treasurer's report, approved by the Auditing Committee are on file with the Recording Secretary and the Treasurer.

Respectfully submitted, C. C. BLICKENSTAFF, *Treasurer*.

CUSTODIAN

(For the period 1 November 1963 to 31 October 1964)

The value of items sold by the Custodian's office amounted to $1,023.65. Of these items, $161.00 was for 26 copies of the *Memoirs*, $525.62 for complete volumes and miscellaneous numbers of the *Proceedings*, $300.00 for one complete set of the *Proceedings*, and $13.40 for miscellaneous papers and reprints.

A copy of the complete, detailed report is on file with the Recording Secretary.

Respectfully submitted, H. J. CONKLE, *Custodian*.

EDITOR

(For the calendar year 1964)

Four numbers of the *Proceedings* were published in 1964. Of the 268 pages published, 6 were devoted to advertising and 262 to scientific papers, notes, obituaries, book reviews, minutes of meetings and announcements. Fifty-seven scientific papers and notes were published during the year. The Society and the *Proceedings* benefited from 2 paid papers totaling 8 pages. None of these caused the articles of regular contributors to be postponed.

Respectfully submitted, JON L. HERRING, *Editor*.

SOCIETY MEETINGS

725th Regular Meeting, April 2, 1964

The 725th meeting of the Society was called to order by the President-Elect, Dr. Paul A. Woke, on April 2, 1964, at 8:00 P.M., in Room 43, U.S. National Museum. Twenty-six members and twelve guests were in attendance. The minutes of the previous meeting were accepted as read.

Setsuya Momoi was accepted for membership.

President-Elect Woke requested the Society's pleasure concerning a buffet dinner rather than a picnic for the annual outing held jointly with the Insecticide Society of Washington. A motion was made, seconded, and passed that the outing consist of a buffet dinner to be held at the Student Union, University of Maryland.

The first speaker for the evening, Dr. John L. Buckley, discussed the inadvertent effects of insecticides on fish and wildlife, pointing out the difficulties encountered in attempting to determine long range effects.

The second speaker, Dr. E. A. Taylor, discussed work being done by USDA entomologists at the Tobacco Research Lab at Oxford, North Carolina, on large-scale control of hornworms with light traps.

There were no notes or exhibition of specimens.

After the introduction of visitors, the meeting was adjourned at 9:55 p.m.

W. DONALD DUCKWORTH, *Recording Secretary*

726th Regular Meeting, May 7, 1964

The 726th meeting of the Society was called to order by the President, Dr. Ross H. Arnett, Jr., on May 7, 1964, at 8:00 p.m. in the Physics Auditorium, Catholic University. Eighteen members and six visitors were in attendance. The minutes of the previous meeting were accepted as read.

President Arnett reported the nomination of Dr. Thomas E. Snyder as Honorary President of the Society and by election of the members his position was confirmed .

Mr. David Fisher, one of the area Science Fair winners, displayed and discussed his project entitled, "Testing Instincts and Reactions of Mosquitos."

The first speaker for the evening, Dr. Philip S. Corbet, Canada Department of Agriculture, discussed rhythmic activity in mosquitos. Dr. Corbet's investigations were conducted in Equatorial Africa and Helsingforsland, Finland.

The second speaker, Dr. S. R. Dutky, Entomology Research Division, U.S. Department of Agriculture, spoke to the Society on circadian and higher frequency rhythm in the Madeira Cockroach. These electrophysiological studies were developed in connection with satellite systems research.

Dr. A. B. Gurney briefly reviewed the work and accomplishments of Dr. L. H. Weld, one of the Society's honorary members who passed away recently. Dr. Weld, a member of the Society since 1920, was a well known authority on cynipid galls and published a large number of papers on this subject during his career. [See Weld's obituary, this issue—Ed.]

Professor C. S. Carbonell, Society member from Montevideo, Uruguay, displayed a set of plastic trays he developed for carrying specimens when traveling by plane. Professor Carbonell was visiting the United States through the auspices of the U.S. Department of Agriculture and a Public Law 480 Fund project concerned with a systematic study of the Grasshoppers of Uruguay.

After the introduction of visitors, the meeting was adjourned at 10:00 p.m.

Refreshments were served in the Biology Building after the meeting.—W. DONALD DUCKWORTH, *Recording Secretary*

727th Regular Meeting, October 1, 1964

The 727th meeting of the Society was called to order by the President, Dr. Ross H. Arnett, Jr., on October 1, 1964, at 8:00 p.m. in Room 43, U.S. National Museum. Thirty members and fourteen guests were in attendance. The minutes of the previous meeting were accepted as read.

Eight candidates for membership were announced: *Dennis F. Abe, R. J. Addington, Z. Allen Barker, E. Elliott Crooks, Thomas G. Darling, Stanley W. Jacklin, G. Gregor Rohwer,* and *Chester L. Stanford.*

Treasurer C. C. Blickenstaff reported that the Society members would receive the Directory Issue of the Washington Academy of Sciences again this year.

Victor Adler displayed a series of stag beetles he purchased in a store during a recent trip to Hungary.

President Arnett noted a recently published key to the curculionid beetles and circulated a copy for examination.

The first speaker for the evening, Dr. F. M. Wadley, discussed various biometric techniques frequently used in Entomology.

The second speaker for the evening, Dr. J. F. Gates Clarke, gave an illustrated report concerning his recent entomological explorations of Rapa Island.

After the introduction of visitors, the meeting was adjourned at 10:00 p.m.—W. DONALD DUCKWORTH, *Recording Secretary*

728th Regular Meeting, November 5, 1964

The 728th meeting of the Society was called to order by the president, Dr. Ross H. Arnett, Jr., on November 5, 1964, at 8:00 p.m. in Room 43, U.S. National Museum. Thirty-two members and eleven guests were in attendance. The minutes of the previous meeting were accepted as read.

Dennis F. Abe, R. J. Addington, Z. Allen Barker, E. Elliott Crooks, Thomas G. Darling, Stanley W. Jacklin, G. Gregor Rohwer, and *Chester L. Stanford* were accepted for membership. Two candidates for membership were announced: *Elwood C. Zimmerman* and *C. J. Marinkelle.*

Phil Luginbill, Jr., Chairman of the Nominating Committee, presented the slate of nominees for the coming year.

Following the report of the Nominating Committee, a very interesting film on insect tissue culture was shown. The film depicted the work in Australia on culturing insect cells in artificial media and included some exceptional time-lapse microphotography.

The speaker for the evening, Dr. O. S. Flint, gave an illustrated discussion of his entomological activities in the West Indies.

A. B. Gurney exhibited some large cockroaches from Madagascar.

L. G. Davis noted that there were several films of entomological interest available through the Australian Embassy. He also called attention to the series *Insects not known to occur in the U. S.* A new series of leaflets on this theme with colored illustrations is now being published featuring the more serious potential pests from the older series.

W. E. Bickley noted Mitchell's new *Golden Nature Guide of Butterflies and Moths.* A. B. Gurney added that the book was available at discount prices at certain stores.

Victor Adler requested suggestions from the members for programs for the coming year.

After the introduction of visitors, the meeting was adjourned at 9:40 p.m.—W. Donald Duckworth, *Recording Secretary*

729th Regular Meeting, December 10, 1964

The 729th meeting of the Society was called to order by the President, Dr. Ross H. Arnett, Jr., on December 10, 1964, at 8:00 p.m. in the auditorium of Symons Hall, University of Maryland. Forty-one members and twenty-four guests were in attendance. Minutes of the previous meeting were accepted as read.

Elwood C. Zimmerman and *C. J. Marinkelle* were accepted to membership.

The annual reports of the Society officers were presented and a motion was made, seconded and passed that they be accepted. Summaries of these reports will appear in a forthcoming issue of the *Proceedings*. [See this issue—Ed.]

Following the annual reports the chair was opened for nominations for Society officers for the coming year. A motion was made, seconded and passed that the slate of nominees presented by the Nominating Committee be elected by acclamation. [See inside front cover of this issue for the officers for 1965.]

The speaker for the evening, Dr. John C. Downey, gave an interesting account of his research on the biology of the butterfly family Lycaenidae. The many thought-provoking problems pointed out during the talk led to a spirited discussion period afterwards.

Dr. Floyd Smith exhibited specimens and photographs of a moth-capturing plant being studied by the U.S. Department of Agriculture to determine its potential as a biological control agent. Studies thus far indicate that although the plant is highly attractive to moths, including several species of economic importance, the trapping mechanism is too inefficient to provide an aid in control.

A motion was made, seconded and passed which extended the Society's appreciation to the outgoing officers, with particular thanks to H. J. Conkle for his ten years of service to the Society as Custodian.

After the introduction of visitors, the gavel was passed to the new President, Paul A. Woke, who adjourned the meeting at 9:45 p.m. Following the meeting refreshments were served by the faculty and wives of the Entomology Department, University of Maryland.—W. Donald Duckworth, *Recording Secretary*

730th Regular Meeting, January 7, 1965

The 730th meeting of the Society was called to order by the President, Dr. Paul A. Woke, on January 7, 1965, at 8:00 p.m. in room 43, U.S. National Museum. Thirty-six members and twenty-three guests were in attendance. Minutes of the previous meeting were accepted as read.

The following candidates for membership were announced: *D. S. Wendleton, D. H. Messersmith, R. A. Flint, G. W. Rawson, E. D. Cashatt,* and *L. H. Herman, Jr.*

President Woke announced the appointment of an obituary committee for L. H. Weld consisting of the following members: B. D. Burks, L. M. Russell, and C. F. W. Muesebeck.

Program Committee Chairman Victor Adler announced that the February meeting of the Society would be held at Walter Reed Army Institute of Research.

The first item on the program was an excellent color film on biological control of insects. The film depicted work done in Australia on biological control of pest species of that country and was obtained through the Australian Embassy.

The second item on the program was a discussion of the coming International Biological Year by Dr. Russell Stevens of the National Academy of Sciences. The theme for the I.B.Y. will be biological productivity and conservation of biological resources.

After the introduction of visitors, the meeting was adjourned at 10:00 p.m.—W. Donald Duckworth, *Recording Secretary*

731st Regular Meeting, February 4, 1965

The 731st meeting of the Society was called to order by the President, Dr. Paul A. Woke, on February 4, 1965, at 8:00 p.m. in the Steinberg Auditorium, Walter Reed Army Medical Center. Thirty-nine members and sixteen guests were in attendance. Minutes of the previous meeting were approved as read.

President Woke called for committee reports, of which there were none. Under new business, President Woke announced the following committee appointments:

Membership Committee—Chairman: George E. Cantwell; Members: Wallace C. Harding, Jr., Ronald W. Hodges, W. B. Hull, T. J. Spilman.

Program Committee—Chairman: Victor E. Adler; Members: Louis G. Davis, Bodine Maksymiuk, Charles W. McComb.

Publications Committee—Chairman: Jon L. Herring (Editor); Members: Two members continuing for one and two year terms: Paul W. Oman, Eugene J. Gerberg. One new member appointed for three year term: James P. Kramer.

Advertising Committee—William N. Sullivan (continuing for second year), John M. Kingsolver (appointed for two years).

Obituary Committee (for Herbert J. Conkle)—Ralph W. Sherman, Chairman; Members: H. I. Rainwater, P. X. Peltier.

A. B. Gurney noted the death, on January 25th, at the age of 83, of James A. G. Rehn of the Academy of Natural Sciences of Philadelphia. Mr. Rehn had published actively on the systematics of Orthoptera for 65 years and he was largely instrumental in building up the world's leading collection of Orthoptera. As a long-time member of the American Entomological Society, he contributed to the continued growth of that organization.

The first item on the program was a talk by retiring Society President Ross H. Arnett, Jr., entitled "Beetle Talk—An Account of Sound Production in Animals." The lecture, illustrated with slides and taped sounds, was based on research done at the Catholic University by Miss Eileen R. Van Tassell and Dr. Arnett. The stress and courtship noises of various beetle species were demonstrated, as well as numerous other animal sounds, including the highest of the primates. A question period followed.

The second item on the program was an illustrated lecture by Major John E. Scanlon, Chief of the Department of Entomology, Walter Reed Army Institute of Research, entitled "Mosquito Borne Diseases in Bangkok, Thailand." Major Scanlon told about the history of the Army work in Thailand against mosquito borne diseases, particularly hemorrhagic fever, and the problems involved in the study. A question period followed.

After the introduction of visitors, the meeting was adjourned at 10:00 p.m.—Paul M. Marsh, *Acting Recording Secretary*

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PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY of WASHINGTON

U.S. NATIONAL MUSEUM
WASHINGTON, D.C. 20560

PUBLISHED QUARTERLY

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THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

Organized March 12, 1884

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Washington, D.C. 20250

Honorary President
Dr. T. E. Snyder, U.S. National Museum

Honorary Member
Mr. C. F. W. Muesebeck, U.S. National Museum

MEETINGS.—Regular meetings of the Society are held in Room 43 of the U.S. National Museum 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 $5.00; initiation fee is $1.00 (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 $6.00 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.

All manuscripts intended for publication should be addressed to the Editor. Acceptable papers submitted by members only will be published in the order received. Immediate publication may be obtained at a cost to the author of about $15.00 per printed page. Titles of papers should be concise but comprehensive and should indicate the systematic position of the subject insect. Bylines should indicate present mailing address of the author and his organizational affiliation, if possible. 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 in which author, year, title, name of publication, volume, and page are given in that order. In shorter articles, references to literature should be included in parentheses in the text.

Proportions of full-page illustrations should closely approximate $4\frac{5}{16} \times 6''$ (26×36 picas); this usually allows explanatory matter to appear on the same page.

Proofs and forms for the abstract and reprint order will be sent to authors.

This issue mailed September 28, 1965

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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 67 SEPTEMBER 1965 No. 3

CULICINE, SABETHINE AND TOXORHYNCHITINE MOSQUITOES OF NEPAL INCLUDING NEW COUNTRY RECORDS

(DIPTERA: CULICIDAE)

GOVIND JOSHI,[1] SHREEDHAR PRADHAN[2] and RICHARD F. DARSIE, JR.[3]

A preliminary record of the culicine and toxorhynchitine (megarhine) mosquitoes of Nepal was published by Peters and Dewar (1956). Their collections were made in the vicinity of Hetaura and Bhimphedi in Makwanpur District, Narayani Zone from which they recorded 29 species in 8 genera and 12 subgenera. They also reported 2 species of *Culex* (*Culex*) from Kathmandu District, Bagmati Zone. Stone, Knight and Starcke (1959) in the catalogue of the mosquitoes of the world list 19 non-anopheline species occurring in Nepal. One more species of non-anopheline, *Culex* (*Culiciomyia*) *longifurcatus* Theobald, 1910, the type locality for which is in Eastern Nepal, is recorded by Barraud (1934) as a synonym of *Culex* (*Culiciomyia*) *viridiventer* Giles, 1901.

This paper records the collections from 5 Zones and 11 Development Districts of Nepal. The collections have been made by the entomological staff during numerous anopheline surveys in connection with the malaria control and eradication campaigns since 1956. As a result, 3 more genera: *Culiseta*, *Malaya* and *Topomyia*, four more subgenera: three of the Genus *Aedes*—*Aedimorphus*, *Mucidus* and *Neomelanicon-ion*; and one from the Genus *Culiseta*—*Culiseta* and 28 more species distributed among 9 genera and 11 subgenera are added as new country records in this paper. The collections have been made mostly in the southern plains (terai) area, but with some work in the inner terai, consisting of low valleys situated between Churia and Mahabharat Ranges, in small valleys amongst Mahabharat Ranges farther north and in Kathmandu Valley, the elevation involved being not higher than 4,500 feet.

The classification system enumerated by Stone, *et al.* (1959) has been followed in this paper. Identification keys of Thurman (1959),

[1] Senior Entomologist, Nepal Malaria Eradication Organization,
[2] Junior Entomologist, Nepal Malaria Eradication Organization, and
[3] Malaria Specialist (Entomology), United States Agency for International Development Mission to Nepal.

Mattingly (1957), La Casse and Yamaguti (1950) and Barraud (1934) were used to make the species determinations.

LIST OF NON-ANOPHELINE MOSQUITOES KNOWN TO OCCUR IN NEPAL

Aedes (*Aedimorphus*) *caecus* (Theobald)*
Aedes (*Christophersiomyia*) *annulirostris* (Theobald)[1, 4]
Aedes (*Finlaya*) *albolateralis* (Theobald)[1, 4]
Aedes (*Finlaya*) *assamensis* (Theobald)[2]
Aedes (*Finlaya*) *aureostriatus* var. *greenii* (Theobald)*
Aedes (*Finlaya*) *chrysolineatus* (Theobald)*
Aedes (*Finlaya*) *dissimilis* (Leicester)*
Aedes (*Finlaya*) *gubernatoris* (Giles)*
Aedes (*Finlaya*) *pseudotaeniatus* (Giles)*
Aedes (*Mucidus*) *scatophagoides* (Theobald)*
Aedes (*Neomelaniconion*) *lineatopennis* (Ludlow)*
Aedes (*Stegomyia*) *albopictus* (Skuse)[1]
Aedes (*Stegomyia*) *unilineatus* (Theobald)*
Aedes (*Stegomyia*) *vittatus* (Bigot)[1]
Aedes (*Stegomyia*) *w-albus* (Theobald)[1, 4]
Armigeres (*Armigeres*) *kuchingensis* Edwards[2]
Armigeres (*Armigeres*) *subalbatus* (Coquillett)*
Culex (*Culex*) *barraudi* Edwards [1, 4]
Culex (*Culex*) *bitaeniorhynchus* Giles[1]
Culex (*Culex*) *epidesmus* (Theobald)*
Culex (*Culex*) *fuscifurcatus* Edwards*
Culex (*Culex*) *fuscocephalus* Theobald [1, 4]
Culex (*Culex*) *gelidus* Theobald [1, 4]
Culex (*Culex*) *jacksoni* Edwards[5]
Culex (*Culex*) *mimeticus* Noe[1]
Culex (*Culex*) *mimulus* Edwards[1, 4]
Culex (*Culex*) *pipiens quinquefasciatus* Say[1]
Culex (*Culex*) *sinensis* Theobald*
Culex (*Culex*) *theileri* Theobald*
Culex (*Culex*) *tritaeniorhynchus* Giles*
Culex (*Culex*) *vagans* Wiedemann*
Culex (*Culex*) *vishnui* Theobald[1]
Culex (*Culex*) *whitei* Barraud [2, 4]
Culex (*Culex*) *whitmorei* (Giles)*
Culex (*Culiciomyia*) *pallidothorax* Theobald[2, 4]
Culex (*Culiciomyia*) *viridiventer* Giles[3, 1]
Culex (*Lophoceraomyia*) *infantulus* Edwards[2, 4]
Culex (*Lophoceraomyia*) *minutissimus* (Theobald)*

---

* New record for Nepal.
[1] Found during this study and also reported by Peters and Dewar (1956).
[2] Reported by Peters and Dewar (1956) and not found during this study.
[3] Reported by Barraud (1934) and not found during this study.
[4] Reported by Stone *et al.* (1959) as occurring in Nepal.
[5] Found during this study and reported by Stone *et al.* (1959).

Culex (Lophoceraomyia) plantaginis Barraud[2, 4] (?)
Culex (Lutzia) fuscanus Wiedemann*
Culex (Lutzia) vorax (Edwards)[1, 4]
Culex (Mochthogenes) castrensis foliatus Brug[2, 4]
Culex (Mochthogenes) malayi (Leicester)[1, 4]
Culex (Neoculex) brevipalpis (Giles)[1]
Culiseta (Culiseta) niveitaeniata (Theobald)*
Heizmannia himalayensis Edwards*
Heizmannia indica (Theobald)[2, 4]
Malaya genurostris Leicester*
Mansonia (Mansonioides) annulifera (Theobald)*
Mansonia (Mansonioides) indiana Edwards*
Mansonia (Mansonioides) uniformis (Theobald)[1]
Orthopodomyia anopheloides (Giles)[1]
Topomyia aureoventer (Theobald)*
Uranotaenia annandalei Barraud[2, 4]
Uranotaenia campestris Leicester[1, 4]
Uranotaenia edwardsi Barraud *
Uranotaenia luteola Edwards*
Uranotaenia maculipleura Leicester*
Toxorhynchites (Toxorhynchites) splendens (Wiedemann)[1]

The body of this paper contains the locality records of the non-anopheline mosquito taxa present in the Nepal Malaria Eradication Organization, Entomology Section Collection, as well as notes on the habitat of the immature stages and specifically where adults were collected. The localities enumerated are based on the newly organized Zones and Development Districts; (See Fig. 1). The locality names given are respectively: 1. Zone, 2. Development District, 3. Specific locality within the District.

Subfamily CULICINAE

Tribe CULICINI

Genus **Aedes** Meigen 1818

Aedes (Aedimorphus) caecus (Theobald, 1901)

Gandaki, Kaski, Pokhara, 6 lar., VI-56, ex muddy ground pool.

Aedes (Christophersiomyia) annulirostris (Theobald, 1905)

Kosi, Sunsari, Dharan, 1♀, VI-61, ex outdoor in jungle; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, reared from contents of holes in mango trees; larva and pupa described.

Aedes (Finlaya) albolateralis (Theobald, 1908)

Bagmati, Kathmandu, Guheswari, 1♀, VII-60, ex natural outdoor shelter; 1♀,

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* New record for Nepal.

1 Found during this study and also reported by Peters and Dewar (1956).

2 Reported by Peters and Dewar (1956) and not found during this study.

3 Reported by Barraud (1934) and not found during this study.

4 Reported by Stone *et al.* (1959) occurring in Nepal.

5 Found during this study and reported by Stone *et al.* (1959).

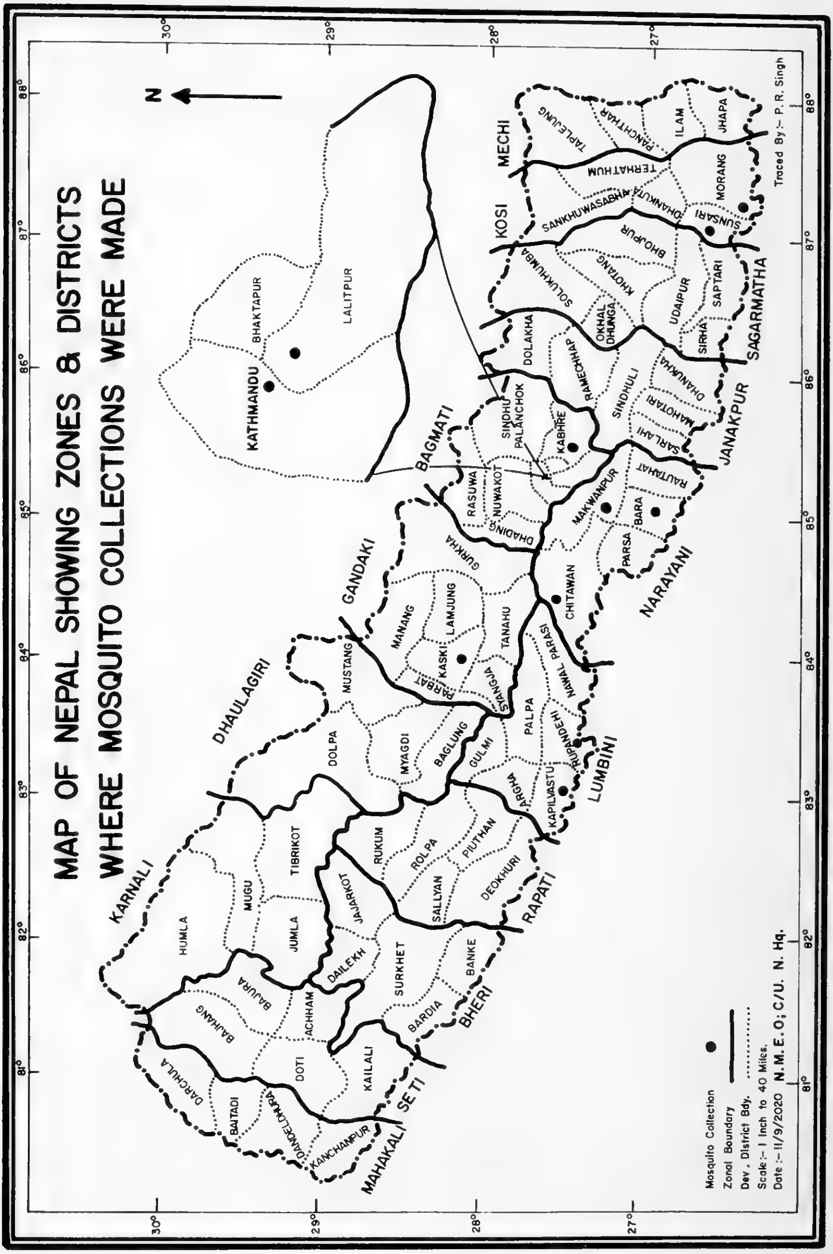

Figure 1. Map of Nepal showing Zones and Districts where mosquito collections were made.

VI-62, emerged from pupa, ex tree hole; Lalitpur, Godavari, 5 lar., VII-63, ex tree hole; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, reared from contents of holes in mango trees.

Aedes (*Finlaya*) *assamensis* (Theobald, 1908)

Reported by Peters and Dewar (1956): Narayani, Makwanpur, Nayagoo (Nayagaon), 1♀, VI-VII-55, ex inside house.

Aedes (*Finlaya*) *aureostriatus* var. *greenii* (Theobald, 1903)

Kosi, Sunsari, Dharan, 3 lar., III-61, ex tree hole.

Aedes (*Finlaya*) *chrysolineatus* (Theobald, 1907)

Bagmati, Lalitpur, Godavari, 6 lar., VII-63, ex cistern.

Aedes (*Finlaya*) *dissimilis* (Leicester, 1908)

Kosi, Morang, Baukajhora, 1♀ and 1♂, IX-61, ex indoor; Sunsari, Dharan, 3♀♀, VIII-61, ex outdoor in jungle.

Aedes (*Finlaya*) *gubernatoris* (Giles, 1901)

Kosi, Sunsari, Dharan, 2♀♀, VIII-61, ex outdoor in jungle; Bagmati, Kathmandu, Wholchowk, 1♀, VIII-63, emerged from pupa, ex tree hole.

Aedes (*Finlaya*) *pseudotaeniatus* (Giles, 1901)

Bagmati, Lalitpur, Godavari, 12♀♀ and 5♂♂, VII-63, emerged from larvae and pupae, ex rock pool; 10 lar., VII-63, ex rock pool; Kathmandu, Sunderijal, 2 lar., X-58, ex rock pool; Kosi, Sunsari, Dharan, 2♀♀, VIII-61, ex outdoor in jungle.

Aedes (*Mucidus*) *scatophagoides* (Theobald, 1901)

Kosi, Morang, Baukajhora, 3♀♀, VII-61, ex mosquito net; Fimraha, 3♀♀, VII-61, ex inside house.

Aedes (*Neomelaniconion*) *lineatopennis* (Ludlow, 1905)

Narayani, Bara, Nizgarh, 1♀, VI-63, ex pitshelter; Kosi, Morang, Baukajhora, 1♀ and 3♂♂, VIII-61, emerged from pupa, ex ground pool.

Aedes (*Stegomyia*) *albopictus* (Skuse, 1894)

Kosi, Sunsari, Dharan, 5♀♀, VIII-61, ex outdoor in jungle, 5 lar., X-61, ex tree hole; Bagmati, Kathmandu, Wholchowk, 3♀♀ and 2♂♂, VIII-63, emerged from pupae, ex tree hole; Swayambhunath, 2♀♀, IX-63, emerged from pupae, ex tree hole, associated with *Aedes pseudotaeniatus*; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, reared from dried contents of holes in mango trees.

Aedes (*Stegomyia*) *unilineatus* (Theobald, 1906)

Kosi, Sunsari, Dharan, 1♀, VIII-61, ex outdoor in jungle; Bagmati, Kathmandu, Balaju, 4 lar., X-58, ex bamboo stump.

Aedes (*Stegomyia*) *vittatus* (Bigot, 1861)

Kosi, Sunsari, Dharan, 1♀ and 1♂, VIII-61, ex outdoor in jungle; reported by Peters and Dewar (1956): Narayani, Makwanpur, Pokhara (1 mile East of Hetaura), 3♀♀ and 2♂♂, ex water in wooden tray.

Aedes (*Stegomyia*) *w-albus* (Theobald, 1905)

Kosi, Sunsari, Dharan, 2♀♀, VIII-61, ex outdoor in jungle; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, reared from dried contents of holes in mango trees.

Genus **Armigeres** Theobald, 1901

Armigeres (*Armigeres*) *kuchingensis* Edwards, 1915

Reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, 2♀♀, VI-VII-55, ex human bait in tent; Nayagoo, 1♀, VI-VII-55, ex inside house.

Armigeres (Armigeres) subalbatus (Coquillett, 1898)

Kosi, Sunsari, Dharan, 6♀♀, VI-61, ex outdoor in jungle; Bagmati, Kathmandu, Siphal, 1♀, XII-60, ex inside house; Gyaneswar, 1♀, VIII-63, ex inside house; Kabhre (Palanchowk), Sipatinghora, 1♀, VI-59.

Genus **Culex** Linnaeus, 1758

Culex (Culex) barraudi Edwards, 1922

Bagmati, Kathmandu, Balaju, 1 lar., VIII-58, ex rice field; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, larvae from shaded jungle pools, male genitalia and stirrup-shaped piece of larval siphon figured (Fig.2 h,i).

Culex (Culex) bitaeniorhynchus Giles, 1901

Kosi, Sunsari, Baukajhora, 1 lar., XII-61, ex fallow rice field; Lumbini, Kapilvastu, Kopuwa, 1♀, IX-62, ex inside house; Bagmati, Kathmandu, Balaju, 5 lar., VIII-58, ex fallow rice field with green algae; Kuriagaon, 5 lar., VI-59, ex fallow rice field; Lalitpur, Harisiddi, 4♀♀ and 1♂, VII-63, emerged from pupa, ex rice field; Narayani, Chitwan, Rapti Valley, 1♀ and 1♂, IV-63; 1♀ and 1♂, VI-63, ex inside house; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura and Bhimphedi, collected from residual pools in main river beds, larvae found in irrigation ditches and patches of swampy ground containing shallow pools, adults from native dwellings, cattlesheds, and in tents; Bagmati, Kathmandu, common in back-waters of Bagmati River, where green filamentous algae was abundant.

Culex (Culex) epidesmus (Theobald, 1910)

Kosi, Morang, Baukajhora, 1♀, VII-61, ex inside house; Narayani, Bara, Nizgarh, 1♀, VI-63, ex pitshelter; Bagmati, Kathmandu, Kalimati, 1♀, VIII-63, ex inside house.

Culex (Culex) fuscifurcatus Edwards, 1934

Bagmati, Lalitpur, Godavari, 3♀♀, VII-63, emerged from pupa, ex rice field.

Culex (Culex) fuscocephalus Theobald, 1907

Bagmati, Lalitpur, Pharping, 2 lar., VIII-58; Taudaha, 1 lar., XII-58; Kathmandu, Swayambhunath, 1 lar., XI-58; Kalimati, 1♀, VIII-63, ex inside house; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, larvae found in irrigation ditches and patches of swampy ground containing shallow pools.

Culex (Culex) gelidus Theobald, 1901

Bagmati, Kathmandu, Guheswari, 1 lar., VIII-58; Kosi, Morang, Murgatola, 3♀♀, X-61, ex house; Baukajhora, 4 lar., III-62, ex fallow rice field; Narayani, Bara, Nizgarh, 1♀ and 2♂♂, VI-63, ex pitshelter; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, adults found in native dwellings and cattle sheds, and in tents.

Culex (Culex) jacksoni Edwards, 1934

Bagmati, Lalitpur, Lubhugaon, 1 lar., XII-58, ex fallow rice field.

Culex (Culex) mimeticus Noe, 1899

Bagmati, Lalitpur, Taudaha, 1 lar., VII-58, ex rice field; Godavari, 4♀♀, VII-63, emerged from pupa, ex seepages; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura and Bhimphedi, ex residual pools in main river beds, irrigation ditches and shallow pools in swampy ground.

Culex (Culex) mimulus Edwards, 1915

Bagmati, Lalitpur, Taudaha, 1 lar., VIII-58, ex rice field; Godavari, 1♀, XII-

60, emerged from pupa, ex seepage; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, larvae found in shaded jungle pools.

Culex (*Culex*) *pipiens quinquefasciatus* Say, 1823 (= *fatigans* Wiedemann, 1828)

Bagmati, Lalitpur, Taudaha, 1 lar., X-58, 1 lar., XII-58, ex tank; Kathmandu, Kathmandu, 5 lar., X-58, 1 lar., XII-58, ex swamp; Dilli Bazar, 1 lar., XI-58; Kalimati, 1 ♀, VIII-63, ex inside house; Kosi, Sunsari, Dharan, 4 lar., III-62, ex tree hole; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, larvae in shaded jungle pools, collected from residual pools in main river beds, adults found in native dwellings, cattlesheds, and tents occupied by human; Bagmati, Kathmandu, Kathmandu, adults very common, a serious domestic pest, found in vast numbers in exposed ground pools, drainage pots, and domestic grease traps.

Culex (*Culex*) *sinensis* Theobald, 1903

Bagmati, Kathmandu, Tupek, 1 ♀, VIII-60, ex inside house; Kathmandu, 1 ♀, VII-63, ex inside house; Kalimati, 2 ♀ ♀, VIII-63, ex inside house.

Culex (*Culex*) *theileri* Theobald, 1903

Bagmati, Lalitpur, Taudaha, 6 lar., XII-58; ex large pond; Swayambhunath, 1 lar., XII-58.

Culex (*Culex*) *tritaeniorhynchus* Giles, 1901

Narayani, Bara, Nizgarh, 1 ♀, VI-63, ex pitshelter; Chitwan, Rapti Valley, 6 ♀ ♀, VI-63, ex outdoor; Bagmati, Kathmandu, Kalimati, 7 ♀ ♀ and 1 ♂, emerged from pupae, and 6 lar., VII-63, ex rice field; Kathmandu, 3 ♀ ♀, VIII-63, ex inside house.

Culex (*Culex*) *vagans* Wiedemann, 1828

Kosi, Sunsari, Dharan, 1 ♂, X-61, ex outdoor in jungle.

Culex (*Culex*) *vishnui* Theobald, 1901 (*sensu lata*)

Narayani, Chitwan, Rapti Valley, 1 ♀, IV-63, ex outdoor; Bagmati, Kathmandu, Kalimati, 1 ♀, VIII-63, ex house; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, collected from residual pools in main river beds, adults found in native dwellings, cattlesheds and tents.

Culex (*Culex*) *vishnui* Theobald, 1901 (*sensu stricta*)

Bagmati, Kathmandu, Balaju, 2 lar., VIII-58, ex rice field.

Culex (*Culex*) *whitei* Barraud, 1923

Reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, larvae found in shaded jungle pools, larva and pupa described.

Culex (*Culex*) *whitmorei* (Giles, 1904)

Bagmati, Kathmandu, Kalimati, 1 ♀, VIII-63, ex inside house.

Culex (*Culiciomyia*) *pallidothorax* Theobald, 1905

Reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, larvae found in shaded jungle pools.

Culex (*Culiciomyia*) *viridiventer* Giles, 1901

Reported by Barraud (1934): Mechi, ? District, Dahawangahary Hills, ♀ and ♂, II-08, ex tree holes, garden watertanks and butts; specific locality not possible to determine.

Culex (*Lophoceraomyia*) *infantulus* Edwards, 1922

Reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, larvae found in shaded jungle pools, imagines found resting near pools.

Culex (*Lophoceraomyia*) *minutissimus* (Theobald, 1907)

Narayani, Chitwan, Rapti Valley, 4 ♂ ♂, VI-63, ex outdoor; Makwanpur, Jyamere, 1 ♂, VIII-62, ex outdoor from bushy vegetation.

Culex (*Lophoceraomyia*) *plantaginis* Barraud, 1924 (?)

Reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, imagines found at rest near shaded jungle pools, larvae, probably this species, collected from same pools.

Culex (*Lutzia*) *fuscanus* Wiedemann, 1820

Kosi, Sunsari, Dharan, 1♀ and 1♂, VI-61, ex inside house; Bagmati, Kathmandu, 2♀♀, VIII-60, ex inside house; Chauni, 1♂, VIII-63, emerged from pupa, ex ground pool; Kalimati, 1♀, VI-63, ex on outside of house, 3♀♀, VIII-63, ex on outside of house; Lumbini, Kapilvastu, Taulihawa, 3♀♀, IX-62, ex inside house.

Culex (*Lutzia*) *vorax* (Edwards, 1921)

Bagmati, Kathmandu, Lubhu, 1♂, X-58, emerged from pupa, ex spring water; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, found in shaded jungle pools.

Culex (*Mochthogenes*) *castrensis foliatus* Brug, 1932

Reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, imagines found resting near shaded jungle pools, male genitalia figured (Fig. 2g).

Culex (*Mochthogenes*) *malayi* (Leicester, 1908)

Narayani, Bara, Nizgarh, 1♀, VI-63, ex pit-shelters; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, pupa from shaded jungle pools, found to contain on dissection unemerged male imago.

Culex (*Neoculex*) *brevipalpis* (Giles, 1902)

Kosi, Sunsari, Dharan, 4 lar., III-62, ex tree hole; Morang, Baukajhora, 1♀, IX-61, ex outdoor in jungle; reported by Peters and Dewar (1956): Narayani, Makwanpur, Chisapani, 2 lar., VI-VII-55, ex tree hole.

Genus **Culiseta** Felt, 1904

Culiseta (*Culiseta*) *niveitaeniata* (Theobald, 1907)

Bagmati, Kathmandu, Balaju, 1 lar., III-58; Guheswari, 3♀♀, I-61, emerged from pupa; Kosi, Morang, Fimraha, 1♀ and 1♂, X-61 ex inside house.

Genus **Heizmannia** Ludlow, 1905

Heizmannia himalayensis Edwards, 1922

Kosi, Sunsari, Dharan, 1♀, VII-61, ex outdoor in jungle.

Heizmannia indica (Theobald, 1905)

Reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, 1♀, found under rock near shallow jungle seepage pool.

Note: It is very possible that this specimen could have been *Heizmannia reidi* Mattingly, 1957, on the basis of information given by Mattingly (1957).

Genus **Mansonia** Blanchard, 1901

Mansonia (*Mansonioides*) *annulifera* (Theobald, 1901)

Lumbini, Kapilvastu, Taulihawa, 5♀♀, IX-62, ex inside house.

Mansonia (*Mansonioides*) *indiana* Edwards, 1930

Kosi, Morang, Baukajhora, 3♀♀, IX-61, ex inside house.

Mansonia (*Mansonioides*) *uniformis* (Theobald, 1901)

Kosi, Morang, Baukajhora, 4♀♀, VIII-61, ex inside house; Lumbini, Kapilvastu, Taulihawa, 3♀♀, VIII-62, ex inside house; reported by Peters and Dewar (1956): Narayani, Makwanpur, Nayagoo, 4♀♀, ex inside house.

Genus **Orthopodomyia** Theobald, 1904

Orthopodomyia anopheloides (Giles, 1903)

Gandaki, Lamjung, Ghanpokhara, 3 lar., XII-59, ex tree hole, associated with *Anopheles annandalei interruptus* Puri; Kosi, Sunsari, Dharan, 1♀ and 5♂♂, X-61, emerged from larvae and pupae, ex tree hole in jungle, associated with *Aedes albopictus*; 12 lar., X-61, ex tree hole; Bagmati, Kathmandu, Wholchowk, 3♂♂, VIII-63, emerged from pupae, ex tree hole; associated with *Aedes gubernatoris*; reported by Peters and Dewar (1956): Narayani, Makwanpur, Chisapani, 1 lar., VI-VII-55, early instar collected from tree hole, associated with *Culex brevipalpis*, however, the identity of this first instar larva remains in doubt.

Genus **Uranotaenia** Lynch Arribalzaga, 1891

Uranotaenia annandalei Barraud, 1926

Reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, imagines captured at rest near two small shallow jungle seepage pools; pupa probably of this species described.

Uranotaenia campestris Leicester, 1908

Narayani, Bara, Nizgarh, 1♀, VI-63, ex pit-shelter; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, imagines captured near two small shallow jungle seepage pools; larvae and pupae found in these pools and described.

Uranotaenia edwardsi Barraud, 1926

Narayani, Chitwan, Rapti Valley, 1♀, IV-63, ex outdoor (bushes near stream).

Uranotaenia luteola Edwards, 1934

Narayani, Makwanpur, Jyamere, 2♀♀ and 2♂♂, VIII-62, ex bushy vegetation.

Uranotaenia maculipleura Leicester, 1908

Narayani, Makwanpur, Jyamere, 2♀♀ and 1♂, VIII-62, ex bushy vegetation.

Tribe Sabethini

Genus **Malaya** Leicester, 1908
(= **Harpagomyia** Meijere, 1909)

Malaya genurostris Leicester, 1908

Lumbini, Rupandehi, Jogikuti, 1♀, VIII-62, ex outdoor under hollow tree near ant colony.

Genus **Topomyia** Leicester, 1908

Topomyia aureoventer (Theobald, 1910)

Narayani, Makwanpur, Jyamere, 1♀, VIII-62, ex bushy vegetation.

Subfamily Toxorhynchitinae

Genus *Toxorhynchites* Theobald, 1901
(= *Megarhinus* Robineau-Desvoidy, 1827)

Toxorhynchites (*Toxorhynchites*) *splendens* (Wiedemann, 1819)

Kosi, Sunsari, Dharan, 2♂♂, VIII-61, emerged from pupae, 2 lar., III-62, ex tree hole in jungle; Lumbini, Rupandehi, Jogikuti, 1♂, VIII-62, ex outdoor in jungle; reported by Peters and Dewar (1956): Narayani, Makwanpur, Hetaura, reared from dried contents of holes in mango trees, associated with *Aedes albolateralis.*

Summary

A detailed record of Nepalese non-anophelines has been presented in this paper. A total of 59 non-anopheline species, sub-species and varieties are reported. Amongst these, 28 species and varieties are published for the first time.

Acknowledgement

The authors' thanks are due to the collectors especially to those Nepal Malaria Eradication Organization entomological staff engaged in a study work in Eastern Nepal during 1961–62. The authors express their thanks to Messrs. B. L. Wattal and K. L. Kalra, Entomologists, National Institute of Communicable Disease, India for confirming the identity of a few specimens presented in this paper. The authors also express their sincere thanks to the Programme Committee, Nepal Malaria Eradication Organization especially to Dr. Y. N. Sharma, Chief Officer, for the permission to publish this paper.

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LECTOTYPES OF PANAMA DROSOPHILA
(DIPTERA, DROSOPHILIDAE)

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Pipkin (1964, Proc. Ent. Soc. Washington 66: 217–245) described 12 new species of *Drosophila* found breeding in flowers in Panama, but neglected to designate holotypes in her publication, although type specimens were labelled and deposited in the U.S. National Museum. The purpose of this note is formally to designate a lectotype specimen, which may be found under the corresponding type number, for each species in the National Collection.

Drosophila alani Pipkin (1964, p. 220), lectotype male, type no. 67778, Almirante, Bocas del Toro, Panama, April 1962, S. Pipkin, ex *Heliconia curtispatha.* Also 7 *paralectotypes,* same data; 1 paralectotype, El Real, Darien, Panama, Nov. 1962, S. Pipkin. same host, in U.S.N.M.

Drosophila alexanderae Pipkin (1964, p. 234), lectotype male, type no. 67779, Almirante, Bocas del Toro, Panama, April 1962, S. Pipkin, ex *Heliconia elongata.* Also 2 paralectotypes, same data; 3 specimens (not mentioned in the paper), El Real, Darien, Panama, Nov. 1962, S. Pipkin, ex *Heliconia elongata,* in U.S.N.M.

Drosophila aureopallescens Pipkin (1964, p. 232), lectotype male, type no. 67780, Fort Sherman Reservation, Canal Zone, 1963, S. Pipkin, ex *Calathea lutea.* Also 15 paralectotypes, same data; 4 specimens from El Real, Darien, Panama, Nov. 1962, S. Pipkin, ex *Calathea lutea* (not mentioned in the paper); 2 specimens from El Volcán, Chiriqui, Panama, June 1962, S. Pipkin.

Drosophila flexipilosa Pipkin (1964, p. 238), lectotype male, type no. 67781, El Volcán, Chiriqui, Panama, 4500 ft., June 1962, S. Pipkin, ex *Hedychium coronarium.* Also 19 paralectotypes, same data, in U.S.N.M.; Also 3 specimens from Angra dos Reis, Estado do Rio Brasil, Brasil, O. Frota-Pessoa, from fruit baited trap (not mentioned in the paper), in U.S.N.M.

Drosophila hansoni Pipkin (1964, p. 227), lectotype male no. 67782 Cerro Campana, 2500 ft., Panama, Panama, July 1961, S. Pipkin, ex *Heliconia vellerigera.* Also 19 paralectotypes, same data, in U.S.N.M.

Drosophila leoni Pipkin (1964, p. 225), lectotype male, type no. 67783, Fort Sherman Reservation, Canal Zone, Jan. 1961, S. Pipkin, ex *Dimercostus uniflorus* (through oversight no type locality given in paper). Also 19 paralectotypes, same data except dates May 1960 and Jan. 1961, in U.S.N.M.

Drosophila leukorrhyna Pipkin (1964, p. 224), lectotype male, type no. 67784, Madden Forest, Canal Zone, Oct. 1962, S. Pipkin, ex *Heliconia mariae.* Also 3 paralectotypes, same data; 14 paralectotypes, Fort Sherman Reservation, Canal Zone, Jan. 1961, March, July, Oct. 1962, S. Pipkin, same host, in U.S.N.M.

Drosophila mcclintockae Pipkin (1964, p. 228), lectotype male, type no. 67785, Cerro Campana, 2500 ft., Panama, Panama, Nov. 1961, S. Pipkin, ex *Aphelandra micans.* Also 19 paralectotypes, same data, in U.S.N.M.

Drosophila nigrasplendens Pipkin (1964, p. 217), lectotype male, type no. 67786, Cerro Campana, 2500 ft., Panama, Panama, July 1961, S. Pipkin, ex *Heliconia subulata.* Also 17 paralectotypes, same data except July 1961, 1962, in U.S.N.M.

Drosophila othoni Pipkin (1964, p. 236), lectotype male, type no. 67787, El Real, Darien, Panama, Nov. 1962, S. Pipkin, ex *Heliconia mariae.* Also 13 paralectotypes, same data, in U.S.N.M.

Drosophila xanthopallescens Pipkin (1964, p. 230), lectotype male, type no. 67788, Cerro Campana, 2500 ft., Panama, Panama, July 1960, S. Pipkin, ex *Calathea insignis.* Also 5 paralectotypes, same data; 2 paralectotypes, El Real, Darien, Panama, Nov. 1962, S. Pipkin, same host, in U.S.N.M.

Drosophila xiphiphora Pipkin (1964, p. 240), lectotype male, type no. 67789, Cerro Campana, 2500 ft., Panama, Panama, Sept. 1963, S. Pipkin, ex *Heliconia subulata.* Also 1 paralectotype, same data; 3 specimens, El Real, Darien, Panama, Nov. 1962, S. Pipkin (not mentioned in paper), in U.S.N.M.

NOTES ON NEARCTIC SYLVICOLA SPECIES
(DIPTERA, ANISOPODIDAE)

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In reviewing the species of *Sylvicola* Harris (= *Anisopus* Meigen, *Rhyphus* Latreille) in the collection of the United States National Museum, I have noted the need for reestablishing an old synonymy, describing a new species, and presenting some new distribution records. A key to the species is also included.

Sylvicola punctatus (Fabricius)

Rhagio punctatus Fabricius, Mantissa Ins. 2: 333, 1787.
Rhyphus marginatus Say, Acad. Nat. Sci. Philadelphia, Jour. 3: 27, 1823.

Loew (1864, p. 317) recognized this species from North America, although he credited it to Meigen, and he placed *Rhyphus marginatus* Say in synonymy under it. The name *punctatus* was used, either in the genera *Rhyphus* or *Anisopus* by many North American authors as late as 1932, and Alexander (1962) lists *Sylvicola punctata* (Say, sic). Edwards (1923) claimed a difference in the male genitalia between *punctatus* and *marginatus* and resurrected the later name for the species in North America. Because *Sylvicola fenestralis* (Scopoli) and *S. fuscatus* (Fabricius) are both Holarctic in distribution, and because *marginatus* and *fuscatus* appear identical externally, I have been uncertain about recognizing them as distinct species. Not enough males from both sides of the Atlantic were available previously to make an adequate study. Now I have examined the terminalia of 4 specimens from Europe (Sweden, Germany, England) and 7 from America (Pa., Ind., Md., Ont., Va., Mich.).

Edwards (1923, p. 488) referred to "small but constant differences in the hypopygia" between *Anisopus punctatus* and *A. marginatus*. For *punctatus* he illustrated a strong, curved black tooth on each lateral shoulder of sternum IX, not illustrated in his figure for *marginatus*. In the key given by Edwards (1928, p. 13), couplet 3 reads, "Ninth sternite of male with a pair of black processes—*punctatus* Fabricius" versus "These processes absent—*marginatus* Say."

In males of both species the entire abdomen is usually partially twisted downward distally on the right side so that the tip of the abdomen lies in a nearly vertical position, and in addition the terminalia are completely inverted between segments VIII and IX so that the genital structures lie dorsally in relation to the proctiger and in a plane with tergum VIII. In *punctatus* a series of 5 or 6 variably sized, strong, somewhat curved teeth lie at the sides and a little underneath the edge of sternum IX and to either side of the aedeagus. These are the "black processes" to which Edwards referred, but the difference between *punctatus* and *marginatus* as he drew them was apparently due to the extent to which they were exposed in the slide preparations he drew. Both drawings show evidence of more than one tooth. In all respects the terminal sclerites and armature appear to be essentially the same in the specimens examined, and therefore I restore Loew's synonymy.

Sylvicola notialis n. sp.

This species so closely resembles the more frequently encountered S. *punctatus* that it seems sufficient to describe only the characters in which the two differ. These characters are as follows:

Female: Costal cell of wing at least slightly infuscated and with many microtrichia in 3 or more irregular rows extending basad of origin of radial sector; apical portion of cell R_1 infuscated, leaving a distinct round hyaline spot just beyond apex of vein R_1; bases of cells R and M distinctly yellowish; some infuscation along middle of anal vein anteriorly; entire wing with more microtrichia; color pattern somewhat darker.

Male: Eyes very narrowly separated. Wing color and trichiation as in female; genitalia: on the margin of the membranous apex of sternum IX, between the large lateral teeth a mass of short, stout, dark teeth separated medially, 12 to 15 on each side; distal filament of claspette very elongate and slender with little, if any, marginal serration.

Holotype ♂, Dallas, Tex., June 4, 1907, W. W. Yothers. Paratypes, 4 ♂♂, 1♀, *ex* cow dung, Panama City, Fla., March 3, 1944, M. Wright, Bishopp No. 24,300; 1 ♂, Hot Springs National Park, Ark., August 18, 1963, B. C. Marshall; 1 ♀, Mound, La., May 8, 1915, D. L. Van Dine, Hunter No. 4552; 1 ♂ at light, Baton Rouge, La., March 20, 1947, W. W. Wirth; 3 ♀♀, reared from cow dung, Falls Church, Va., August 9, 1917, C. T. Greene. (U.S. National Museum No. 67448). 1 ♀, Monticello, Fla., March 7, 1919, W. A. Hoffman (Cornell University).

In *Sylvicola punctatus* the costal cell is hyaline with microtrichia few in a single or double row with no more than 1 or 2 basad of origin of radial sector; apex of wing hyaline or only very faintly darkened; bases of cells R and M hyaline; margin of anal vein not infuscated; eyes of male touching medially; although there may be a few pale denticles on the membranous distal margin of sternum IX these are much fewer in number; filament of claspette not so attenuated and margin distinctly serrate.

Sylvicola fuscatus (Fabricius)

There are very few published records for this Holarctic species in North America. Specimens which I have seen bear the following data: ALASKA: Matanuska, June 31, 1944, May 26, August 28, September 10 and 15, 1945 (J. C. Chamberlin); Camp 32, Alaska Engineering Commission, July 12, 1921 (J. M. Aldrich); NEW HAMPSHIRE: White Mountains (Morrison); NEW YORK: Mt. Whiteface, 2000–4000 ft., August 22–24, 1916; NORTH CAROLINA: Newfound Ridge, Great Smoky Mountains, July 11, 1941 (A. L. Melander); ONTARIO: Algonquin Park, July 7, 1957 (Bennett and Wood); WASHINGTON: Big Four Mountain, July 6, 1924 (A. L. Melander).

Key to Nearctic Species of Sylvicola

1. Cell M_1 pointed at base, *m* connecting with M_{1+2} at base 2
   Cell M_1 truncated at base, *m* connecting with M_2 some distance from base .. 4
2. No infuscation behind stigmal spot in cells R_1 or R_5 .... **fuscatus** (F.)
   A dark marking in cell R_5 and usually in cell R_1 behind stigmal spot 3
3. Costal cell hyaline with microtrichia sparse in 1 or 2 rows; cell R_1 hyaline distally; bases of cells R and M hyaline; eyes of male touching **punctatus** (F.)
   Costal cell somewhat infuscated with microtrichia abundant, in at least 3 rows; cell R_1 distinctly infuscated distally; bases of cells R and M yellowish; eyes of male narrowly separated .... **notialis**, n. sp.
4. Pale spot in outer radial field white, clearly delimited; median mesonotal stripe divided; eyes of male touching .... **alternatus** (Say)
   Pale spot in outer radial field dirty white or yellowish white, its limits less sharply defined; median mesonotal stripe not divided; eyes of male rather widely separated .... **fenestralis** (Scopoli)

Distribution of North American Species

The five species of *Sylvicola* found in North America are known from the following States and Provinces:

alternatus (Say). B. C., Conn., Fla., Ga., Idaho, Ill., Kans., Maine, Man., Md., Mass., Mich., Miss., N. H., N. J., N. Y., N. C., Ohio, Ont., Oreg., Pa., P. E. I., Que., R. I., S. C., Texas, Va., Wash., W. Va., Wisc.

fenestralis (Scopoli). Calif., Conn., Idaho, Maine, Mass., N. J., N. H., N. Y., N. S., Ohio, Ont., Oreg., Pa., Que., R. I., Wash. Also seen from England, China, Norway, Germany, and Sweden.

fuscatus (Fabricius). Alaska, N. H., N. Y., N. C., Ont., Vt., Wash. Also seen from Germany.

notialis n. sp. Ark., Fla., La., Texas, Va.

punctatus (Fabricius). Alta., Ill., Ind., Kans., Maine, Md., Mass., Mich., Mo., Nebr., N. H., N. J., N. Y., Ont., Pa., Que., R. I., Vt., Va., W. Va., Wisc. Also seen from England, France, Germany, and Sweden.

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NOTES ON CRITICAL ASIAN HAEMAPHYSALIS SPECIMENS IN EUROPEAN MUSEUM COLLECTIONS, WITH DESIGNATIONS OF LECTOTYPES AND A NEOTYPE.
(Acarina : Ixodidae)

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In 1896 G. Neumann began the publication of his "Révision de la famille des Ixodidés." The genus *Haemaphysalis* was treated in the second part appearing in 1897. From that year until the 1915 publication of the *Haemaphysalis* volume in the "Monograph of the Ixodidae" undertaken by G. H. F. Nuttall and his collaborators there was great activity in the description of new tick species of the genus *Haemaphysalis.*

At that time taxonomic practices were less formalized than now. Type specimens were not routinely designated as such in published accounts of new species, although describers sometimes inserted labels in specimen tubes deposited in museum collections reading "TYPE" or "CO-TYPE." However, these terms were not necessarily used in the rigid sense they are today. Thus Nuttall and Warburton, 1915, p. 434, could designate as "types," specimens of *Haemaphysalis bispinosa* var. *intermedia* collected in 1911 although they had described *intermedia* in 1909. It is evident from the context in which the terms were used that the term "types" was applied to material considered by the original describers to be conspecific with their original specimens and "cotypes" were specimens compared with original material, even by another worker, and judged by him to be conspecific.

It has become the practice now to consider specimens enumerated in these early original descriptions as having been intended as cotypes or, as now more rigidly defined by the International Code of Zoological Nomenclature of 1961, syntypes, in the absence of the designation of a holotype by the original describer.

The material with which European scientists worked was sent to them from many parts of the world of which they had no personal knowledge and, with rare exceptions, they had no large series of specimens for the study of constancy and variation of morphological characters in species populations. New species or "varieties" were described routinely on the basis of only one, two or sometimes several specimens of generally similar appearance.

With the recent realization of the involvement of the *Haemaphysalis* ticks in the transmission of arthropod-borne viruses in South Asia, and the inevitable increasing utilization of *Haemaphysalis* species names in the medical and veterinary literature, it has become of pressing importance to provide nomenclatorial stability by clearly defining the species units and seeking out authentic names which will be valid under the International Code.

In the course of checking on seeming inconsistencies in the literature while working up field studies on Indian *Haemaphysalis* ticks involved in the transmission of Kyasanur Forest disease, and in preparation for a guide to the Indian *Haemaphysalis*, original South Asian material deposited in several European collections has been studied in detail during the past year. It has unfortunately become all too apparent that it was the rule, rather than the exception, for species names based on anything more than one specimen to include two, three or even more species. Conversely, early descriptions were often so brief and accompanying illustrations, when present, were so crude or sketchy, that one author had no clear concept of the taxon intended by another.

The present author is now engaged in a collaborative effort with Dr. Harry Hoogstraal, and the co-operation of Mr. Glen M. Kohls, to redefine, redescribe and illustrate in detail the South Asian *Haemaphysalis*, a project which will take some years to complete. Meanwhile, to fix the names of various species so that they can be used with confidence in papers dealing with bionomic problems, it has become necessary to designate lectotypes and in one case a neotype. This is done for one important group of species here.

For this study I have examined original material in the Nuttall collection now lodged at the British Museum (Natural History) London, where it has been transferred from Cambridge; the Neumann collections in part deposited at the Muséum Nationale d'Histoire Naturelle, Paris, and in part at the École Nationale Vétérinaire, Toulouse; Larrousse specimens borrowed from the Laboratoire de Parasitologie de la Faculté de Médecine de Paris; and Supino specimens at the Museo Civico di Storia Naturale, "Giacomo Doria," Genoa.

In the following species accounts specimen catalogue numbers in the Nuttall collection are designated by the prefix "N" and those in the Neumann collection by the prefix "Nn." The species names dealt with here, alphabetically arranged for convenience, are:

Haemaphysalis aculeata Lavarra, 1905.
Haemaphysalis birmaniae Supino, 1897.
Haemaphysalis bispinosa Neumann, 1897.
Haemaphysalis cornigera Neumann, 1897.
Haemaphysalis cuspidata Warburton, 1910.
Haemaphysalis flava Neumann, 1897.
Haemaphysalis hystricis Supino, 1897.
Haemaphysalis intermedia Warburton and Nuttall, 1909.
Haemaphysalis lagrangei Larrousse, 1925.

Haemaphysalis minuta Kohls, 1950.
Haemaphysalis neumanni Dönitz, 1905.
Haemaphysalis obesa Larrousse, 1925.
Haemaphysalis semermis Neumann, 1901.
Haemaphysalis spiniceps Warburton and Nuttall, 1909.
Haemaphysalis spinigera Neumann, 1897.

Haemaphysalis aculeata Lavarra, 1905.

Lavarra based this species on 16 ♂♂ off *Tragulus meminna* from India. He gave one specimen from his type series to Nuttall (N 2731), and two specimens to Neumann (Nn 1368). The remainder of the series is said by Nuttall and Warburton, 1915, to be in the Museo Zoologico Universitario, Rome. I have seen the Neumann specimens which are at Toulouse and the Nuttall specimen now at the British Museum (Natural History).

The two Neumann specimens are of two species. One is that illustrated and redescribed by Nuttall and Warburton, 1915, pp. 440–442, figs. 371 and 372 as *H. aculeata*, and the other the species described by Warburton, 1910, as *Haemaphysalis cuspidata*. The original description of Lavarra is not accompanied by illustrations and does not provide sufficient critical detail to distinguish between these two species. The specimen in the Nuttall collection is the species Nuttall and Warburton, 1915, illustrated and described as *H. aculeata*. To conserve the names *aculeata* and *cuspidata* in the sense of Nuttall and Warburton, 1915, and subsequent authors I have designated the specimen in the Nuttall collection (N 2731) as the lectotype of *H. aculeata*.

See also *Haemaphysalis cuspidata* Warburton, 1910.

Haemaphysalis birmaniae Supino, 1897.

As with *H. hystricis*, also named by Supino in 1897, the original description of specimens from Burma is inadequate to define this species, but the Supino material on which the species is based is fortunately available at the Genoa and British Museums.

The Genoa material is in two tubes. One lot, Genoa no. 44, consists of three ♂♂. The second tube, Genoa no. 27, contains four ♂♂ and one ♀, although a Nuttall and Warburton label in the tube indicates seven ♂♂. The one ♀ is unengorged and about the same size as the ♂♂ which perhaps explains its having been mistaken for a ♂ by Nuttall and Warburton.

The Nuttall collection at the British Museum contains two tubes of Supino specimens received from the Genoa Museum: N 2970, 1 ♂ from Genoa no. 44, and N 2962, 3 ♂♂ from Genoa no. 27. This series of four syntypes of *H. birmaniae* in the Nuttall collection represents two species, the one ♂ in lot N 2970 and two of the ♂♂ in lot N 2962 are one species and one ♂ in lot N 2962 is a second species. In view of the inadequate original description of Supino either species could be taken to be *H. birmaniae*. As three of the four specimens in the Nuttall collection are one species and probably that intended by the describer, I have designated one of the two conspecific specimens in lot N 2962 as the lectotype of *H. birmaniae* and the single specimen which differs, an undescribed taxon, will become the holotype of a new species to be described separately. The specimen selected as the lectotype of *H. birmaniae* will be fully illustrated and the species redescribed in a separate publication with Dr. Harry Hoogstraal.

Haemaphysalis bispinosa Neumann, 1897.

The description of this important ectoparasite of domestic animals was based on "une femelle jeune provenant de Ramnad (Indes) (Coll. E. Simon)." Ramnad is an alternate name for the locality now known as Ramanathapuram in southern Madras State, India.

While the type locality and description are consistent with the species considered to be *H. bispinosa* by Nuttall and Warburton, 1915 (Figs. 358, ♂, and 360, ♀) and most subsequent authors, it is difficult to interpret the Neumann Fig. 7 of the dorsal aspect of the right palp. (This is reproduced in Nuttall and Warburton, 1915 as their Fig. 361.) The characteristic dorsal spur of palpal segment 3 is evident but the representation of the basal margin of palpal segment 2 is confusing. It is probable, as was suggested by Nuttall and Warburton, 1915, that this illustration was prepared from a slide mount, and that the appearance of the dorsal basal margin of palpal segment 2 was misinterpreted.

A re-examination of contemporary collections in both the Nuttall collection at London and the Neumann collections at Paris and Toulouse reveals that at the time there was no clear concept of the species *bispinosa* as it is understood today. In the Neumann catalogue at Toulouse three lots are listed under the name *H. bispinosa*: Nn 1418, Nn 1427 and Nn 1736.

Nn 1418 consists of 1 ♀ from Sumatra received from Dr. Foerster and according to the label with the specimen it was determined by Neumann in 1902. The specimen label reads "*Haemaphysalis hystricis* Sup., (*H. bispinosa* Nn.)." Neumann, 1902, p. 128, had come to consider his *bispinosa* described in 1897 a synonym of *hystricis* Supino, 1897. I find this specimen to be *H. semermis* Neumann, 1901. (See further remarks under *H. semermis*.)

Nn 1427. The specimen tube contains two labels, both indicating the collection consists of 15 ♂♂, 1 nymph and 80 larvae off *Lepus nigricollis* from Madras (India) and was received from W. S. Patton in 1908. One label indicates that the specimens were originally identified as *H. flava* by Neumann in 1908 and the other that Neumann later, in 1910, determined them as *H. bispinosa*. The tube contains 14 ♂♂, 1 nymph and a number of larvae of *H. intermedia* Warburton and Nuttall, 1909 (*sensu* Trapido and Hoogstraal, 1963).

Nn 1736 consists of 1 ♂ and 2 ♀♀ off *Bos taurus* from Saidapet (South India) received from W. S. Patton in January 1910 and determined by Neumann as *bispinosa* in 1910. One ♂ and one ♀ are *Haemaphysalis intermedia* (*sensu* Trapido and Hoogstraal, 1963) and 1 ♀ is *H. bispinosa* (*sensu* Nuttall and Warburton, 1915, fig. 360, and most subsequent authors). Additionally there are two slides labelled *H. bispinosa* with the same collection data although they lack any catalogue number. These consist of one slide on which are mounted two ♀♀ and another with two ♂♂, clearly removed from the tube Nn 1736. The two ♀♀ are *H. intermedia.* While the two ♂♂ also appear to be *H. intermedia*, one specimen has the palps rotated and it is difficult to be certain of the appearance of the palpal spurs which provide critical characters for the separation of *H. bispinosa* and *H. intermedia.*

In the Neumann collection at Paris there is one collection under the name *H. bispinosa*, 1 ♂ and 1 ♀ off dog from Borlasgama, Ceylon, collected by Kinnear and donated to the Paris Museum by Nuttall in 1912. These specimens are *H. bispinosa* as understood by Nuttall and Warburton, 1915.

The name *H. bispinosa* has been widely used for an economically important ectoparasite of domestic animals, particularly cattle, in South Asia, Australia and New Zealand and it is thus especially desirable that it be stabilized. As the name is based on the one female (and hence holotype) from Ramnad, Madras State, an exhaustive search was made for this specimen among both alcoholic and slide mounted material in the Neumann collection at Paris and Toulouse. The specimen could not be found and must be presumed lost. As the holotype was a ♀ from Madras State, India, to stabilize the name *bispinosa* for the tick originally intended by Neumann and redescribed by Nuttall and Warburton, 1915, I have selected one ♀ from Madras State in the Nuttall collection (N 167) and designated it as the neotype. This specimen is one of a lot consisting of 42 partially engorged ♀♀ *H. bispinosa* received by Nuttall from Col. Skinner on 3 January 1907, having been collected off slaughter house cattle at Madras on 9 November 1906. Apart from this series of *H. bispinosa* the tube contained 2 ♀♀ *Haemaphysalis intermedia* (*sensu* Trapido and Hoogstraal, 1963) and 1 ♂ *Hyalomma brevipunctata* Sharif, 1928, which I have removed to separate tubes, as also the neotype specimen.

Haemaphysalis cornigera Neumann, 1897.

The description of this species was based on four collections, "une femelle jeune et deux mâles de Singapour (coll. Simon), deux mâles recueillis sur un Cerf à Borneo (coll. R. Blanchard), un mâle pris sur

Bos bubalus à Sumatra (coll. Oudemans), un mâle, de Judée, par Roux (Muséum de Paris)."

The Roux specimen listed as from "Judée" is in the Neumann collection at Paris and is actually *H. spinigera.* (See account of *H. spinigera* for further comment on this specimen.)

Of the remaining three collections two are presently in the Neumann collection at Toulouse. Of the Simon collection from Singapore one ♂ remains. This is catalogued as Nn 1007, and has the characters attributed to the species by Nuttall and Warburton, 1915, pp. 500–504, figs. 441, 442, 444 and 445. The Blanchard collection from Borneo is catalogued as Nn 1008 and consisted of two ♂♂. One ♂ remains in the Neumann collection, the other having been presented to Nuttall and catalogued by him as N 2883. I could not find the Oudemans collection, 1 ♂ from Sumatra, at either Paris or Toulouse.

The original description of *H. cornigera* is accompanied by two figures, one of the ventral view of the right palp (fig. 16) and a second of the coxae (fig. 17). These figures are reproduced in Neumann, 1911, as figs. 57 and 58, and in Nuttall and Warburton, 1915, as figs. 443 and 444. The figure of the coxae is consistent with the Neumann type material seen (Nn 1007 and Nn 1008) but the representation of the ventral aspect of the palp is confusing. It is not unlikely that Warburton and Nuttall, 1909, described a male *cornigera* from Malaya as *H. spiniceps* because they were misled by the Neumann figure as to the appearance of the ventrobasal margin of palpal segment 2. On receiving a syntype of *H. cornigera* from Neumann (see above) they must have realized that their *spiniceps* was conspecific with *cornigera* and in their 1915 monograph relegated *spiniceps* to the synonymy of *cornigera.*

As in the case of the holotype of *H. bispinosa*, the figure was probably drawn from a slide mounted specimen in which the appearance of the basal margin of palpal segment 2 was misinterpreted. The setae represented in the Neumann figure were probably somewhat diagrammatic, and are not consistent with those in his syntype specimens which I have examined, or a considerable number of other *cornigera* specimens from South Asia. The infrainternal setae (the setae of the ventrointernal margin of palpal segment 2) are of diagnostic importance in the characterization of South Asian *Haemaphysalis*, and number four or five in *H. cornigera*, not seven as represented in the Neumann figure.

To stabilize the name *cornigera* I have selected the ♂ of the Blanchard collection from Borneo in the Neumann collection at Toulouse (Nn 1008) and designated it as the lectotype for the species.

Recent studies of *H. cornigera* in collaboration with Dr. Harry Hoogstraal have revealed clinal variation in several morphological features and one new race has already been described, *Haemaphysalis cornigera shimoga* Trapido and Hoogstraal, 1964. A full redescription with detailed illustrations of the nominate subspecies will be published separately.

Haemaphysalis cuspidata Warburton, 1910.

In describing this species Warburton adequately differentiated it from the somewhat similar appearing *H. aculeata* Lavarra, 1905, but did not designate a holotype. As the type series of the latter species includes specimens of both *H. aculeata, sensu* Warburton, 1910 (see account of *H. aculeata*) and *H. cuspidata* it is desirable to designate a lectotype for *H. cuspidata* as well as for *H. aculeata.* I have therefore selected a male from the type series of *H. cuspidata* (N 1108) off *Tragulus meminna* from Colombo, Ceylon, collected 3 August 1909, by C. C. Dobell and designated it as the lectotype of this species.

Haemaphysalis flava Neumann, 1897.

Neumann based his description of *H. flava* on several collections from Japan and also, "avec doute, quatre jeunes mâles et une nymph, rapportés de Ceylan par Deschamps, et qui se distinguent du type surtant par leurs palpes plus courts (Muséum de Paris)." He later, Neumann, 1911, p. 112, included Ceylon in the distribution of *H. flava* without further comment.

This Ceylon collection is now available in the Neumann collection at Paris. It was seen by Santos Dias in 1955 who inserted a label, "*Haemaphysalis turturis* Nut. & Warb.?". I have examined the specimens and find them to be *Haemaphysalis intermedia* Warburton and Nuttall, 1909 (*sensu* Trapido and Hoogstraal, 1963). Ceylon may thus be eliminated from the known distribution of *H. flava.*

Haemaphysalis hystricis Supino, 1897.

The brief description of this species by Supino, 1897, p. 237, is based on material in the Fea collection from Burma. Supino, 1898, p. 252, pl. 13, figs. 19, 20, later also briefly described and figured the tarsi of the ♂ and ♀, but these descriptions and figures are inadequate to characterize the species.

I have been able to examine Supino's type material at the Genoa Museum and in the Nuttall collection at the British Museum. The Genoa specimens are in two tubes; one, Genoa no. 20, contains a single ♂ in good condition; the other, Genoa no. 51, contains two specimens, a ♂ and ♀ which have at some time in the past been mutilated by dissection, the capituli and certain of the appendages having been removed as also the genital area of the ♀. Labels in the tubes indicate the specimens were seen by Nuttall and Warburton. Nuttall and Warburton, 1915, p. 425 cite yet a third Genoa collection, no. 21, but I did not find this at the Genoa Museum. They also cite two lots in the Nuttall collection as Supino specimens having been presented by the Genoa Museum, N 2956 and N 2957. I have been able to find one of these lots, N 2956 in the Nuttall collection at the British Museum, consisting of one ♂, which according to the label comes from Genoa lot no. 20.

The non-mutilated specimens of the type series now available for study thus consist of one ♂ at Genoa (no. 20) and one ♂ at the British Museum (N 2956 from Genoa lot no. 20). I find these two ♂♂ to be conspecific, and designate the specimen at the British Museum, N 2956, as the lectotype.

Haemaphysalis hystricis has been much confused in the literature, and a full redescription of the species is needed to clarify its status. This will be done separately in collaboration with Dr. Hoogstraal in a paper which will also provide detailed illustrations of the lectotype, and other material.

An additional collection of *H. hystricis*, Nn 1791, was seen in the Neumann collection at Toulouse determined by Neumann in error as *H. birmaniae* on 6 December 1912. This consists of three ♂♂ and two ♀♀ off *Canis familiaris* from Kosempo, Formosa, received from the Berlin Museum on 4 November 1912.

Haemaphysalis intermedia Warburton and Nuttall, 1909.

See accounts of *Haemaphysalis bispinosa* Neumann, 1897, and *H. flava* Neumann, 1897.

Haemaphysalis lagrangei Larrousse, 1925.

This species was described from ten ♂♂ and one ♀ from Annam (Indochina). Nine ♂♂ and one ♀ are now in the collection of the Laboratoire de Parasitologie de la Faculté de Médecine, Paris and one ♂, N 3599, is in the Nuttall collection at the British Museum, a gift received in 1927.

All specimens of the syntype series are conspecific. I have selected one ♂ from the specimens at Paris as the lectotype.

Haemaphysalis minuta Kohls, 1950.

This species was described from Ceylon by Kohls based on males only. Santos Dias, 1956, and 1958, recognized that one ♂ and four ♀♀ from Ceylon, received from Deschamps and now in the Neumann collection at Paris, part of the type series of *H. spinigera*, were actually specimens of *H. minuta*. (See account of *H. spinigera*.) In his 1956 paper he redescribed and figured the male and described and figured the female.

H. minuta has since been collected in Shimoga District, Mysore State, India, and reared associated material of all stages and both sexes have been obtained at the Virus Research Centre, Poona. (See Trapido et al., 1964, for illustrations of the immature stages.) The female figured and described by Santos Dias is consistent with the VRC reared specimens except in one important character. The dorsobasal margin of palpal segment 3 in the reared females of *minuta* has a distinct and prominent deltoid spur. This spur is absent in the Santos Dias illustration of the female (Fig. 3) and is not mentioned in his description. I have re-examined the Deschamps material in the Neumann collection seen by Santos Dias and find the females do in fact have this spur and otherwise also exactly match Indian specimens. The presence of the spur was perhaps overlooked by Santos Dias as there is no comparable spur in the male. There is a similar expression of sexual dimorphism in *H. spinigera* in which palpal segment 3 is provided with a dorsobasal spur in the female, but not the male.

Haemaphysalis neumanni Dönitz, 1905.

Dönitz proposed this name for males and females of a taxon occurring in Japan related to *H. bispinosa.* In his original description he does not cite particular specimens but merely indicates that the name is based on specimens off horse, cattle and dog from various provinces of Japan. However, he did send specimens to Neumann and Nuttall which, from the data accompanying them, are clearly syntypes.

The name *neumanni* has had a confused history, but the taxon concerned is currently under study and will be redescribed and fully illustrated separately. To fix the name *neumanni* for the taxon intended by Dönitz I have selected a ♀ from the lot sent to Neumann by Dönitz and designated it as the lectotype. This specimen is one of a lot composed of 6 ♀♀ and 2 ♂♂, Nn 1425, in the Neumann collection at Toulouse. The accompanying data slip indicates that the specimens were off horse, cattle and dog from Japan, determined by Dönitz in 1905 and donated by Dönitz to Neumann on 25 June 1906. The label also lists the specimens as two ♂♂, five ♀♀ and one nymph; one of the small females having been supposed to be a nymph in error.

Haemaphysalis obesa Larrousse, 1925.

This distinctive species was described from five ♂♂ off *Cervulus muntjac* ? from Annam (Indochina) but a holotype was not designated.

Original Larrousse material under this name which I have borrowed from the collection of the Laboratoire de Parasitologie de la Faculté de Médecine de Paris consists of one male which matches the Larrousse description and figures. I have designated this specimen as the lectotype of the species.

Haemaphysalis semermis Neumann, 1901.

This species was described from a single male from Benkalis, received from Maindron. Benkalis (now spelled Bengkalis in most atlases) is an island off the east coast of Sumatra in the Strait of Malacca about 100 miles west of Singapore. Later, Neumann, 1902, p. 128 and 1911, p. 109, came to consider this species to be a synonym of *H. birmaniae* Supino, 1897. But Nuttall and Warburton, 1915, p. 516, remarked that the type of *semermis* was seen by Nuttall and they considered this taxon a synonym of *H. hystricis* Supino, 1897; they further illustrated (fig. 355) the Neumann type under the name *hystricis*. They were followed in this by Anastos, 1950, p. 36, who also included *H. semermis* in the synonymy of *H. hystricis*.

In the Neumann collection at Paris there is a tube with a single male *Haemaphysalis* labelled "*Haemaphysalis birmaniae* Supino, ♂, G. Neumann det. 1906, Benkalis, Maindron, 1885." While there is no label identifying this as the specimen on which the name *semermis* is based, it is apparent that this is the holotype of the species and I have so labelled it.

I, and Dr. Harry Hoogstraal, have compared this holotype of *H. semermis* with other recently collected material from South Asia now available in the collection of the Rocky Mountain Laboratory and conclude that this is a distinctive and valid species. In collaboration with Mr. Glen Kohls we will redescribe and illustrate in detail this species which has been lost for more than half a century.

See account of *H. hystricis* for other comments.

Haemaphysalis spiniceps Warburton and Nuttall, 1909.

See account of *Haemaphysalis cornigera* Neumann, 1897.

Haemaphysalis spinigera Neumann, 1897.

This species has recently become recognized as being of medical importance as a vector of the virus of Kyasanur Forest disease, Work, 1958, and Trapido et al., 1959.

In his description of *H. spinigera* Neumann cited the following material—"D'apres 1° Trois préparations: une femelle d'un Boeuf indien de Mahratta, deux mâles d'un *Felis tigris* et d'un Ours de Mahratta (Indes) (Coll. R. Blanchard); 2° Quatre femelles et deux jeunes mâles, de Ceylan, par Deschamps (Muséum de Paris)."

Of the three "préparations," presumably slide mounts, two are in the Neumann collection at Toulouse: 1 ♀ from an Indian bullock, south Mahratta, and 1 ♂ from a bear, also south Mahratta (now Maharashtra State, India). A careful search of the Neumann collections both at Paris and Toulouse failed to reveal the 1 ♂ from *Felis tigris* either among slide mounts or alcoholic material and this specimen must be presumed lost, although Santos Dias, 1958, lists it with the others as being in the Neumann collection at Toulouse.

Of the Deschamps material from Ceylon there are four females and one male now in the Neumann collection at Paris, as has been noted by Santos Dias, 1956, and 1958, who also correctly realized that this collection, part of the syntype series of *H. spinigera*, was in fact *H. minuta* Kohls, 1950. (For further information on the Santos Dias report see account of *H. minuta.*)

The presently existing type material of the species currently being called *H. spinigera* thus consists of the two slide mounts from south Mahratta, 1 ♂ and 1 ♀, mentioned above. To stabilize the name *H. spinigera* I have designated the male specimen from a bear, south Mahratta, as the lectotype and attached a label to this effect to the slide mount.

Later Neumann, 1901, cited an additional collection of *H. spinigera*, "3 ♀ rapportées de Judée par Roux," a record which has become established in the literature and which has been the basis for the inclusion of Judea (now Israel) in the range of *H. spinigera* (for example, Nuttall and Warburton, 1915, p. 449, Sharif, 1928, p. 263). Curiously enough, Neumann also cited 1 ♂ from Judea obtained by Roux in the list of specimens on which his description of *H. cornigera* was based (see Neumann, 1897, p. 352). This record has also been accepted by various authors (Nuttall and Warburton, 1915, p. 504 and Sharif, 1928, p. 272).

On ecological and geographical grounds these Judea records have seemed doubtful. Both of these Asian species have relatively high moisture requirements which would not be likely to be met in the eastern Mediterranean, and they were not found by Feldman-Muhsam, 1951 and 1960, in her studies of the *Haemaphysalis* of the eastern Mediterranean, nor by Hoogstraal and Kaiser, 1958, in Turkey nor by Hoogstraal, 1959, in Iraq. I am advised (in litt.) by Feldman-Muhsam, who lives in the Middle East and has worked on that tick fauna for a number of years, that she has not found these species and doubts the records.

The Roux material labelled as from Judea now in the Neumann collection at Paris consists of two tubes, one labelled "*Haemaphysalis spinigera* ♀" containing two ♀♀ of the three listed by Neumann in 1901, and a second labelled "*Haemaphysalis cornigera* ♂" with the "*cornigera*" scored out and another label reading "*Haemaphysalis spinigera* ♂ Nn. 1901." Each of the tubes contains a small printed label of the sort used for recording data on pin mounted insect specimens, reading "Muséum Paris, Judée, Roux, 1-36." It would appear that Neumann may later (in 1910) have realized the Roux male was *spinigera* and not *cornigera*, although in his 1911 treatment of the Ixodidae prepared for the Das Tierreich series, he continues to give "Judée" as a locality for both species.

The male and two females are in poor condition, in each case with a hole through the body indicating they were at one time dry mounted on insect pins. All three specimens of both sexes are typical *H. spinigera* as may be determined with certainty from the illustrations accompanying the original description and as presently understood. That is, the male has coxa IV with a single, not a double spur, and the females have the ventral basoexternal margin of palpal segment 2 with the characteristic spur which is absent in female *cornigera*. (Further comment on *cornigera* will be found under the remarks on that species.)

Thus all the Roux specimens attributed to Judea are *H. spinigera*. I am informed by M. Marc André, who has the Neumann tick collection at Paris in his care, that Roux was a naturalist who collected for the Paris Museum in the 19th century. It is apparent that if it could be established that Roux collected in India as well as the eastern Mediterranean there would be grounds for supposing that when his specimens were entered in the Paris Museum collection, there could have been a mixup or misreading of labels, which would have resulted in attributing Indian specimens to Judea. A search of the 19th century literature has revealed that this is in all likelihood what happened. The Annales des Sciences Naturelles, 2nd. ser., vol. I, Zoologie, 1834, pp. 99–104, contains a "Lettre de M. Polydore Roux addressée à M. le Baron de Ferussac en datée de Bombay, 15 juin 1832." In this letter Roux tells of having arrived at Bombay from Egypt on that day and of his plans for travel in India to visit Pondicherry, Madras and Calcutta. In a footnote the editors provide the further information that Roux died at Bombay on 12 April 1833.

In discussions of this matter with M. André and also Dr. Otto Kraus of the Senckenberg Museum, Frankfurt, it has been brought to my notice that as rendered in 19th century French script on a handwritten field label, "Judée" and "Indes" would be readily confused. The number of letters in the two words is the same; the capital letters "J" and "I" are similar in appearance; the letter "u" is often indistinguishable from "n"; the "d" is common to both words; and the final two letters "ée" and "es" are similarly rendered.

There are thus reasonable grounds for supposing that the Roux *spinigera* specimens actually came from India, and "Judée" may now be eliminated from the known distribution of this species.

Acknowledgments

I am much indebted to the authorities of several museums and institutions for permission to study types and other material in their care, and for facilities to examine these specimens: Dr. G. Owen Evans, the British Museum (Natural History), London; M. Marc André, Muséum Nationale d'Histoire Naturelle, Paris; Professor André Brizard, École Nationale Véterinaire, Toulouse; Professor E. Tortonese, Museo Civico di Storia Naturale "Giacomo Doria," Genoa. Professor Henri Galliard kindly loaned Larrousse specimens in the collection of the Institut de Parasitologie, Faculté de Medécine, Université de Paris, and Mr. Charles Elton, Director of the Bureau of Animal Population, Oxford University, provided facilities while this material was being worked up. Dr. Harry Hoogstraal and Mr. Glen M. Kohls have given freely of their time in advising on the taxonomic problems dealt with.

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A NEW MITE, PROSARCOPTES SCANLONI, FROM MONKEY
(ACARINA : SARCOPTIDAE)

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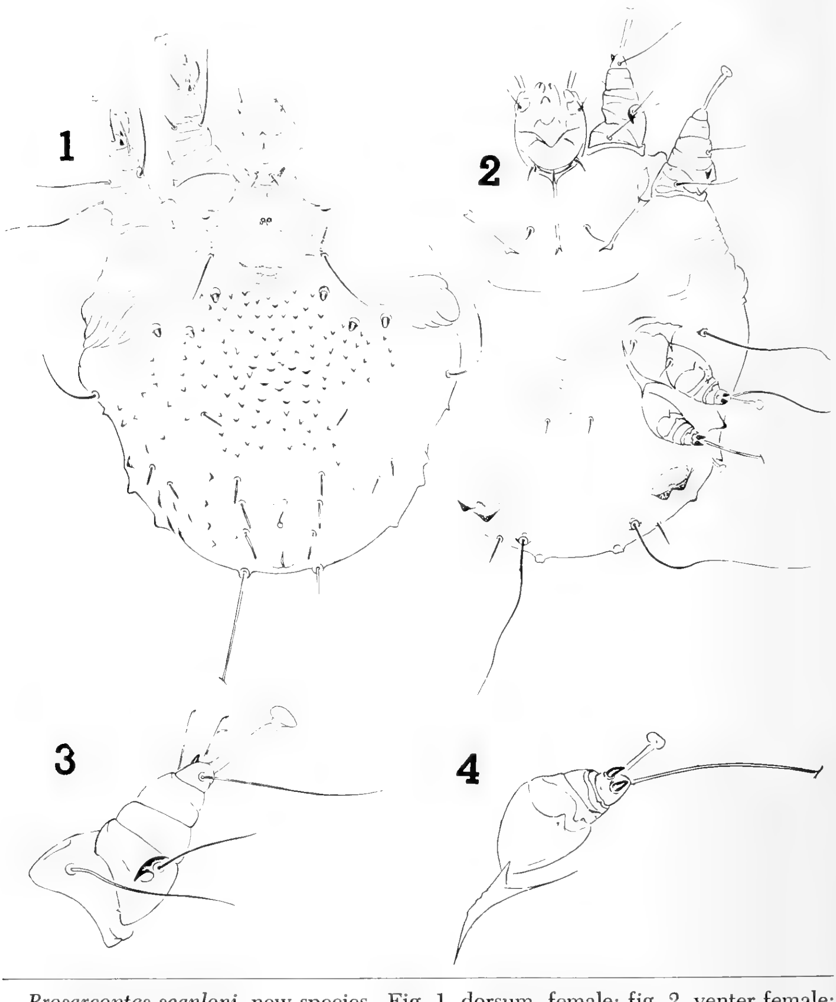
The genus *Prosarcoptes* Lavoipierre, 1960, contains only one species, *Prosarcoptes pitheci* (Philippe, 1948). This genus, although closely related to *Sarcoptes*, differs in having ambulacra on all legs of the female, whereas in *Sarcoptes* only legs I and II possess these ambulacra.



Prosarcoptes scanloni, new species. Fig. 1, dorsum, female; fig. 2, venter female; fig. 3, leg I, female; fig. 4, leg IV, female.

In July, 1963, Major J. E. Scanlon of the SEATO Medical Research Laboratory, Thailand, sent two specimens of a sarcoptid mite for identification. These were taken from the monkey *Macaca irus* and were reported to be the apparent cause of depilation of several individuals. Examination showed these mites to be another species of the genus *Prosarcoptes.*

Prosarcoptes scanloni, new species
(Figs. 1–4)

This species closely resembles *Prosarcoptes pitheci* (Philippe). It differs in the shape of the ventral apodemes in the region of legs III and IV, and in possessing two posterior ventral sclerotic areas each having large triangular projections.

Female. Palpi typical for family, short, stout, with two long dorsal setae of equal length and one shorter ventral seta. Propodosoma with small anterior median shield with two short setae; one large posterior shield without setae; a pair of long whiplike setae laterad of shield; and transverse striae as figured. Hysterosoma with transverse striae possessing large triangular lobes (much larger on lateral margins of body), and lacking on the posterior area of *bursa copulatrix.* Dorsal hysterosomal setae short, the three anterior pairs peglike; humeral setae whiplike; two pairs of long, whiplike posterior setae. Ventral striae transverse: posterior to coxae IV a pair of small sclerotized shields, each with two strong triangular lobes. Legs I to IV each with embulacra; setation as figured. Body 236μ long by 196μ wide.

The female holotype, U.S. National Museum No. 2981 and a female paratype were collected from a monkey, *Macaca irus,* in Thailand, July, 1963, by Majoı John E. Scanlon, for whom this species is named.

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NEW SPECIES OF TRICHOPTERA FROM THE UNITED STATES

OLIVER S. FLINT, JR., *Smithsonian Institution, Washington, D. C.*

During the past few years a number of undescribed Nearctic caddisflies have been found in material being determined from various sources. The purpose of the present paper is to provide names for these novelties. I wish to thank the following people who have submitted this material: Mr. James H. Baker, Baker, Oregon, Dr. J. F. Gates Clarke, Department of Entomology, Smithsonian Institution, Dr. R. L. Fischer, Department of Entomology, Michigan State University, Dr. J. G. Franclemont, Department of Entomology, Cornell University, Dr. S. W. Hitchcock, Connecticut Agricultural Experiment Station, Dr. R. W. Hodges, Insect Identification & Parasite Introduction Research Branch, U.S. Department of Agriculture, and Dr. Ellis G. MacLeod, Biological Laboratories, Harvard University.

HYDROPSYCHIDAE

Aphropsyche monticola, new species

This, the second species placed in the genus *Aphropsyche*, is closely related to *A. doringa* (Milne). *A. monticola* differs in lacking the strong spine on the posterior margin of the tenth tergum and in possessing a pair of arms overlapping the aedeagus dorsally at its midlength.

Length of forewing 8–9 mm. Dorsum of head, thorax and abdomen black; head beneath antennae, venter of thorax and abdomen, and legs brownish yellow; antennae fuscus. Wings covered uniformly with brownish setae. Fifth abdominal segment with a pair of filamentous processes arising anteroventrally, more than half as long as segment.

Male genitalia (Fig. 1). Ninth segment narrow, with a lateral projection anteriorly and a ventral shelf posteriorly. Tenth tergum with posterior margin heavily sclerotized, this portion widely separated dorsomesally. Claspers long and cylindrical, curving slightly more dorsally near apex, apical segment poorly set off; in posterior aspect, apex broadened and developed into a mesal subapical tooth. Aedeagus complex; ventral tube becoming flattened and scoop-shaped apically, above tube a single process with a single dorsal subapical barb, above process a pair of long slender rods not quite as long as process; at about midlength the ventral tube bears a pair of processes which meet above the other processes, holding all in place.

Female eighth abdominal sternum completely divided mesally, halves nearly meeting at base, tapering toward lateral line apically. Ninth segment without any clasper groove or receptacle.

Holotype, male: Virginia, Shenandoah National Park, Hogcamp Brook just below Skyline Drive, 24 June 1961, R. A. & O. S. Flint, Jr. United States National Museum type 67409.

Allotype, female: same, but 8 July 1961.

Paratypes: 4 males, same data as holotype. 2 males, same data as allotype.

Hydropsyche macleodi, new species

Very similar to *H. slossonae* Banks, from which it differs primarily in the structure of the aedeagus. In *macleodi* the dorsolateral arm possesses near the base a small lobe that is capped by a few spicules and the apical spine of the arm is directed toward the tip of the aedeagus, and the apex of the tube lacks the ventral pair of spicule filled pockets.

Length of forewing 7–9 mm. Specimens in alcohol, and so now uniformly brown.

Male genitalia (Fig. 2). Ninth segment annular, with both anterior and posterior margins produced ventrally. Tenth tergum with a low crest middorsally, apical processes well developed, semicircular in dorsal aspect. Clasper long and cylindrical, apical segment tapering to a sharp point. Aedeagus Z-shaped, with only 1 pair of apical spicule pockets (evaginated in holotype), dorsolateral arm with a basal lobe capped by a few spicules, apical spine directed toward apex of aedeagus and arising subapically from a small spiculiferous lobe.

Holotype, male: North Carolina, Blue Ridge Parkway, Crabtree Meadows Campground, 9 June 1961, R. A. & O. S. Flint, Jr. United States National Museum type 67410.

Paratypes: 3 males, same data, but 5–6 June 1962, E. G. MacLeod.

Hydropsyche opthalmica, new species

This rather distinctive small species is a member of the *H. scalaris* group and seems closest to *H. fattigi* Ross from which it differs in possessing large eyes, and larger, more dorsally produced lateral processes of the aedeagus. The type may be a bit teneral, thus appearing paler than a fully mature specimen.

Length of forewing 8 mm. Eyes large, about 1.5 times as wide as interocular width. Head, thorax and coxae fuscus with white setae, appendages pale brown, wings pale brown with faint dark irrorations in the typical pattern.

Male genitalia (Fig. 3). Ninth segment annular with setae along posterior margin. Tenth tergum narrow, tip slightly produced into a dorsal point. Claspers cylindrical, apical segment poorly delimited. Aedeagus with lateral processes produced well above dorsal margin of the stem; in ventral aspect, lateral processes wider than the stem of aedeagus, well separated mesally.

Holotype, male: West Virginia, along Cacapon River about 2 miles south of Capon Bridge, at black light, 13 May 1963, W. D. Field & O. S. Flint, Jr. United States National Museum type 47411.

Hydropsyche potomacensis, new species

This species belongs to the *H. depravata* group, and is probably most closely related to that species. However, *potomacensis* differs in not

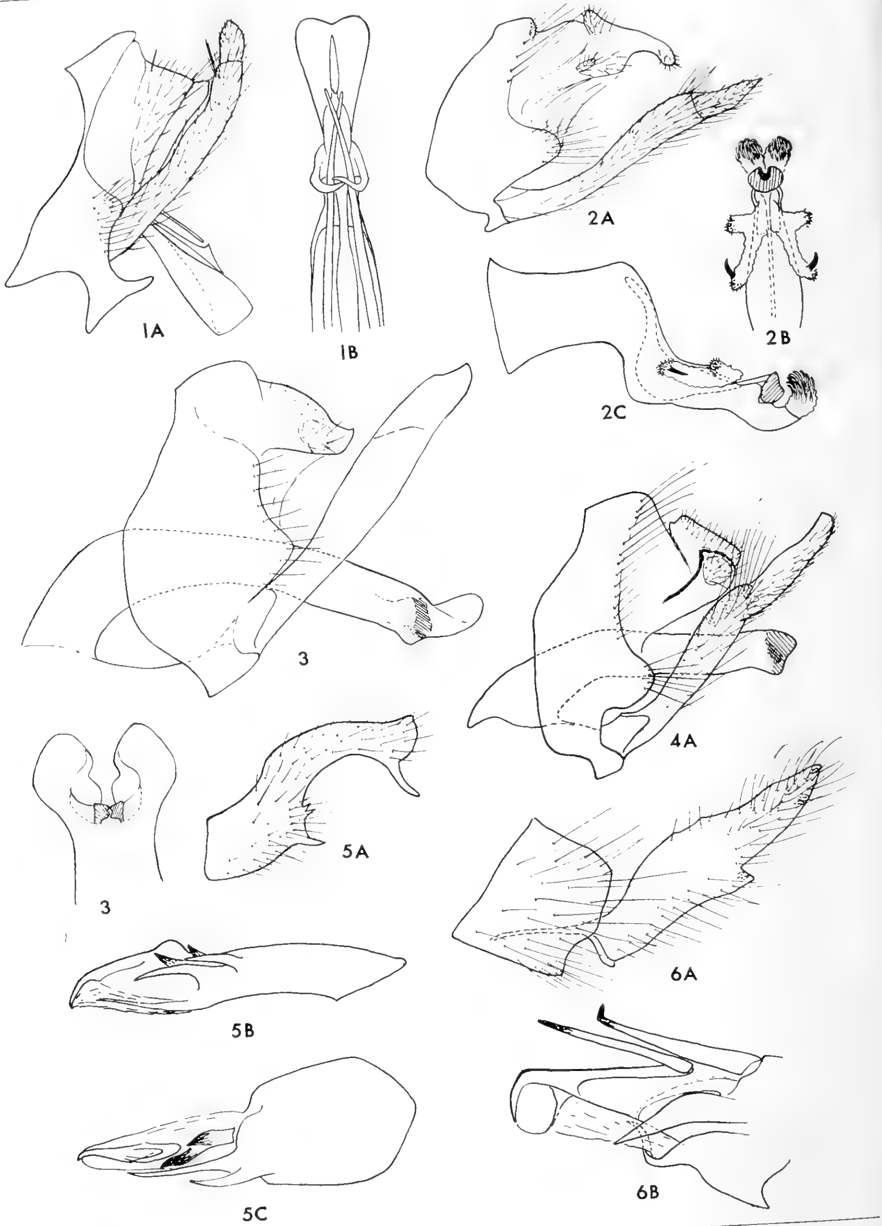

Fig. 1, *Aphropsyche monticola* n. sp. A, male genitalia, lateral, B, aedeagus, dorsal; fig. 2, *Hydropsyche macleodi* n. sp. A, male genitalia, lateral, B, tip of aedeagus, dorsal; C, aedeagus, lateral; fig. 3, *Hydropsyche opthalmica* n. sp. A, male genitalia, lateral, B, tip of aedeagus, ventral; fig. 4, *Hydropsyche potoma-*

having the tip of the aedeagus greatly enlarged ventrally, and in having a declivous tenth tergum.

Length of forewing 11–12 mm. Body brown, legs brownish-yellow, antennae with dorsal V-marks on basal segments. Wings spotted with brown and cream-colored setae in the typical pattern.

Male genitalia (Fig. 4). Ninth segment with a conspicuous row of setae along its posterior margin. Tenth tergum declivous, with an elongate dorsomesal lobe and a pair of lateral setal warts. Claspers cylindrical, with apical segment almost ⅔ as long as basal segment. Aedeagus with basal portion angled at about 135° from apical portion, apex slightly decurved, divided and with a small central lobe internally.

Holotype, male: Virginia, Highland County, bridge on Route 220 over East Fork of Potomac River, 18–20 May 1963, W. D. Field & O. S. Flint, Jr. United States National Museum type 67412.

Paratypes: 14 males, same data.

Hydroptilidae

Ochrotrichia okanoganensis, new species

Closely related to *O. logana* (Ross), this species may be recognized by the structure of the tenth tergum, especially by the ventral process which is twisted beneath the tergum.

Length of forewing 3.5 mm. Wings fuscus, with a few small transverse patches of whitish hairs.

Male genitalia (Fig. 6). Ninth segment incomplete dorsally, almost quadrate in lateral aspect. Clasper pointed apically, apex produced into a small mesally directed spine, ventral margin with a lobe at midlength bearing a few dark spines, several spines below apex. Tenth tergum dorsally with 2 elongate, black-tipped spines, distal one almost attaining apex of tergum; basal sinistral spine curving entirely across venter of tergum, lateral spine broad and directed slightly ventrad.

Holotype, male: Washington, Okanogan County, Winthrop, 26 July 1962, J. F. Gates Clarke. United States National Museum type 47413.

Ochrotrichia dactylophora, new species

A species that is in the *O. confusa* section of the genus, perhaps closest to *O. spinosa* Ross. From the latter and all other described species in the genus, it differs in the long apicoventral process of the clasper and in the details of the processes of the tenth tergum, most especially the two lateral spines.

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censis n. sp. A, male genitalia, lateral; fig. 5, *Ochrotrichia dactylophora* n. sp. A, male clasper, lateral, B, tenth tergum, lateral, C, tenth tergum, dorsal; fig. 6, *Ochrotrichia okanoganensis* n. sp. A, male ninth segment and clasper, lateral; B, tenth tergum, lateral.

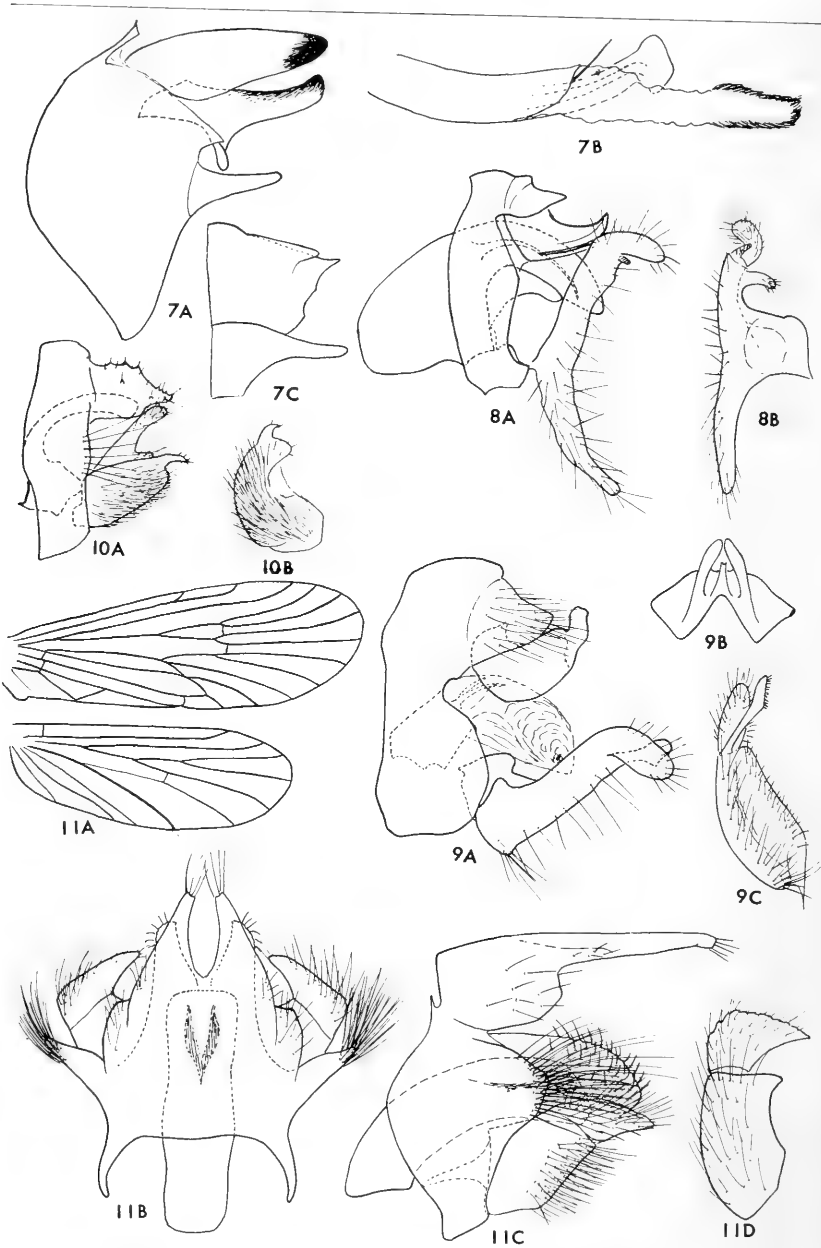

Fig. 7, *Limnephilus apache* n. sp. A, male genitalia, lateral, B, aedeagus, lateral, C, female genitalia, lateral; fig. 8, *Athripsodes ruthae* n. sp. A, male genitalia, lateral, B, clasper, caudal; fig. 9, *Athripsodes cama* n. sp. A, male genitalia, Length of the forewing, 2.5 mm. Wings fuscus, with a few transverse patches of white hairs.

Male genitalia (Fig. 5). Ninth segment incomplete dorsally, expanded apicoventrally to twice dorsal width. Clasper sigmoid in lateral aspect with a strong apicoventral tooth directed ventromesally, with a spine ventrally at near mid-length and several spines mesally. Tenth tergum dorsally with 2 short black-tipped spines; laterally with 2 spines, dorsal spine standing out conspicuously and about half length of more appressed ventral spine; apically elongate and developed into a decurved structure.

Holotype, male: Arizona, Coconino County, West Fork, 16 miles southwest of Flagstaff, 6500 ft. elevation, 5 August 1961, R. W. Hodges. United States National Museum type 67414.

Paratypes: 2 males, Arizona, Portal, Southwest Research Station, 16 June 1963, J. H. Baker. 5 males, same data, but 11 July 1963, P. J. Spangler. 32 males, New Mexico, nr. Silver City, Cherry Creek Recreation Area at black light, 9 July 1963, P. J. Spangler.

Limnephilidae

Limnephilus apache, new species

This species is related to *L. sublunatus* Prov., but differs in having less strongly arched cerci and a narrower tenth tergum.

Length of forewing 13 mm. Pale brown; forewings with white markings in cell Cu_2, apically in cell 1st M, around the cord, and in cell M_2. Basal segment of foretarsus in male 1½ times length of second segment.

Male genitalia (Fig. 7 A, B). Eighth tergum posteromesally with a patch of scabrous black setae. Clasper developed into a rather long digitate lobe. Cercus elongate, slightly tapering, apex blackened and slightly produced mesally. Tenth tergum extending as far posteriad as cercus, considerably expanded basally, becoming much narrowed beyond, dorsal margin blackened. Aedeagus with lateral arms formed of a basal sclerotized portion which bears an apical seta, and an apical membranous portion which is margined dorsally and ventrally with a dense row of short setae; central tube slightly upturned, apical segment short and considerably expanded.

Female genitalia (Fig. 7C). Cercus basally united with tenth segment, tips extending freely. Tenth segment tubular, divided on middorsal line, projecting further caudad dorsally than ventrally. A digitate lobe on each side extending caudad beneath tenth segment.

Holotype, male: Arizona, Coconino Co., Fort Valley 7½ mi. N.W. Flagstaff, 7350 ft. elevation, 9 August 1961, J. G. Franclemont. United States National Museum type 67738.

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lateral, B, tenth tergum, caudal, C, clasper, caudal; fig. 10, *Lepidostoma bakeri* n. sp. A, male genitalia lateral, B, clasper, cuadal; Fig. 11, *Adicrophleps hitchcocki* n. sp. A, wing venation, B, male genitalia, dorsal, C, genitalia, lateral, D, clasper, caudal.

Allotype, female: same data.

Paratypes: 1 male, 2 females, same data. 1 male, New Mexico, Ruidoso, 2 July 1961, G. C. Eikwort. Paratypes in the collections of J. G. Franclemont and Michigan State University.

Leptoceridae

Athripsodes cama, new species

Athripsodes cama is related to *A. resurgens* (Walker), but lacks the ventral lobe of the clasper and has a totally different tip on the tenth tergum.

Length of forewing 10–12 mm. Specimens totally denuded; coloration thus unknown.

Male genitalia (Fig. 9). Cercus broadly triangular, apex rather blunt. Tenth tergum with apex upright and divided mesally, mesal incision with perpendicular process. Clasper lacking ventral process, with a thin mesal expansion, mesal process long and slender. Aedeagus C-shaped, mostly membranous apically, with a pair of short spines at midlength.

Holotype, male: North Carolina, Lake Waccamaw, 23 March 1952, W. J. Gehweiler. United States National Museum type 67415.

Allotype, female: same data.

Paratype, male: North Carolina, Faison, 8 August 1952, R. E. Howell.

Athripsodes ruthae, new species

The species is a member of the complex containing *A. annulicornis* (Steph.) and is closest to *A. scopulosus* Leonard. From *scopulosus*, *ruthae* differs in having the ventral process of the clasper almost as long as the dorsal part of the segment, in having the mesal lobe of the basal segment of the clasper slender, in lacking the 2 membranous lobes between the cerci, and in having a slender rod along the ventral margin of the tenth tergum.

Length of forewing 9 mm. Coloration generally fuscus, an indication of paler setae at anal angle of forewing, basal segments of antennae conspicuously annulate.

Male genitalia (Fig. 8). Cercus trianguloid, partially separated dorsally. Tenth tergum with tip slightly upturned, a slender, rod-like process appressed to ventral margin. Clasper with ventral angle formed into a long rugose process, mesal process very short, mesal lobe slender. Aedeagus C-shaped, basally inflated, with a single curving internal spine.

Holotype, male: Massachusetts, East Amherst, at black light along Fort River, 27 June 1962, Ruth A. Flint, O. S. Flint, Jr., and J. F. Hanson. United States National Museum type 67416.

Paratype, male: New York, Tompkins County, Slaterville Springs, July 1960, Ruth A. Flint.

Lepidostomatidae

Lepidostoma bakeri, new species

This is another species of the *L. unicolor* group, and is closely related to *L. knulli* Ross. The ventral aspect of the clasper of *bakeri* differs in having a more rounded lateral margin and in having the tip developed into a mesally directed hook surmounting a thin lobe.

Length of forewing 7–8 mm. Color of specimens in alcohol, uniformly brown. Legs and wings without modifications; maxillary palpus a single segment held straight forward, concave mesally and filled with scale-like setae; basal segment of antenna about as long as head, with an opening basomesally through which a small, spherical structure may be everted.

Male genitalia (Fig. 10). Ninth segment annular. Tenth tergites rugose, tapering uniformly in lateral aspect, diverging in dorsal aspect. Clasper with basal process erect and about as long as clasper, dorsal process arising from base of basal process and appressed to body at clasper, apex of clasper with a single pointed process in lateral aspect, in ventral aspect with an apical hook surmounting a thin rounded lobe, lateral margin evenly curved.

Holotype, male: Arizona, Portal, Southwest Research Station, 16 June 1963, J. H. Baker. United States National Museum type 67417. Paratype, male: same data.

Brachycentridae

Adicrophleps, new genus

Ocelli absent. Maxillary palpus 2-segmented, segments short and subequal. Spurs 2,2,2. Forewing of male with R_1 lacking angulation beneath stigma, R_{4+5} branching at r-m, 2A touching wing margin before angling sharply to 1A, 3A greatly reduced or lacking. Hindwing of male with 3 branches from R_s, M and Cu_1 unbranched. Sixth sternum of male with a short, quadrate mesal process. Male genitalia with clasper 2-segmented, cercus produced into a long dorsomesal process.

Type species: *Adicrophleps hitchcocki* Flint

The genus seems most closely related to *Micrasema*, but also combines characteristics of *Brachycentrus* and unique structures. The branching of R_{4+5} at r-m is characteristic of *Brachycentrus*, whereas the configuration of the anal veins in the forewing and Cu_1 in the hindwing are unique. The structure of the maxillary palpus, and the spur count are typical of *Micrasema*, most especially *aspilus* which also possess a 2-segmented clasper.

Adicrophleps hitchcocki, new species

As mentioned above the species seems closest to *M. aspilus* (Ross), but differs in many venational characteristics and details of the male genitalia.

Length of forewing 4.5 mm. Color of specimen in alcohol very dark, almost black.

Male genitalia (Fig. 11). Posterior margin of ninth segment developed into a lateral, hirsute lobe. Cercus bearing a basoventral lobe, and a long dorsomesal process. Tenth tergum divided mesally, lateral lobes bearing short upright setae. Clasper with anterior margin appressed to ninth segment, apical segment developed into a posteromesal point. Aedeagus slightly arcuate, tubular.

Holotype, male: Connecticut, Portland, 13 May 1963, S. W. Hitchcock. United States National Museum type 67418.

Paratypes: 2 males, same data. 1 male, Connecticut, Mt. Carmel, brooklet in Sleeping Giant State Park, 5 May 1961, S. W. Hitchcock.

ANNOUNCEMENT

Short scientific articles of **less** than one printed page, with or without small illustrations, are urgently needed and will be published promptly. A printed page equals approximately 50 typewritten lines. See page 201 of this issue for format.—Editor

ELEVEN NEW SPECIES OF PACIFIC NORTHWEST ELATERIDAE (COLEOPTERA)

MERTON C. LANE, *Collaborator, Entomology Research Division, ARS, U. S. Department of Agriculture*

In connection with the task of preparing keys to the Elateridae for "The Beetles of the Pacific Northwest," Volume 5, by Dr. M. H. Hatch, it was necessary to describe some 40 new species. Eleven species are being described at this time. These species will be keyed to their proper relationship with the older species in the above publication within the next year.

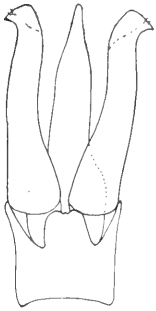
Paratypes are deposited in various collections. Those collections are indicated by initials under the discussion of each species. The initials and their meanings are as follows: ANSP, Academy of Natural Sciences of Philadelphia, Philadelphia, Pa.; ATM, A. T. McClay; CAS, California Academy of Sciences, San Francisco, Calif.; CDA, Canadian Department of Agriculture, Ottawa, Ontario; HPL, H. P. Lanchester; JHB, J. H. Baker; JNK, J. N. Knull; KEG, K. E. Gibson; LGG, L. G. Gentner; MCL, M. C. Lane; MCZ, Museum of Comparative Zoology, Cambridge, Mass.; MHH, M. H. Hatch; UBC, University of British Columbia, Vancouver, B. C.; UC, University of California, Berkeley, Calif.; UI, University of Idaho, Moscow, Idaho; USNM, U.S. National Museum, Washington, D. C.; WSC, Washington State College, Pullman, Wash.

Ctenicera barri, new species

Holotype male, length 10.5 mm., width 4.0 mm., (paratype males 9.2–10.7 mm.). Color black; except orange on anterior margin of pronotum side margins above and beneath, epipleura of elytra, narrow dorsal side margins on anterior half of elytra, basal spots two intervals wide, and an irregular spot near apex of each elytron; pronotum smooth and shiny, elytra less so due to reticulated surface; vestiture hardly noticeable above, very fine and dark brown beneath.

Head quadrate, slightly concave above, horizontally rounded between eyes, front not margined in middle, moderately finely punctate, surface shiny smooth. Antennae pectinate from 3rd to 10th segments, inclusive, second segment small and 11th elongate with tip pinched and pointed; 2nd to 6th inclusive and 11th with the following lengths and widths in mm.: $.20 \times .20$, $.50 \times .45$, $.50 \times .50$, $.60 \times .60$, $.65 \times .60$, $1.00 \times .20$; pectinations extend .25 to .35 mm. longer than bases from 4th to 10th segments; antennae extending four segments beyond posterior angles of pronotum.

Pronotum one-third wider than long, very convex on anterior half of disc, with margins thickened and explanate, including hind angles, which are divaricate and pointed. Punctures simple and moderately spaced. Middle line smooth on basal half and basal plica very fine. Scutellum flat, as long as wide, blunt posteriorly, simply punctate with a slight raised middle line.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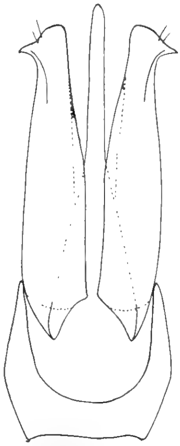
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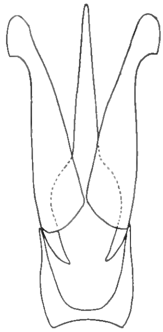
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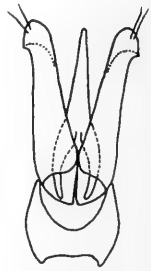
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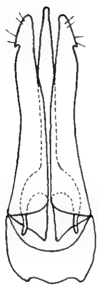
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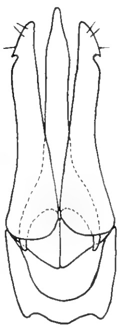
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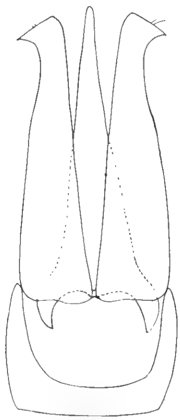
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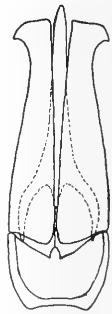
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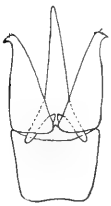
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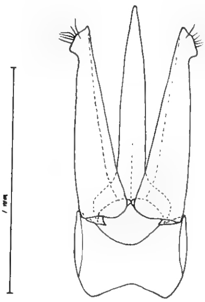
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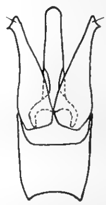
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Elytra twice as long as wide, parallel in anterior two thirds, then broadly rounded to apex, together rather robustly convex; striae shallow with elongate punctures, intervals reticulately punctured, making surface rougher than rest of body.

Propleura coarsely, deeply punctate, surface shiny, posterior margins broadly sinuate near produced tip; prosternum coarsely punctate, anterior lobe short, broadly rounded, mucro convex between prolegs, sharply bent inwards and punctate to narrowed tip. Metasternum and abdomen with legs finely rather inconspicuously punctate, legs black with yellow claws. Aedeagus as figured. (fig. 1).

Allotype female, length 12.3 mm., width 5.0 mm., (paratype female 10.6 × 4.4 mm.). Differs from male in having the antennae coarsely serrate, not pectinate, and only extending to the posterior angles of the pronotum. Female is colored same as in male with the body somewhat more convex and robust.

Holotype male, Lolo Pass, Idaho Co., Idaho, June 14, 1963, W. F. Barr collector. Allotype female, Lolo Pass, Idaho Co., Idaho, June 30, 1964, W. F. Barr collector, both deposited in the California Academy of Sciences, San Francisco. Paratypes (74): Lolo Pass, Idaho Co., Idaho, June 14, 1963 and June 30, 1964, W. F. Barr collector, except some collected by O. O. Fillmore, G. B. Hewitt, and R. L. Wescott. The paratypes are being deposited in the following collections: UI, USNM, CAS, CDA, ANSP, MCZ, MHH, JNK, MCL.

Remarks: There is some variation in the yellowish-orange coloration; some specimens have anterior margin of pronotum with deep central notch of that color, others with anterior margin black, except at angles. Elytral spots vary only slightly, the apical spot usually extending from 4th interval to margin, irregular in shape. The yellowish-orange color was bright red in living specimens. The series was collected sweeping in a swampy area, and I am naming the species after my friend Dr. W. F. Barr, University of Idaho, Moscow, who has furnished me with several new species.

This species is unique in several ways: first, by having pectinate antennae which character occurs in only six other elatrid species from North America, only one of which is included in this genus, namely *C. kendalli* Kby.; second, the coloration is rather spectacular; third, the species is closely related by shape, size and male genitalia to only one other known North American species, namely *C. appressus* Rand., from New Jersey, New York, and Minnesota, also found in swampy areas. The latter have the usual serrate antennae. I have placed this species in *Ctenicera* because of its pectinate antennae, although both *appressus* and *barri* have many characters in common with the genus *Eanus* of LeConte, which already includes several not too closely related species.

Ctenicera manisi, new species

Holotype male, length 14.8 mm. (paratype males 12–15 mm.), width 3.4 mm. Form elongate, narrow, and convex; body black, except 4th to 7th intervals of elytra which are flavous their whole length, the light color also including the 1st, 2nd, and 3rd intervals at apex; legs dark brown on femur to light brown on tarsi; surface shiny on dorsum, less so beneath except on prosternum, with fine gray vestiture, somewhat denser beneath.

Head wider than long beween eyes, slighly concave, deeply umbilicaely punctured on front and densely punctate on base at insertion into pronotum; eyes slightly prominent, about as wide as anterior angles of pronotum. Antennae very long, extending four segments beyond posterior tips of pronotum; second segment small, third much larger and similar in shape to fourth, third to eleventh opaquely punctured; 2nd to 6th inclusive and 11th with following widths and lenghs, in mm.: .15 × .25, .40 × .60, .45 × .70, .45 × .70, .45 × .80, and .20 × 1.10.

Pronotum more than one-half longer than wide on middle lines, sides gradually widening to posterior angles which are only slightly divaricate, finely carinate and blunt; disc finely umbilicately punctured, quite densely so on sides, which are obtusely margined, hardly showing from above; posterior third vaguely grooved, but with shallow depressions on each side of mid-line just in front of deeply emarginate posterior margins. Scutellum longer than wide, punctate and more setose than remainder of body.

Elytra two and one-half times longer than pronotum, parallel in front gradually tapering to apex, which is narrowly rounded; each elytron flat near suture, convex towards side, which is hardly visible from above; striae distinct and finely punctate, intervals flat and finely punctate.

Propleura densely umbilicately punctured, suture single with no flare in front; posterior margin not emarginate with outer angle rectangular, not produced. Prosternum sparsely umbilicately punctate, mucro long, bent inwards with smooth blunt carina between procoxae.

Metasternum and abdomen moderately densely punctured, surface slightly less shiny than pronotum and prosternum. Legs medium long, tarsal segments of metathoracic legs measuring, .80, .50, .40, .20, .55 mm. in length. Aedeagus as figured (fig. 2). Female is not known at present.

Holotype male, Winona, Idaho Co., Idaho, Apr. 29, 1953, W. F. Barr collector, specimen in California Academy of Sciences (San Francisco). Paratypes (20): IDAHO: Winona, Apr. 29, 1953 (W. F. Barr); Gifford, May 24, 1951, 2900′ (W. F. Barr); May 27, 1949 (W. F. Barr); NezPerce, May 20, 1949 (H. C. Manis); Apr. 27, 1949, 3132′ (A. J. Walz); Lewiston, May 2, 1937 (C. C. Ball); Webb, May 18, 1934 (J. N. Knull). The paratypes are being deposited in the following collections: UI, USNM, CDA, MCZ, ANSP, JNK, MCL, and MHH.

Remarks: This species belongs in a group with *horni* Schw., *macer* Fall, *linearis* Fall, and *patricia* VanD., having auriculate posterior angles on pronotum, and is closely related to the last species differing in its longer antennae with wider and longer segments, more sparsely punctate disc of pronotum, less flavous coloration, heavier vestiture, and darker legs. From *linearis* it varies in being shorter and stouter, more convex on sides of pronotum, elytral intervals flatter, and darker beneath. It differs from the all brown *macer* in color and shorter antennae. It was collected in sweeping "Idaho" fescue grasses on upland prairies in north central Idaho. It is named for my friend Dr. Hugh C. Manis, Head, Department of Entomology at Univ. of Idaho, Moscow. Van Dyke's *patricia* seems to be a species limited to coastal areas of Oregon and Washington.

Ctenicera gibsoni, new species

Holotype male, length 11.2 mm., (paratypes 9.7–13.4 mm.), width 2.7 mm. Form elongate, narrow, parallel, slightly convex; body light brown above and beneath, with disc of pronotum and antennae darker brown; surface somewhat shiny, slightly obscured with a fine grey vestiture only slightly finer beneath.

Head quadrate, coarsely deeply punctured; front flat between eyes, latter prominent, above as wide across the eyes as anterior angles of pronotum; antennae long, extending three and a half segments beyond posterior tips of pronotum; second segment shiny and small, third similar in shape to fourth, following segments all opaquely punctured, segments 2nd to 6th inclusive and 11th with following widths and lengths, in mm.: $.20 \times .20$, $.25 \times .45$, $.35 \times .50$, $.35 \times .60$, $.35 \times .65$, and $.20 \times .80$.

Pronotum one-half longer than wide (2.9×1.9 mm.), excluding divaricate posterior angles, sides parallel, acutely defined and slightly explanate anteriorly, very finely carinate on posterior angles which are quite pointed; disc convex, densely punctate, somewhat more finely so at sides, with slight groove extending from base almost to apex. Scutellum slightly longer than wide, flat finely punctate, with vestiture slightly longer than on rest of body.

Elytra nearly three times longer than wide (8.0×2.8 mm.), sides straight and parallel to apical third, gradually narrowed to point at apex; each elytron flat near suture, convex near lateral margins which are hidden in dorsal view except in apical third; intervals flat and finely punctate.

Propleura densely and finely umbilicately punctate, posterior margin deeply sinuate near angles, which are long and pointed; sternopleural suture single and not flared in front. Prosternum long, mucro bent inwards and concave between procoxae, punctures umbilicate and separated by distance approximately equal to own diameters, surface shiny.

Metasternum and abdominal segments fairly densely and finely punctate, but leaving surface shiny under a fine pubescence. No impunctate areas are present on lateral portion of segments. Legs long, metathoracic tarsal segments measuring: .60, .40, .35, .20, .50 mm. Aedeagus as figured (fig. 3).

Female unknown.

Holotype male, Walla Walla, Washington, 2000′, Apr. 24, 1937, M. C. Lane collector, specimen in the U. S. National Museum, No. 67818. Paratypes (60): OREGON: Baker, May 5 (Knull); Blue Mts., Tollgate Rd., June 4 (Lane); Blue Mts., Cottonwood Canyon, Apr. 20 (Jones); Blue Mts. Gov't Rd., Apr. 28 (Lanchester); WASHINGTON: Blue Mts., Apr. 24 (Jones); Blue Mts., Mormon Grade, Apr. 25 (Lane); same, May 4 (Lane); same June 21 (Lanchester); Walla Walla, 2000′, Apr. 24 (Lane); Walla Walla, Mormon Grade, Apr. 23 (Gibson); Walla Walla, Kooskosskie, May 21 (Lanchester).

The paratypes are being deposited in the following collections: USNM, CAS, CDA, MCZ, ANSP, MCL, KEG, MHH, JNK, and HPL.

Remarks: This species has been collected frequently from brushy pastures on lower slopes of western Blue Mts., at approximately 2000 feet, near Walla Walla, Washington, and to date the female has not been found, though industriously searched for. The series of males is quite uniform in color, shape, and size, except the pronotum is sometimes piceous. It is somewhat related to *tenella* Van Dyke and *protracta* LeC. It differs from former in its finer punctation and somewhat finer denser vestiture, as well as in lack of impunctate spots along the side margins of the abdominal segments.

The antennae are shorter and wider than in *tenella*, and *gibsoni* differs in posterior margin of propleura being sinuate, while in *tenella* it is straight with wider, blunter apex to angle. From *protracta* it varies in many ways, longer antennae, lighter color, finer punctation, flat intervals on elytra, and different distribution. This species is named for Kenneth E. Gibson, my associate in wireworm research and good friend for many years.

Limonius jonesi, new species

Holotype male, length 6.4 mm. (paratype males 5.6–7.5 mm.), width 2.2 mm. Form small, robust, convex; body black except episterna of elytra which are dark brown, antennae black, legs dark brown to black; surface somewhat shiny with short gray to yellowish vestiture.

Head quadrate, coarsely deeply punctured; frons broadly slightly concave; clypeal margin entire, slightly emarginate; antennae extending one segment beyond posterior angles of pronotum, second and third segments cylindrical, shiny, subequal, not quite twice as long as wide, together longer than fourth, which is broadly triangular, sixth segment only slightly longer than wide, fourth to tenth slightly serrate and opaquely punctate.

Pronotum quadrate, as wide as long, sides slightly arcuate at middle, broadly rounded to anterior angles, slightly sinuate in front of posterior angles, the latter slightly divergent with short carina; disc convex, side margins hidden from above, surface shiny, coarsely, deeply punctate, densely on sides, less so on disc, with semblance of impunctate middle line. Scutellum moderately prominent, finely densely punctate and pubescent.

Elytra one-tenth wider than pronotum, about two and one-quarter times as long as wide, sides straight and parallel in basal two-thirds, broadly arcuate to apices, which are bluntly rounded; each elytron slightly convex on disc, more so towards sides, lateral margin barely showing from above; striae distinct with elongate nearly confluent punctures, intervals usually flat with three irregular rows of fine punctures.

Propleura densely, almost umbilicately punctate; sternopleural plate excavated and slightly flared in front, grooved nearly one-half distance to procoxa; posterior margin of propleura slightly emarginate with small notches; hind angles barely produced and rectangularly blunt. Prosternum more deeply and densely punctate than propleura. Abdomen even more finely and distinctly punctured. Aedeagus as figured (fig. 4).

Allotype female, length 7.7 mm. (paratype females 6.8–8.1 mm.), width 2.5 mm. Differs from male in being on average slightly larger with antennae barely reaching to posterior angles of pronotum.

Holotype male, Blue Mts., Mottet R. S., Oregon, 4500′, June 27, 1935, M. C. Lane collector; allotype female: Same locality and date, both deposited in U. S. National Museum, No. 67819. Paratypes (over 100): OREGON: Blue Mts., Mottet R. S. (sometimes labeled Mottet Meadows and the R. S. should be G. S. in Forest Service nomenclature) 4500′, June 7 to July 3 (Lane, Jones, and Lanchester); Blue Mts., Tollgate R. S., 5000′, May 23 to June 29 (Lane, Lanchester, Fender); Meacham, 4000′, May 13 and 22 (Lane, Lanchester); Whitman N. F., Hoodoo G. S., 6000′ and Trail Cr., 5500′, June 12 (Lane, Lanchester); Granite, June 16 (Lane); Bly, June 13 (Fender); Lake O'Woods, Klamath Co., June 11 to July 4 (Gentner, McClay); Steen Mts., Fish Lake, Harney Co., 8000′, June 22 (Malkin); Forest Grove, May 23 (Rockwood); Gaston, April 22 (Rockwood); McMinnville, May 21 and June 21 (Fender); Baker, June 11 (Baker). IDAHO: Smith's Ferry, June 23 (Lane, Lanchester); McCall, Brundage Mt., 6000′, June 23 (Lane). CALIFORNIA: Mt. Lassen N. P., June 10 to July 25 (Nelson, Reynolds); Donner Creek, Nevada Co., June 10 (Fender).

The paratypes are being deposited in the following collections: USNM, CAS, UC, CDA, MCZ, ANSP, ATM, JNK, LGG, and JHB.

Remarks: This large series varies little in size and shape, the punctures of thorax and elytra always being distinct. This species might be confused with *nitidulus* Horn, but when placed side by side it is easily distinguished. This new species is more convex dorsally, especially on pronotum, with posterior angles usually divergent and carina shorter than in *nitidulus*. Antennae of latter are more slender and segments more elongate, and general punctation is finer on body.

Male genitalia of *jonesi* is quite different from *nitidulus*, being longer, with broader and more elongate tips to the lateral lobes.

Limonius jonesi is fairly common on very short grass in mountain meadows and along edges of mountain streams soon after the snow is melted. Specimens from Willamette Valley are indistinguishable from mountain forms, but seem to be quite rare. This species is named for my deceased friend Edward W. Jones, who was associated with me in research on the Elateridae for many years in the Pacific Northwest.

Limonius shircki, new species

Holotype male, length 8.2 mm., width 2.4 mm. (paratype males length 7.2–9 mm.). Body above and beneath black, with anterior half of elytra reddish orange in color; vestiture fine and dark brown on prothorax, lighter brown on elytra to yellowish on abdomen, not obscuring integument entirely.

Head quadrate, densely umbilicately punctate; frons slightly concave, clypeal margin slightly depressed and arcuate and not raised; antennae slightly shorter than pronotum at posterior angles, 2nd and 3rd segments small subequal, together slightly longer than 4th, with following six are triangularly serrate, last segment elongate and pointed.

Pronotum as wide as long, widest at posterior angles, then narrowed gradually to anterior angles which are not explanate; posterior angles produced and rounded on outside, with short carina divergent from margin; disc convex, side margins barely showing in middle, broadly canaliculate at base only; surface densely umbilicately punctate all over. Scutellum slightly convex, densely punctate and pubescent.

Elytra not wider than pronotum, two and a fourth times longer than wide, sides straight and parallel in basal two-thirds, evenly arcuate to apices which are rounded; orange color covering anterior half of elytra and extending along epipleura to apical third, with first interval only slightly darker brown to area near scutellum; striae well marked and deeply punctate, intervals slightly convex and simply punctate.

Propleura densely umbilicately punctate, sternopleural plate excavated and flared in front, suture grooved only one-fourth distance posteriorly; posterior margin of propleura deeply evenly emarginate, outer angles obtusely angulate. Prosternum somewhat less densely umbilicately punctate than propleura, but more coarsely so on anterior lobe, mucro flat and slightly inclined inwards. Metasternum deeply simply punctate on disc. Abdomen deeply punctate, last sternite broadly rounded and simply pubescent. Legs dark brown on femur, tibiae and tarsi lighter brown. Aedeagus as figured (fig. 5).

Allotype female, length 9.6 mm., width 2.9 mm. (Paratype females, length 8.4–9.2 mm.). Differs very little from male in shape and color, except it is slightly larger, antennae shorter, and first elytral interval entirely orange as rest of anterior half.

Holotype male, Parma, Idaho, April 11, 1930, H. P. Lanchester collector; allotype female, Harper, Oregon, May 2, 1932 (H. P. Lanchester); both deposited in the U. S. National Museum, No. 67820. Paratypes (17 males and 4 females): IDAHO: Parma, March 17 (Lanchester), April 11 and 21 (Lanchester), April 20 (Lane); Boise, no date or collector; Rock Creek, Twin Falls Co., May 28 (Lane); Minidoka N. F., May 12 (Thatcher); Shoshone, Apr. (Portman). OREGON: Harper, May 2 (Shirck and Lanchester); Unity, May 21 (Lane); Hereford, May 6 (Lane); Hereford, May 8 (Baker). The paratypes are being deposited in the following collections: CDA, CAS, UI, HPL, and MCL.

Remarks: This species is most nearly related to *L. mirus* of California but latter has more of elytra colored a deep yellow color. Antennal segments are shorter and more triangular in present species than in most of other similarly colored species. There is very little variation among the paratypes in color and shape, except the dark color has a tendency to expand forward near suture on some, as in holotype. It appears to be the smallest as compared to rest of western *Limonius* with this black-orange coloration. It appears to inhabit areas near water and is found resting on willows, tall grasses, and shrubs on river banks or along irrigation ditches. I have named it after F. H. Shirck, a friend and associate of long standing in wireworm research.

Limonius snakensis, new species

Holotype male, length 9.8 mm. (paratype males 8.8 to 10.8 mm.), width 2.7 mm. Elongate parallel, moderately convex; body above and beneath shiny black, with only humeral region of elytra reddish orange; vestiture very fine and dark brown above, becoming lighter and heavier beneath, but never obscuring integument.

Head quadrate, moderately umbilicately punctate; frons slightly concave; clypeal margin entire, arcuate, and slightly raised; antennae extending not more than one segment beyond the posterior angles of pronotum, 2nd and 3rd segments small, cylindrical, only slightly longer than wide, together as long as 4th, the latter triangular, nearly as wide as long, 4th to 10th serrate, 11th pointed.

Pronotum as wide as long, widest at posterior angles, sides gradually narrowed to anterior angles which are not explanate; posterior angles produced and obtusely angulate on outside, with short carina slightly divergent from margin; disc convex, side margins hidden in middle, broadly canaliculate at base; surface moderately deeply punctate on disc, punctures becoming larger and umbilicate near lateral margins, separated by their own diameters. Scutellum prominent, flat, finely densely punctate, more pubescent than rest of body.

Elytra not wider than pronotum at posterior angles, two and half times longer than wide, the sides straight and parallel in basal two-thirds, evenly arcuate to apices which are bluntly rounded; orange color covering entire humeral region including basal one-third of elytra and epipleura to middle, except two intervals of black color extending forward along suture to apex of scutellum; striae well defined and coarsely punctate, intervals almost flat with fine punctures.

Propleura moderately umbilicately punctate, sternopleural plate excavated and flared in front, grooved to one-third distance posteriorly; posterior margin of propleura deeply emarginate without teeth, produced angles somewhat rectangular. Prosternum deeply finely punctate, umbilicately so on anterior lobe; mucro flat between procoxae and slightly inclined inwards. Metasternum moderately densely deeply punctate on disc. Abdomen finely densely punctate, last sternite evenly rounded and simply pubescent. Legs piceous, tarsi brown. Aedeagus as figured (fig. 6).

Allotype female, length 10 mm. (paratype females 9.5 to 12 mm.), width 2.9 mm. Differs very little from male, except slightly larger, antennae shorter than pronotum by about two segments, and abdomen more convex.

Holotype male, Wawawai, Washington, March 28, 1939 H. P. Lanchester collector; allotype female, Same locality, April 18, 1939 (M. C. Lane); both deposited in the U. S. National Museum, No. 67821. Paratypes (14 males and 13 females): BRITISH COLUMBIA: Merritt, June 9, 1948 (Neilson & Finlayson). WASHINGTON: Wawawai, March, April, May (Bales, Lanchester, Lane, Turner, Schenefelt); Cheney, May 16, 1942 (Rogers); Deep Lake, Spokane Co., May 3, (Hebard). Sun Lake State Park, Grant Co., May 9, 1958 (Knudsen). OREGON: Durkee, July 4 and May 6 (Lane); The Dalles, May 19

(Hubbard & Schwarz). IDAHO: Lewiston, April 20; Lenore, May 19 (Miller). State Creek, Idaho Co., May 14 (Barr). MONTANA: Jefferson Co., May 30. The paratypes are being deposited in the following collections: USNM, CDA, CAS, MCZ, ANSP, UI, WSC, and MCL.

Remarks: This species is closely related to *L. crotchi* which inhabits the coastal areas west of the Cascade Mts. from British Columbia southward to middle California. Besides difference in distribution the present species differs from *crotchi* in the more restricted humeral rufous area, finer punctation above and beneath, and in male genitalia. It seems to be found only along margins of streams or lakes resting on early blossoming shrubs such as wild currant and willows. Most of the specimens were collected along banks of Snake River, hence the name.

Hemicrepidius montanus, new species

Holotype male, length 15.0 mm., width 4.7 mm. (paratype males 11.5–15.0 mm.).

Body robust, dark brown to black, with posterior margin and angles of prothorax, lobe of prosternum, and inflexed margin of elytra reddish. Surface slightly shiny with very fine dark brown vestiture.

Head quadrate, slightly concave on front above arcuate margin, coarsely cribrately punctate, interspaces shiny. Antennae long, extending one segment beyond posterior tips of pronotum; second segment small, shiny, third longer, almost as long as fourth and opaque like the rest; segments three to ten strongly triangular, slightly longer than wide and extending outwards to make the whole antenna much more serrate than is usual in the genus; last segment restricted at apex.

Pronotum convex, about as broad as long, sides slightly arcuate at middle and sinuate near posterior angles, gradually widening with a short prominent carina diverging from sides; disc moderately punctate with simple punctures denser and umbilicate at the sides, with partial impunctate middle line, slightly grooved at base. Surface very slightly alutaceous between punctures. Scutellum saddle-shaped with raised ridge and almost impunctate.

Elytra about two and half times longer than pronotum, converging gradually from humeral angles to apex, which is blunt; each elytron broadly convex, sides visible from above; striae distinct, deep, with elongate punctures; intervals convex and simply punctate, irregular near apex.

Propleura moderately umbilicately punctured with impunctate space near posterior margin, the latter arcuate with slightly extended posterior angles. Prosternum coarsely not densely punctate, mucro impunctate, shiny, and straight. Metasternum and abdomen finely punctate and less shiny than rest of body surface. Legs with first four tarsal segments lobed, the first and fourth smaller than second and third lobes. Aedeagus as figured (fig. 7).

Allotype female, length 15.5 mm., width 5.0 mm. (paratypes 13.5–18 mm.). Body very similar to form and color of male, except more robust and convex. Antennae several segments shorter than pronotum, the segments being less serrate than in male, though the third segment is still triangular in shape and similar to following segments.

Holotype male, Moscow, Idaho, 2560′, June 23, 1932, Paul Rice collector, specimen in California Academy of Sciences; allotype female, Moscow, Idaho, June 28, 1931, 3000′ Paul Rice collector, specimen in U. S. National Museum. Paratypes (25): IDAHO: Moscow, June 19, 1927; June 14, 1930; June 21, 1931; June 1938; June 11, 1930; Moscow Mt., Aug. 1, 1953; Wallace, July 12, 1935; McCall, Valley Co., July 30, 1952; Lowman, Sept. 1, 1932. WASHINGTON: Anatone, July 3, 1946. OREGON: Baker, Pine Cr., 4400 ft. June 15, 1941; Pinehurst; Halfway, Baker Co., July 4; Meacham, June 19, 1927; East Lake, June 20, 1959; O'Brien, Josephine Co., May 30, 1952. CALIFORNIA: Echo Lake, 7000′ June 29, 1934. BRITISH COLUMBIA: Creston, July 14, 1929, G. Stace-Smith; June 27, 1948; Cooper Mt., July 27, 1929 G.S-S; Midday Valley, Merritt, July 4, 1923, R. Hopping; June 26, 1924, R.H.; June 25, 1924; K. F. Auden. ARIZONA: Palmerlee, Cochise Co., July; Aug.; Flagstaff, July 1941.

Paratypes deposited in following collections: UBC, USNM, CDA, CAS, MHH, JNK, and MCL.

Remarks: This species is closely related to *H. morio* LeC., but the antennal segments are more triangular and more serrate than in *morio*. The latter species is less punctate on pronotum and usually larger, especially in females. Tendency for lighter posterior angles of pronotum and other margins is distinctive in *montanus*, which is known mostly from higher elevations inland from B. C. to Arizona, while *morio* is a species of lower elevations and the coast.

Hypolithus olympus, new species

Holotype male, length 7.5 mm. (paratype males (2) 6.8–7.8 mm.), width 2.4 mm. Form semi-flattened, semi-opaque, and very dark brown in color; first segment of antennae, epipleura of elytra beneath, and legs lighter brown. Body above covered wih a short golden vestiture, lighter yellow beneath and somewhat more dense.

Head wider than long between the eyes, frontal margin broadly rounded and slightly depressed at the middle, evenly densely punctate. Eyes not prominent and slightly narrower than anterior margin of pronotum. Antennae slightly shorter than the pronotum, second segment small, third longer than second and cylindrical in shape. Fourth to tenth segments as broad as long and only slightly serrate; second and third segments slightly shiny, fourth to eleventh opaque; second to sixth segments and eleventh with following lengths: .18, .25, .20, .20, .20, .25 mm. Eleventh segment blunt at tip.

Pronotum slightly longer than wide, broadly arcuate on sides, sinuate near posterior angles, which are slightly divergent; posterior angles with short carina, parallel and close to margin; disc densely punctate, more cribrately towards the sides; middle line slightly impressed; surface alutaceous. Scutellum as broad as long with punctures and vestiture same as rest of body.

Elytra twice as long as pronotum, sides parallel to behind middle length, tapering broadly to apex. Striae distinct with elongate punctures, intervals rather coarsely punctate, giving a roughened appearance to whole elytra.

Propleura with coarse shallow punctures on background of very fine punctures, posterior margins beneath sinuate, angles oblique. Prosternum shiny, punctures simple and moderately dense, cribrate on anterior lobe; mucro slightly concave between the procoxae and slender to tip.

Metasternum coarsely and densely punctate, surface shiny. Metacoxal plate sinuate on inner margin before obtuse angles, then sinuate to outer margin, which is sharply pointed. Abdomen more finely and less densely punctate, the surface somewhat alutaceous and obscured by the gray yellow vestiture. Male aedeagus as figured (fig. 8).

Allotype female, length 7.8 mm. (paratype females (9) 7.3–8.2 mm.), width 2.4 mm. Form similar to male, but more flattened and with shallow depressions behind the middle of pronotum on each side about half distance from middle line to margins. This character appears in all females, but not in the males. Antennal segments similar in shape to male and body slightly more opaque overall.

Holotype male, Olympic Hot Springs, Washington, Aug. 4, 1942 M. H. Hatch collector, specimen in Hatch Collection, University of Washington, Seattle; allotype female, with same data, deposited in M. C. Lane Collection, Tacoma. Paratypes (10): with same data, and one male from Pacific City, Oregon, July 20, 1941 (K. M. Fender). The paratypes are being deposited in the following collections: USNM and CAS.

Remarks: This species belongs to the group with *H. funebris* and *squalidus*, with more or less opaque and roughened surfaces. It varies from *funebris* in simpler punctation on pronotum, less flattened above, and with coarse punctation beneath. From *squalidus* it varies in the finer vestiture and coarser punctation beneath, sinuation on inner posterior margin of metacoxa and more uniform darker coloration. The aedeagus of male in *olympus* differs from either of the others by the decidedly angulate apex to lateral lobes. It is not known just how this species was collected, but presumably along the margin of a stream.

Megapenthes gentneri, new species

Holotype male, length 7.0 mm. (paratype males 6.4–7.6 mm.), width 2.2 mm. Form bluntly elongate; body maculate on black, with base and posterior angles of pronotum, slightly more than one-third of anterior portion of elytra including the epipleura, and a spot on each elytron about one-third from apex and 5 to 6 intervals wide, yellow in color with some differences in shading. Mouthparts, anterior angles of propleura and legs also yellowish. Vestiture very fine, golden, somewhat denser beneath.

Head quadrate, slightly convex, simply punctate; front evenly rounded, eyes not prominent, about as wide as anterior angles of pronotum. Antennae not quite attaining posterior angles of pronotum, second and third segments small, subequal and cylindrical; fourth segment longer than second and third together, triangular in shape, with outer angles prolonged slightly, as are the following segments, except the last which is elongate oval; length of second to sixth and eleventh segments, in mm.: .10, .10, .30, .25, .25, and .30. Extra long supplemental hairs on 4th to 11th segments secondary sexual structures, and give antenna a hairy appearance.

Pronotum as broad as long, sides parallel, broadly rounded to anterior angles; side margins disappear from dorsal view in anterior half, only very slightly sinuate before posterior angles, which have a short sharp carina divergent from margin; disc with very fine sparse punctures, less dense towards side margins. Scutellum narrowly triangular and moderately rugose, punctures not distinct.

Elytra twice as long as wide, parallel on anterior third, gradually narrowing to apical third and more sharply narrowed to apex; dorsal surface flattened, humeral angles prominent, striae deeply punctate, intervals flat and slightly rugose; apex of elytra with coarse marginal spinules.

Propleura finely rugosely punctate, surface slightly alutaceous, sternopleural plate slightly flared in front; prosternum shiny with distinct simple punctures; mucro deeply indented between procoxae and only slightly bent upwards to a point.

Metasternum densely and somewhat rugosely punctate; metacoxal plates not widely expanded on inner third, angle broad, with outer portion retaining its width to the side margins of elytron. Abdomen slightly more finely punctate than metasternum, both slightly alutaceous on surface. Aedeagus as figured (fig. 9).

Allotype female, length 8.0 mm. (paratype females 6.9–8.9 mm.), width 2.3 mm. Form coloration, vestiture, and punctation same as in male. Female is slightly larger and broader; antennae shorter, without extra supplemental hairs.

Holotype male, Butte Falls, Oregon, July 3, 1951, Gentner collector, specimen in the U. S. National Museum, No. 67822; allotype female, same locality and date, Lane collector, in Lane Collection. Paratypes (22): OREGON: Same data as holotype. WASHINGTON: Tacoma, July 10, 1960 (Lane). BRITISH COLUMBIA: Ladysmith, Aug. 13, 1959 (Kelton); Horne, Aug. 27, 1948 (F. I. S.). CALIFORNIA: Whitehall, Eldorado Co., June 21, 1931 (Saylor); Riverton, July 6, 1931 (Zimmerman). Paratypes are being deposited in the following collections: CAS, CDA, JNK, MHH, and LGG.

Remarks: This species seemed at first to be only a color variation of *M. caprella* LeC. But *gentneri* differs by having larger broader form, more hairy, serrate antennal segments, different male genitalia, and by the males and females having identical coloration. The other related species, *stigmosus* LeC. and *caprella* LeC., show sexual differences in pattern of maculation on elytra, the males usually with much reduced areas of yellow and females never with anterior portion of elytra all yellow. The last paratype mentioned by Brown (1933:140) in his description of *M. californicus* is really this new species, though the specimen is immature; it is the above designated paratype from Riverton, Cal., Aug. 6, 1931 (E. C. Zimmerman). This new species is named for my good friend Louis G. Gentner of Medford, Oregon, with whom I have spent many enjoyable hours collecting in southern Oregon.

Ampedus bakeri, new species

Holotype male, length 10 mm. (paratype males 8–10 mm.), width 3 mm. Form moderately elongate, somewhat convex, with shiny integument; color of body black, except elytra, which are bright reddish orange without black markings; antennae and legs dark brown, first three segments of antennae and tarsi lighter or reddish, vestiture piceous on head and pronotum, orange on elytra, and yellow on ventral surface of body, coarse semi-erect on dorsum, but finer and decumbent ventrally.

Head slightly convex, densely umbilicately punctured; antennae barely reaching to posterior angles of pronotum, second and third segments small, shiny, the third segment a little wider and longer, second and third together slightly longer than fourth; segments four to ten triangular, a little longer than wide, serrate, with outer angles rounded, punctate and pubescent.

Pronotum slightly wider than long, sides sub-parallel in posterior half, broadly rounded and narrowing to anterior angles, very slightly sinuate in front of posterior angles, which are acutely produced with short carina divergent from side margin; disc convex, densely coarsely punctate as on head, punctures umbilicate on sides, finer and less dense in middle at base; median line barely canaliculate at base. Scutellum flat, coarsely punctate, with vestiture black.

Elytra, only slightly wider than pronotum, a little over twice as long as wide, the sides sub-parallel to apical third, evenly arcuate to apex, which is bluntly rounded; striae shallow with round punctures separated by approximately their own diameters, intervals flat, finely, irregularly punctured.

Propleura moderately densely and coarsely punctate, interspaces finely alutaceous; sternopleural plate widely excavated and flared somewhat in front, grooved to one-third distance to procoxa; prosternum deeply punctate, punctures a little sparser than on propleura, interspaces shiny; mucro grooved between coxae. Metasternum, coxal plates, and abdomen moderately densely punctate, the punctures becoming finer towards apex of abdomen. Aedeagus as figured (fig. 10).

Allotype female, length 10.5 mm. (paratype females 8.8–11 mm.), width 3.4 mm. Differs from male very slightly, being on average only a little broader and longer, with antennae somewhat shorter, and pronotum somewhat more robust.

Holotype male, Meacham, Oregon, May 13, 1933, M. C. Lane collector; allotype female same locality, June 8, 1930, M. C. Lane collector; both deposited in the U. S. National Museum, No. 67823. Paratypes (over 100): OREGON: Meacham, May 13 to June 23 (Lane); Union, April 27 (Baker); Baker, June 21 (Baker); Blue Mountains, Bone Springs, 5,800′, June 27 and July 2 (Lane, Lanchester); Blue Mountains, Squaw Springs, 5,000′, July 5 (Lanchester); Blue Mountains, Tollgate Road, 3,500′, June 7 and 25 (Lanchester, Gibson); Mt. Hood, Cloud Cap Inn, 6,000′, June 12 (Lane, Lanchester); Mt. Hood, Government Camp, 4,000′, July 6 (Jones); Mt. Hood, Timberline Lodge, 6,000′, July 6 (Lane); Mt. Hood, Brightwood, March 21 (W. W. Baker); Fort Klamath, May 26 (Lane); Crater Lake, April, July 13, and Aug. (Brode-Keen); Mt. McLoughlin, Fish Lake, June 12 (McClay); Butte Falls, April 27 (McClay); Ashland Nat., Jackson Co., July 14 (Scullen); Lake-O-Woods, Klamath Co., July 5 (Malkin);

Keno, Klamath Co., May 22 (Schuh); Upper Klamath Lk., May 17, (Schuh). WASHINGTON: Blue Mountains, Mormon Grade, May 3 and 31 (Lanchester, Gibson); Blue Mountains, Lewis Peak, July 3 (Lanchester); Blue Mountains, Blacksnake Ridge, 3,500′, June 16 (Lane); Mt. Rainier, White River Camp, July 27 (Wilcox); Mt. Rainier, Paradise Park, 5,400′, July 18 (Lane); Tampico, April 10 (Rolfs); Mt. Adams, West Klickitat, 3,500′, July 8 (Morley); Carson, August 15 (Gibson); Boulder Cave, Yakima Co., May 10 (Nelson). IDAHO: McCall, May 17 and June 10 (Lanchester, Shirck, Gibson); Cedar Mt., Moscow, 4,000′, May 5, 21 (Lane, Downie); Dreary, May 14 (Downie). CALIFORNIA: Giant Forest, May 31; Truckee, Nevada Co., June 23 (Armaud); Sequoia N. P., 5000–7000′, July 24 (McClay); Yuba Pass, Sierra Co., June 2 (McClay); Manzanita Lake, Lassen, N. P., May 25 (Anderson); Buck's Lake, Plumas Co., July 19 (MacSwain); Fallen Leaf Lake, Eldorado Co., June 22 (Madsen); Lake Tahoe, July 20 (Saylor); Lake Alpine, July 16 (Allen); Castle Lake, Siskiyou Co., June 6 (Chandler). The paratypes are being deposited in the following collections: USNM, CAS, CDA, MCZ, ANSP, MCL, HPL, MHH, JHB, JNK, ATM, LGG, and KEG.

Remarks: This species has been confused with *A. phoenicopterus* Germ., both having all red elytra and practically same distribution. They differ in shade of color of elytra, *bakeri* having a richer more orange red color. Vestiture of head and pronotum is piceous in *bakeri* and yellow in *phoenicopterus*, and is also coarser and more erect. Vestiture of elytra is orange in *bakeri* but dark grey in the other species. Aedeagi of males are quite different, the lateral lobes in *bakeri* being blunt at tips with rounded angles, while those of *phoenicopterus* are sharp and pointed. Both species develop under bark of rotting pine stumps and logs throughout the Pacific Slope, *bakeri* being probably the rarer species. It is named for my good friend and companion on many collecting trips, James H. Baker of Baker, Oregon.

Agriotella fusca, new species

Holotype male, length 6.2 mm. (paratypes 5.4–6.5 mm.), width 1.6 mm.

Form elongate, color nearly a solid brown with only angles of pronotum and propleura somewhat lighter. Vestiture recumbent and yellowish.

Head slightly wider than long, slightly convex on front, with frontal margin broadly rounded; punctures closely umbilicate. Antennae attaining pronotal posterior angles, second and third segments subequal, shining, cylindrical, together longer than fourth; fourth to tenth longer than wide, punctate, and slightly serrate; second to sixth segments and 11th segment with following lengths, in mm.: .12, .12, .20, .20, .20, and .30.

Pronotum longer than wide (1.7 × 1.4 mm.); sides parallel from posterior angles to anterior third, which is slightly wider; disc convex laterally, slightly so longitudinally, finely umbilicately punctate, a little more densely towards sides, intervals shiny; posterior angles with fine short carina divergent from margin. Scutellum triangular, with fine, rugose punctures.

Elytra two and half times longer than wide (4.0 × 1.6 mm.), parallel in anterior two-thirds, gradually narrowed in apical third, apices rough and only slightly truncate at tips. Striae closely, elongately punctate, shallow; intervals flat and finely rugosely punctate; dorsal surface slightly convex laterally.

Propleural suture grooved in anterior third, with dense umbilicate punctures, except with smooth area near base, outer angles pointed; prosternum with dense umbilicate punctures, only slightly lobed, mucro indented between procoxae and carinate to apex. Mesosternal cavity elongate.

Metasternum moderately densely punctate, slightly less so on abdomen. Metacoxal plates with inner angle nearly rectangular, sinuate to outer margin near elytra. Legs slender, tarsal segments becoming gradually shorter apically. Aedeagus as figured (fig. 11).

Allotype female, length 5.5 mm., width 1.5 mm. Varies from male in being more reddish brown, pronotum somewhat wider at anterior third, proportionally not as elongate, antennae shorter, intervals of elytra more rugosely punctate, and metacoxal plates obtusely angulate on inner third.

Holotype male, near Kahlotus, Washington, April 18, 1935, M. H. Hatch collector, specimen deposited in Hatch Collection, Seattle, Washington. Allotype female from Washington Co., Utah (no date) (Chas. Schaeffer Coll.) in M. C. Lane collection at present. Paratypes: OREGON: Hart Mtn. Antelope Refuge, May 15, 1954 (O. C. Nelson). IDAHO: Twin Falls, June 24, 1928 (R. W. Haegele); Twin Falls, May 30, 1914 (C. W. Creel). Paratypes in M. C. Lane collection at present.

Remarks: This distinct species has been collected from sagebrush in the Great Basin only rarely so far. It shows only slight variation in color from reddish brown to brown.

FOUR NEW TENUIPALPIDS FROM PUERTO RICO WITH NOTES ON SOME PREVIOUSLY DESCRIBED SPECIES
(ACARINA: TENUIPALPIDAE)

DONALD DE LEON, *Route 2, Erwin, Tennessee*

In his preliminary survey of the plant mites of Puerto Rico, Cromroy (1958) recorded 4 species of *Brevipalpus* (*B. longisetosus* Baker 1948 should have been included in the list, making 5 species) and 2 species of *Tenuipalpus* as occurring in Puerto Rico. This paper records 4 additional *Brevipalpus* and 7 additional *Tenuipalpus* that occur there.

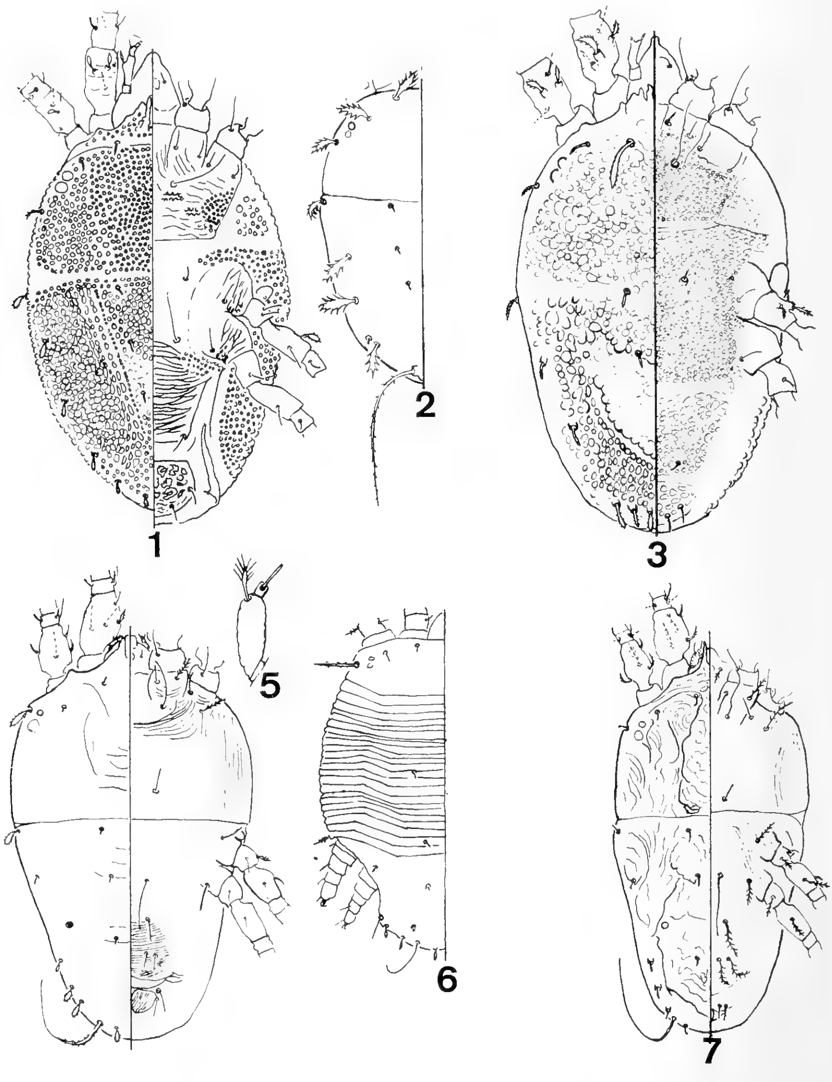
Three of the *Brevipalpus* found in Puerto Rico (*phoenicis* (Geij.), *californicus* (Banks), and *obovatus* Donn.) occur round the world chiefly in the tropics; a fourth (*trinidadensis* Baker) seems to be limited to the Caribbean area and Mexico and *mori* DeL.? and *longisetosus* Baker also occur in Mexico. The remaining 3 species may be endemic. With *Tenuipalpus*, 5 species (*bakeri* McGregor, *anoplus* Baker, *uvae* DeL., *gumbolimbonis* DeL., and *tabebuiae* DeL.) also occur in either Florida or Mexico or both places, and *frondosus* Cromroy has been found in Jamaica, leaving 3 species which may be endemic.

Following is a list of the described species collected, the locality, and the host plants; the collecting covered such a short period (Aug. 23–Sept. 5, 1963) that date of collection is omitted. The species listed by Cromroy (1958) and also collected by the writer are indicated by an asterisk and only new host records are included.

Brevipalpus trinidadensis Baker: Nymphs fitting the characters given for this stage were collected at Santurce on *Bidens pilosa* and at Rio Piedras on *Clerodendron* sp. Characters for separating the adult of this species from *californicus* are not known. Adults which appear to be this species or perhaps *californicus* were collected at Santurce on *Bidens pilosa, Ipomoea polyanthis, Poinsettia geniculata, Boerhavia erecta, Tridex procumbens, Sida carpinifoliae,* and *Vernonia cinerea*; at Rio Piedras on *Clerodendron* sp., *Lantana involucrata,* and at Coamo on *Banara spicata.* Nymphs with the characters given for *trinidadensis* were collected at Rio Piedras from *Nephrolepis biserrata,* but the adults taken with these nymphs have the characters of *lilium* Baker. Nymphs were taken at Santurce on *Jasminum azoricum* with the characters of *californicus* except that all the dorsolateral setae are about as long as the last 4 pairs of dorsolateral hysteromals. It seems obvious that rearing studies are needed here to determine the amount of variation within these "species" before satisfactory identifications can be made.

**Brevipalpus obovatus* Donn.: Santurce, nymphs and adults on *Bidens pilosa.*

**Brevipalpus phoenicis* (Geij.): Santurce, on *Ipomoea polyanthis, I. pes-capra, Bauhinia* sp., *Cocos nucifera, Malvaviscus* sp., *Pseudelephantopus spicatus*; Juanadias, on *Citherexylon fruticosum*; Salinas, on *Cordia sebestina*; Cayey Mt., on *Inga vera.*



Figs. 1 & 2. *Brevipalpus bucerasae*, n. sp. Fig. 1, female; fig. 2, nymph.
Fig. 3. *Brevipalpus absens*, n. sp., female.
Figs. 4–6. *Tenuipalpus simarubae*, n. sp. Fig. 4, female; fig. 5, palpus; fig. 6, nymph.
Fig. 7. *Tenuipalpus panici*, n. sp., female.

Brevipalpus mori DeL. ?: Coamo, 1 adult on *Boureria succulenta*. Nymphs are needed to make a positive identification of this species.

Tenuipalpus anoplus Baker: Rio Piedras, on Swietenia mahagoni.

Tenuipalpus tabebuiae DeL.: San Juan and Santurce, on *Tabebuia* spp.

**Tenuipalpus frondosus* Cromroy: El Yunque, on *Alsophila borinquensis*; the nymphs, not previously known, resemble closely the adult female.

Tenuipalpus bakeri McGregor: El Yunque, on *Psychotria bertierana*.

Tenuipalpus gumbolimbonis DeL.: Santurce, on *Hura crepitans*.

Tenuipalpus uvae DeL.: Ponce, on *Spondias dulcis* and *Guazuma ulmifolia*. On *Spondias*, the mites occurred in countless thousands.

Except as noted, the descriptions and drawings are of type females. All measurements are in microns, and length of dorsum includes the rostral shield.

Brevipalpus bucerasae, new species
(Figs. 1 and 2)[1]

Brevipalpus bucerasae appears to be closely related to *B. combreti* DeL. in having 6 pairs of dorsolateral hysterosomal setae, 1 seta and a sensory rod at end of palpus, 1 sensory rod on tarsus II of female, and in other characters; it differs chiefly in having the dorsum with areolae of more uniform size and tarsi I and II each with only 4 setae. The nymph differs in having the last pair of dorsolateral hysterosomal setae flagelliform. The male is unknown.

FEMALE: Dorsum 241 long, 157 wide with setae and markings as shown in Fig. 1. Palpus 4-segmented, the last segment bearing a seta and sensory rod; sensory rod of tarsus I about 18 long, of tarsus II about 15 long, each with an overlying setiform seta; all tarsal claws with strong hooks; tibiae I and II each with only 4 setae (no seta on posterior face).

NYMPH: Chaetotaxy of dorsum as shown in Fig. 2; dorsolateral propodosomal seta 125 long, last dorsolateral hysterosomal seta about 100 long.

Holotype: Female, Juanadias, P. R., 28 August 1963 (D. De Leon), on *Bucida buceras*. *Paratypes*: 5 females, 2 nymphs collected with holotype. The mites were not on the leaves but at the junction of petiole and twig.

Brevipalpus absens, new species
(Fig. 3)

Brevipalpus absens is distinct from other mites in the group with 5 pairs of dorsolateral hysterosomals, 1 seta on end of palpus, and 1 sensory rod on tarsus II in several unusual ways: The 3 posterior dorsolateral hysterosomals are grouped together, the pair of posterior medioventral podosomal setae is missing, the palpus appears to be 2-segmented and lacks a sensory rod, and genua III and IV each bear a dorsal seta in addition to the usual ventral seta. The male and immature stages are unknown.

FEMALE: Dorsum 253 long, 153 wide; arrangement of setae and markings as shown in Fig. 3. Sensory rod of tarsus II about 5 long, with an overlying setiform seta: all tarsal claws with strong hooks. Dorsolateral propodosomal seta 1 25 long.

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[1] A hysterosomal seta was omitted from Figures 1 and 2, this is a minute seta just anterior to the last seta.

Holotype: Female, El Yunque, P. R., 26 August 1963 (D. De Leon), on *Miconia foveolata*.

Tenuipalpus simarubae, new species
(Figs. 4–6)

Tenuipalpus simarubae resembles *T. punicae* Pritchard and Baker differing from that species chiefly by having the dorsum practically smooth, genua I and II each with 3 setae (2 on the anterior face), tibiae I and II each with 5 setae, and palp segment 2 with a somewhat palmate seta (Fig. 5). The male is unknown.

FEMALE: Dorsum 293 long, 182 wide; body with chaetotaxy and markings as shown in Fig. 4. Palpus 3-segmented; tarsi I and II each with a posterodistal sensory rod about 7 long and each with an overlying narrow-ovate seta.

NYMPH: The chaetotaxy of the nymph is shown in Fig. 6.

Holotype: Female, N. of Coamo, P. R., 28 August 1963 (D. De Leon), on *Bursera simaruba*. *Paratypes*: 2 nymphs collected with female.

Tenuipalpus panici, new species
(Fig. 7)

Tenuipalpus panici resembles *T. heveae* Baker in having the opisthosoma with medioventral and genital setae plumose, but differs from it chiefly in genua I and II each having 3 setae (2 on the anterior face) and coxa III with a seta on anterior face. The male and nymph are unknown.

FEMALE: Dorsum 284 long, 146 wide; body red and black with chaetotaxy and markings as shown in Fig. 7. Palpus 3-segmented, middle segment much wider near middle than at either end, segment 3 with a single seta about 7 long at distal end; tarsi I and II each with a posterodistal rod-shaped seta about 6 long and each with an overlying setiform seta.

Holotype: Female, S. of Baranquetas, P. R. 28 August 1963 (D. De Leon), on *Panicum maximum*. *Paratype*: 1 female collected with holotype.

Types and paratypes of the new species are in the author's collection.

ACKNOWLEDGMENT

I should like to thank Dr. R. O. Woodbury, botanist at the Agricultural Experiment Station, Rio Piedras for identifying practically all of the plants collected.

LITERATURE CITED

Cromroy, H. L. 1958. A preliminary survey of the plant mites of Puerto Rico. Jour. Agri. Univ. Puerto Rico 52 (2): 39–144.

THE GENUS VALDIVIA SHANNON
(DIPTERA: SYRPHIDAE)

YALE S. SEDMAN[1] *Department of Biological Sciences*
Western Illinois University, Macomb, Illinois

The genus *Valdivia* Shannon includes five previously described species based on nine specimens collected in Chile and Patagonia. Nine more specimens from Chile have come to me in a miscellaneous collection from the Chicago Museum of Natural History. Included in this material is a representative of a new species and the allotype of the type species, *V. darwini* Shannon.

Etcheverry and Shenefelt (1962) have illustrated the genitalia of Chilean Syrphidae, but did not include this genus. Illustrations of the two species studied are included in this paper and will complement their work.

I am indebted to the following people for help with this material: R. L. Coe of the British Museum of Natural History, who kindly compared a male *darwini* with the holotype; W. W. Wirth, of the United States National Museum, who compared the new species described with *nigra* Shan. and Aubertin; S. Camras, who kindly loaned these specimens through the Chicago Museum of Natural History; and K. Weisman, who prepared the illustrations.

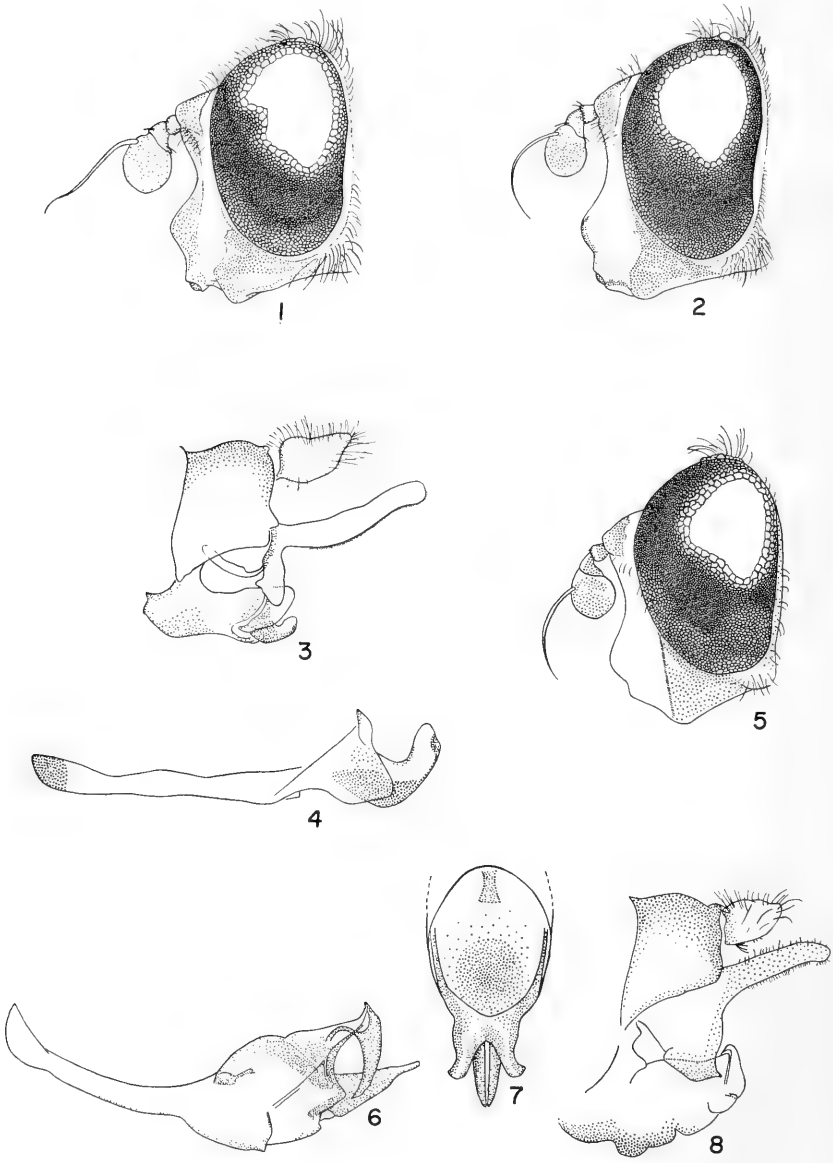
Valdivia darwini Shannon
(Figs. 1–4)

1927. Proc. U.S.N.M. 70 (2658): 32.

Shannon selected this species as type of the genus. His description is based upon a single male from Valdivia, Chile. Shannon's description is in general agreement with the males at hand even though the brown color mentioned is probably a function of age since the males and females are generally black, with purplish iridescent reflections.

Male. I would like to add the following to Shannon's original description: arista dark brown; face with at least the tubercle shining, usually in the form of an arrow, with the apex directed dorsally, this area occupying the lower third of the face; cheeks shining brown or black; facial pollen continued as a narrow band along the eye orbits and uniting above the shining black antennal prominence; a distinct depressed line separates the front from the ocellar triangle, while a raised orange area contrasts with the black of the front and vertex; anterior ocellus remote from posterior ocelli; pile of head yellow, limited to sparse patches on the ventral slopes of the antennal prominence, posterior to cheeks, upper angles of front, and on occiput; black

[1] This study was partially supported by a grant, NSF GB-1336.



Figs. 1–4. V. *darwini* Shannon. 1. Female head; 2. Male head; 3. Male genitalia; 4. Axial system of male genitalia; Figs. 5–8. V. *camrasi*, n. sp. 5. Male head; 6. Axial system of male genitalia; 7. Dorsal view of penis; 8. Male genitalia.

pile on ocellar triangle; scutum black with short black appressed pile; pollinose margins of scutum with yellow to golden pile, mostly erect, interrupted laterally only at the post-alar callosities which are brownish, and bear golden, or mixed golden and black bristles; anterior margin with weakly developed lateral triangular pollinose spots and a more or less linear stripe; a pair of small pollinose spots at the inner ends of the transverse suture; sternopleuron with a pollinose stripe; pleurae with limited areas of sparse pile, highly polished and devoid of pile on lower portion of sternopleuron, and in the area anterior to the mesopleuron; posterior femora with black spines below arranged in two rows, with long golden pile above; scutellum with yellow pile on surface and projecting from the subscutellar fringe below; halteres yellow to brown, the knobs usually brown; squamae yellow; wing veins brown; segments 2-4 of abdomen with very narrow yellow or white pollinose apices, although weakly developed in some individuals; lateral pile on 1st and 2nd segments very long and yellow, short black and appressed medially; short yellow pile in basal corners of 3rd segment, short, dark and appressed medially and apically; fourth abdominal tergite with short black setae, a few short yellow setae in lateral apical corners; male genitalia with elongate styli; axial system composed of ejaculatory apodeme, chitinous box, and ejaculatory hood; ejaculatory hood heavily sclerotized and simple.

Female. Like the male with the following differences: face with a broad shining stripe reaching from the oral margin to the antennae and occupying the medial one-half of the face; second abdominal segment not as elongate as in male, narrowed near base and flaring apically to twice its basal width; 3rd and 4th segments broader than long; with pale pollinose stripes apically on segments 2-4, absent on 5.

Males. Chile: Rio Blanco, 21/24 II 54, 1050–1400 m., 1; Icalma, 31 XII 58, 2; Bulamala, 23/31 I 54, 1100–1400 m., 1; Curacautin, Rio Blanco, 27/31 I 59, 1; all collected by L. Pena.

Females. Chile: Rio Blanco, 21/24 II 54, 1050–1300 m. There is a second female with the same data as the allotype. The allotype is being deposited in the British Museum of Natural History.

Valdivia camrasi n. sp.
(Figs. 5–8)

Male. Face and tubercle covered with pruinescent pollen; cheeks shining and dark brown; antennae brown, the third segment orange at base; sparse white pile present posterior to cheeks, below antennal prominence, on occiput, and at margin between front and ocellar triangle; pile on ocellar triangle black.

Thorax black with purplish reflections; lateral scutal pollinose stripe gradually narrowed from humeri to anterior margin of post-alar callosity, pollinose stripe absent before scutellum and with sparse black and yellow pile; dorsum of scutum covered with dense appressed black setae; pleurae with sparse yellowish pile but large areas devoid of pile and polished; squamae yellow; halteres yellow with the knob reddish; legs with coxae and trochanters black, front four femora orangish-red with posterior dark stains basally, hind femora narrowly reddish basally and apically, black on middle ¾; front four tibiae reddish, 1st pair darkened apically; hind tibiae reddish but with dark stains medially; 5th tarsal segments pale yellow, 4th darkened; wings yellow, the veins deep yellow with a darkened area sub-apically. Abdomen black, 1st and 2nd abdominal segments with diffuse reddish-orange areas medially; tergal pile long, erect and white on 1st and 2nd segments, shorter, dense, white pile on anterior angles of 3rd segment and black appressed elsewhere; sternites 1–4 with fine pale pile except for a few long black hairs in apical corners of 4th sternite; postabdomen black with short, coarse pile; 4th sternite with lightly sclerotized area apicomedially, which apparently coincides with the placement of the elongate claspers; male genitalia with extreme development of the axial system in which paired sclerotized bars make up the ejaculatory hood as well as a peculiar dorsal development of paired clasping structures.

Holotype. Chile: Icalma, 29 XII 58, L. Pena. The type is being deposited in the United States National Museum.

This species differs from all described species in several important characteristics. It is possible that *V. nigra* Shannon may be confused with *camrasi*. These two species can be easily separated by the following: in *nigra*, the femora and tibiae are black except for the extreme femoral apex and tibial base, while in *camrasi*, there are only posteriorly located black stains on the femora and tibiae; in *nigra*, the wings are brown, while in *camrasi*, they are yellow with a darkened area sub-apically; in *nigra*, the facial tubercle is black and shining while in *camrasi*, the face is golden pollinose.

The genitalia of *camrasi* while obviously similar in epandrial structure differ remarkably in penis structure. The study of the other species, as specimens become available, may necessitate a sub-generic splitting of this interesting genus.

The following key is adapted from Shannon and Aubertin (1933).

Key to Species

1. Femora and tibia entirely orange 2
   Femora and tibia with black markings 3
2. Antennae dark brown, dorsum of thorax with a marginal band of grey tomentum .... **darwini** Shannon
   Antennae orange, thorax entirely shining black **edwardsi** Shannon and Aubertin
3. Abdomen reddish .... **ruficauda** Shannon
   Abdomen black 4
4. Tarsi gleaming white, wing-tip noticeably yellowish-hyaline **albimanus** (Bigot)

Tarsi dirty white, wing-tip not hyaline 5
5. Facial tubercle shining black .... **nigra** Shannon
Facial tubercle covered with golden pollen .... **camrasi**, n. sp.

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Shannon, R. C., *and* **D. Aubertin.** 1933. Diptera of Patagonia and South Chile. Part VI (Fascicle 3): 120–170.

THE FAMILY TANYPEZIDAE IN NORTH AMERICA
(DIPTERA, ACALYPTRATAE)

In the most recent papers on the family Tanypezidae, by Hennig (1936, Deutsch. Entom. Zeits. 1936: 27–38; 1937, in Lindner, Die Fliegen der pal. Reg. 5 [fam. 44]: 1–6) and Enderlein (1936, Deutsch. Entom. Zeits. 1936: 39–47), it is stated that the generic reference of the two North American species described in the genus *Tanypeza* is uncertain. I have examined the material in the United States National Museum collections, including the types of the two North American species, and come to the following conclusions:

Tanypeza longimana Fallén, 1820, Opomyzides Sueciae: 4 (= *T. luteipennis* Knab and Shannon, 1916, Insecutor Inscitiae Menstruus 4: 34); *new synonym.*

Tanypeza picticornis Knab and Shannon, 1916, Insecutor Inscitiae Menstruus 4: 35, valid species closely related to *T. longimana.*

These two species are therefore both referable to the genus *Tanypeza sensu strictu.* They constitute the only known species in the group and share the following characters, which distinguish this group from the others found in the Neotropical Region: only 1 pair of *dc*, close to scutellum; 2 pairs of *fo*; male hind femur with oblique mesobasal row of bristly black hairs and hind trochanter with mesoventral row of somewhat smaller similar hairs; aedeagus beyond fulcrum rod-like, elongate. They may be separated as follows:

KEY TO SPECIES OF **Tanypeza s. s.**

Antenna with 3rd segment dark brown to blackish; front at least as wide as postocellar white-pruinose spot, which is separated from posterior ocelli by less than one ocellar diameter; presutural thoracic bristle lacking; separation of ends of 3rd and 4th wing veins nearly or quite equal to length of *ta*; tip of wing evenly rounded (Europe; Maine, N.H., N.Y., Va., Ga., Mich., Ill., Wis., N.D., S.D., Ont., Alta.) .... **T. longimana** Fallén

Antenna with 3rd segment yellowish; front considerably narrower than postocellar white-pruinose spot, which is separated from posterior ocelli by more than 1.5 times ocellar diameter; smaller presutural thoracic bristle usually present; separation of ends of 3rd and 4th wing veins usually much less than length of *ta*; tip of wing rather pointed, much more rounded anteriorly than posteriorly (Va., Md., Mich.) .... **T. picticornis** Knab and Shannon

GEORGE C. STEYSKAL, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

THE STATUS OF AMPHIAREUS DISTANT, BUCHANANIELLA REUTER AND PORONOTELLUS KIRKALDY
(HEMIPTERA: ANTHOCORIDAE)

Much confusion exists in the literature concerning the correct names to use for an assemblage of anthocorid species which can be shown to represent two distinct genera.

Reuter described *Poronotus* in 1871 to hold Stal's *Xylocoris constrictus* and *Xylocoris discifer*, both from Brazil. In 1884, however, he transferred *constrictus* to *Asthenidea* and *discifer* to *Cardiastethus.* The former change was handled only in the "Addenda et Corrigenda" to his monograph. There he incorrectly placed *Asthenidea pallescens* Reuter, described on page 51 of this same monograph as a synonym of *Asthenidea constricta* (Stal). Champion in 1900 resurrected the genus *Poronotus* for *constrictus* Stal and gave excellent characters for separating it from both *Asthenidea* and *Cardiastethus.* He also showed that *Asthenidea pallescens* was a valid species.

In September of 1904 Distant described the genus *Amphiareus* (type *Xylocoris fulvescens* Walker 1872) from Ceylon and in November of the same year Kirkaldy proposed *Poronotellus* for *Poronotus* Reuter which is preoccupied by *Poronotus* Gill 1861 in the fishes. Poppius (1909) did not follow Kirkaldy's proposal but incorrectly treated *Buchananiella* Reuter 1884 as congeneric with Reuter's *Poronotus* and stated that the older name *Poronotus* must be used. The combination of *Buchananiella* with Stal's *constrictus* has not been used in the literature although this generic name has been accepted by many workers as the next available name for the entire group. *Buchananiella,* with its type *continua* (White), contains *anulata* (Carayon), *crassicornis* Carayon, *sodalis* (White) and *whitei* Reuter.

Also in 1909, Poppius synonymized *Amphiareus* with *Cardiastethus.* Recently, Hiura (1960) stated that specimens of *Poronotellus constrictus* from California were clearly conspecific with *Cardiastethus macilentus* Hiura (= *Amphiareus fulvescens*). The formal synonymy is as follows:

Amphiareus constrictus (Stal), **New Combination**

Xylocoris constrictus Stal 1860, Rio Jan. Hemipt. 2: 44.

Poronotus constrictus; Reuter 1871, Ofv. Svenska Vet.-Ak. Forh. 28: 562.—Stal 1873, Enum. Hemipt. 3: 102.—Champion 1900, Biologia Centrali-Americana 2: 333.—Poppius 1909, Acta Soc. Sci. Fenn. 37(9): 15.

Xylocoris fulvescens Walker 1872, Cat. Hemipt. Het. B. M. 5: 160. **New Synonymy.**

Xylocoris fumipennis Walker 1872, Cat. Hemipt. Het. B. M. 5: 160.

Asthenidea constricta; Reuter 1884, Monogr. Anthocor. (Separata): 193.—Lethierry and Severin 1896, Cat. Gen. Hem. 3: 241.

Cardiastethus fulvescens; ?Lethierry and Severin 1896, Cat. Gen. Hem. 3: 250.—Poppius 1909, Acta Soc. Sci. Fenn. 37(9): 19.—Usinger 1946, B. P. Bishop Museum Bull. 189: 55.—Zimmerman 1948, Insects of Hawaii 3: 178.—Gross 1955, Rec. South Australian Mus. 11(4): 415.—(Amphiareus) Carayon 1958, Mem. Inst. Sci. Madagascar 9: 344.

Cardiastethus? fumipennis; Lethierry and Severin 1896, Cat. Gen. Hem. 3: 250.

Amphiareus fulvescens; Distant 1904, Ann. Mag. Nat. Hist. 14: 221.—Distant 1906, Fauna Brit. India 3: 4.—Distant 1910, Fauna Brit. India 5: 300.—Hiura 1960, Bull. Osaka Mus. Nat. Hist. 12: 45.

Poronotellus constrictus; Kirkaldy 1904, The Entomologist 37: 280.—1906, Trans. Amer. Ent. Soc. 32: 120.

Cardiastethus macilentus Hiura 1958, Ent. Rev. Japan 9(2): 39.

I selected *Amphiareus* Distant 1904 as the first available name rather than *Poronotellus* Kirkaldy 1904 on the basis of the date of receipt of the pertinent journals by the Smithsonian Institution Library. The Annals with Distant's paper was received on September 13 and The Entomologist with Kirkaldy's replacement name on November 15.

The genus *Amphiareus* may be separated from *Buchananiella* by the unique bifurcated projection of the metasternum, the subequal widths of the apices of the corium and embolium and the shape of the scent gland opening. In addition to the type species, *constrictus* (Stal), *Amphiareus* includes *morimotoi* (Hiura) and *obscuriceps* (Poppius).—JON L. HERRING, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

SOCIETY MEETINGS

732nd Regular Meeting, March 4, 1965

The 732nd meeting of the Society was called to order by the president, Dr. Paul A. Woke, on March 4, 1965, at 8:00 p.m. in Room 43 of the National Museum. Thirty-seven members and sixteen guests were in attendance. Minutes of the previous meeting were approved as read.

The following names of candidates for membership were read for the second time and received into the society: *D. S. Wendleton, D. H. Messersmith, R. A. Flint, G. W. Rawson, E. D. Cashatt,* and *L. H. Herman, Jr.* The following new candidates for membership were presented: *W. H. Hendrickson* and *P. H. Thompson.*

President Woke called for new business and notes or comments of which there were none.

The first item on the program was an interesting talk by Dr. Lewis J. Stannard of the Illinois Natural History Survey entitled "Insect Collecting in Peru." The talk, illustrated by slides, related Dr. Stannard's experiences while collecting thrips in Peru. A brief question period followed.

The second item on the program was a thought-provoking talk by Mr. George L. Hutton of the U.S. Navy entitled "The Future of Entomology as a Profession." These four questions were presented and discussed: (1) What is our professional status?; (2) What are our academic standards?; (3) What is the role of public relations?; and (4) What are our goals? The talk was followed by considerable spirited and serious discussion from the audience.

After introduction of visitors, the meeting was adjourned at 10:00 p.m.—PAUL M. MARSH, *Acting Recording Secretary*

733rd Regular Meeting, April 1, 1965

The 733rd meeting of the Society was called to order by the president, Dr. Paul A. Woke, on April 1, 1965, at 8:00 p.m. in the auditorium of the National Museum. Thirty-eight members and sixteen guests were in attendance. Minutes of the previous meeting were approved as read.

The following names of candidates for membership were read for the second time and received into the society: *W. H. Hendrickson* and *P. H. Thompson.* The following new candidates for membership were presented: *Arthur K. Burditt, Jr.*, and *Thor Lehnert.*

Louise Russell announced that the annual meeting of the Entomological Society of Washington and the Pesticide Society of Washington will be held on Monday, May 24, 1965. The meeting will be a dinner meeting and further details will be announced later.

President Woke announced that friends were invited to several retirement parties for W. Doyle Reed who recently retired as chief of the Entomology Section, Army Corps of Engineers.

The guest speaker for the evening was Dr. G. E. Shewell, taxonomist for the Entomology Research Institute, Canada Department of Agriculture, Ottawa. His subject was "The Decline of Insect Taxonomy in North America." Dr. Shewell's talk, illustrated by slides, was based on his studies of North American dipterists, but was seen to apply to all fields of insect taxonomy. Following his talk, the audience participated in a lively discussion.

After the introduction of visitors, the meeting was adjourned at 10:00 p.m.—PAUL M. MARSH, *Acting Recording Secretary*

BOOK REVIEW

Orthopterorum Catalogus. Edited by Max Beier. 25 cm. Paper bound. Issued in parts at irregular intervals, separately priced. Published by W. Junk, 13 Van Stolkweg, The Hague, Netherlands.

The last general systematic catalogue of Orthoptera was that of W. F. Kirby, published in London in 3 volumes, 1904–10, itself of great value though marred by imperfections. Now, another catalogue, badly needed, is underway, with 7 parts totaling 745 pages already published. The Junk Catalogue, under the editorship of the veteran orthopterist, Dr. Max Beier of Vienna, was launched in 1938 and 1939 with two parts dealing with 6 subfamilies of Tettigoniidae which are restricted to the Old World. Publication of other parts was interrupted by World War II, and was resumed in 1962 with a new series, beginning with a part on Blattariae (cockroaches), by Dr. K. Princis of Lund, Sweden. Four parts on Blattariae now have appeared, the most recent one in 1965, and at least two other parts remain to be completed. Meanwhile, the 1938–39 parts on Tettigoniidae, authored then by Dr. Richard Ebner, since deceased, have been reissued in a 101-page volume brought up-to-date by Dr. Beier. A 246-page volume on Pseudophyllinae (a large worldwide subfamily of katydids), written by Dr. Beier following publication in the Das Tierreich series of an important world monograph of that group, appeared in the Junk Catalogue in 1963. To date, authors have written in German; the Catalogue consists so predominantly of literature references that users who do not read German fluently suffer scarcely any handicap.

It has been announced that catalogues of other groups of Orthoptera are in preparation. Prices of the parts issued, listed in Dutch Florins, appear to be about the equivalent of $9.00 per 100 pages, but customers wishing to subscribe to the Catalogue regularly are offered reduced prices for the parts; such discounts are about 12%, judging from a prospectus.

The format of the Orthoptera Catalogue is typical of the well-known Junk catalogues for other insect orders. An attempt is made to secure every published reference; in other words, the Catalogue is not selective like recent major catalogues published in the United States. Major groups are introduced by references arranged under headings of general works, systematics and nomenclature, faunistics of major regions, morphology, stridulatory organs, sexual organs, and many other categories. This section for cockroaches has been compiled in great detail by Dr. Princis. References under common species occupy much space, for example, almost 10 pages for *Pycnoscelus surinamensis*. There is no bibliography, which at least for cockroaches would have been extremely voluminous. Nor are type localities and locations of type specimens indicated. Whether the user personally likes the Junk format, this Catalogue is so valuable as to be a "must" for all orthopterists wishing to be complete in their work.

When completed, the cockroach catalogue will be a most significant contribution from the pen of Dr. Princis, who left his native Latvia late in World War II and began the serious study of cockroach systematics on a worldwide basis after becoming a research scholar at the University of Lund. The Catalogue is arranged according to the classification which he proposed in 1960. There are some reasons for reluctance to endorse the use of the 28 families which he recognized, and some modifications of the relationships he outlined already have been suggested in literature, but these criticisms in no way negate the permanent value of his Catalogue as a source-book for students and investigators.

We may hope that cataloguing of other groups of Orthoptera moves forward actively.—ASHLEY B. GURNEY, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

Percentage of Synonymy in Diptera. Of the 16,130 species of Diptera listed in the recently published Catalog of the Diptera of America North of Mexico (A. Stone et al., eds., 1965, U.S. Dept. Agric., Agric. Res. Serv., Agric. Handbook No. 276, 1696 pp.), the great majority were described by 40 authors, each of whom was responsible for 100 or more specific names. They described 14,478 species, 2,384 names of which are now considered synonyms. This means that the great masters of Dipterology averaged 16.5 percent synonymous names. The spread is between 1.9 percent and 42.7 percent. The most recent authors have the best scores, probably because time has not yet told on them.—GEORGE C. STEYSKAL, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

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PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY of WASHINGTON

U.S. NATIONAL MUSEUM
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THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

Organized March 12, 1884

MEETINGS.—Regular meetings of the Society are held in Room 43 of the U.S. National Museum 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 $5.00; initiation fee is $1.00 (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 $6.00 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.

All manuscripts intended for publication should be addressed to the Editor. Acceptable papers submitted by members only will be published in the order received. Immediate publication may be obtained at a cost to the author of about $15.00 per printed page. Titles of papers should be concise but comprehensive and should indicate the systematic position of the subject insect. Bylines should indicate present mailing address of the author and his organizational affiliation, if possible. 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 in which author, year, title, name of publication, volume, and page are given in that order. In shorter articles, references to literature should be included in parentheses in the text.

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.

Proofs and forms for the abstract and reprint order will be sent to authors.

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PROCEEDINGS OF THE

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A LIST OF THE SPECIES OF DACTYNOTUS RAFINESQUE OF NORTH AMERICA, WITH NEW COMBINATIONS AND SYNONYMY

(HOMOPTERA: APHIDIDAE)

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The purpose of this paper is to furnish a list of the known species of *Dactynotus* Rafinesque in North America. Until recent years, most of the included species were placed in the genus *Macrosiphum* Passerini. Of the 52 species included, only 19 were originally described in *Dactynotus*. Fifteen new combinations are listed.

An attempt is made to place each species in one of the three subgenera of *Dactynotus*: *Dactynotus* Rafinesque, *Uromelan* Mordvilko, and *Lambersius* Olive. The species are arranged alphabetically, each being following by the letter (D.), (U.), or (L.), to indicate the subgenus to which it belongs. A synonymy of each species and the location of the types are also given.

This paper is a result of a study of the U.S. National Museum's aphid collection. The study was made possible by National Science Foundation Grant GB-3526. The author gratefully acknowledges the patient help given by Louise M. Russell, Entomology Research Division, ARS, U.S. Department of Agriculture.

aaroni (Knowlton) (**D.**), new combination.
Macrosiphum aaroni Knowlton, 1947, Ent. News 58:47.
Holotype, USNM.

adenocaulonae (Essig) (**D.**), new combination.
Macrosiphum adenocaulonae Essig, 1936, Pan-Pacific Ent. 12:65.
Cotypes, USNM.

ambrosiae (Thomas) (**D.**)
Siphonophora ambrosiae Thomas, 1878, Ill. State Lab. Nat. Hist. Bull. 2:4.
Nectarophora ambrosiae: Oestlund, 1887, Minn. Geol. Nat. Hist. Surv. Bull. 4:84.
Nectarophora solidaginis: Cockerell, 1903, Canad. Ent. 35:167.
Macrosiphum ambrosiae: Cockerell, 1904, Canad. Ent. 36:262
Siphonophora solidaginis: Williams, 1910, Univ. Stud. Lincoln, Neb. 10:86.
Macrosiphum solidaginis: Gillette, 1911, Jour. Econ. Ent. 4:383; Davis, 1911, Univ. Stud. Lincoln, Neb. 11:34.

Tritogenaphis ambrosiae: Oestlund, 1922, Nineteenth Rept. State Ent. Minn., p. 142.
Tritogenaphis kosacaudis Knowlton, 1928, Pan-Pacific Ent. 5:79.
Dactynotus ambrosiae: Hille Ris Lambers, 1939, Temminckia 4:6.
Lectotype, Ill. Nat. Hist. Surv.

anomalae (Hottes and Frison) (**L.**)
Macrosiphum anomalae Hottes and Frison, 1931, Ill. Nat. Hist. Surv. Bull. 19:298.
Dactynotus anomalae: Olive, 1963, *in* M. D. Leonard, Jour. N.Y. Ent. Soc. 52:86.
Holotype, Ill. Nat. Hist. Surv.

astronomus Hille Ris Lambers (**D.**), 1962, Canad. Ent. 94:1034.
Holotype, collection of D. Hille Ris Lambers. Paratypes, collection of A. Thomas Olive.

atripes (Gillette and Palmer) (**D.**), new combination.
Macrosiphum atripes Gillette and Palmer, 1933, Ann. Ent. Soc. Amer. 26:359.
Holotype, USNM.

bradburyi Olive (**L.**), 1965, Ann. Ent. Soc. Amer. 58:285.
Holotype, USNM.

chrysanthemi (Oestlund) (**D.**)
Nectarophora chrysanthemi Oestlund, 1886, Minn. Geol. Nat. Hist. Surv. Rpt. 14:22.
Siphonophora chrysanthemi: Williams, 1910, Univ. Stud. Neb. 10:158(74).
Macrosiphum chrysanthemi: Hottes and Frison, 1931, Ill. Nat. Hist. Sur. Bull. 19:302.
Dactynotus chrysanthemi: Hille Ris Lambers, 1960, Canad. Ent. 92:254.
"Type," University of Minnesota collection.

chrysopsidicola Olive (**D.**), 1963, Misc. Pub. Ent. Soc. Amer. 4(2):36.
Holotype, USNM.

ciefi Olive (**D.**), 1963, Misc. Pub. Ent. Soc. Amer. 4(2):38.
Holotype, USNM.

cirsii (Linnaeus) (**D.**)
Aphis cirsii Linné, 1758, Systema Naturae, Ed. X, p. 735.
Dactynotus cirsii: Hille Ris Lambers, 1931, Tijdschr. Ent. d. 74, a, 2–3, pp. 169–170.
No types exist.

crepusisiphon Olive (**L.**), 1965, Ann. Ent. Soc. Amer. 58:288.
Holotype, USNM.

eoessigi (Knowlton) (**U.**), new combination.
Macrosiphum eoessigi Knowlton, 1947, Pan-Pacific Ent. 23:137.
Holotype, USNM.

epilobii (Pergande) (**D.**), new combination.
Nectarophora epilobii Pergande, 1900, Wash. Acad. Sci. Proc. 2:515.
Macrosiphum epilobii: Gillette and Palmer, 1934, Ann. Ent. Soc. Amer. 27:177.
Holotype, USNM.

erigeronella (Soliman) (**L.**), new combination.
Macrosiphum erigeronella Soliman, 1927, Univ. Calif. Pub. Ent. 4:115.
Cotypes, Essig collection, Univ. California at Berkeley.

erigeronensis (Thomas) (**L.**)

Siphonophora erigeronensis Thomas, 1878, Ill. State Lab. Nat. Hist. Bull. 2:7.
Macrosiphum erigeronensis: Cockerell, 1903, Ent. News 14:248.
Tritogenaphis erigeronensis: Knowlton, 1928, Pan-Pacific Ent. 5:80.
Dactynotus erigeronensis: Olive, 1963, *in* M. D. Leonard, Proc. Rochester Acad. Sci. 10:343.
Neotype, Ill. Nat. Hist. Surv.

escalantii (Knowlton) (**L.**)
Macrosiphum escalantii Knowlton, 1928, Pan-Pacific Ent. 5:79.
Tritogenaphis utahensis Pack and Knowlton, 1929, Canad. Ent. 61:202. [*fide* synonymy of Palmer, 1952, The Thomas Say Foundation, Vol. V, p. 304.]
Tritogenaphis gutierreziae Pack and Knowlton, 1929, Canad. Ent. 61:203. [*fide* synonymy of Palmer, 1952, The Thomas Say Foundation, Vol. V, p. 304.]
Dactynotus (Lambersius) escalantii: Olive, 1965, Ann. Ent. Soc. Amer. 58:285.
Holotype, Knowlton collection. Paratypes, USNM.

eupatoricolens (Patch) (**D.**), new combination.
Macrosiphum eupatoricolens Patch, 1919, Maine Agric. Expt. Sta. Bull. 282:214.
Holotype, Patch collection, Univ. Maine.

eupatorifoliae (Tissot) (**U.**), new combination.
Tritogenaphis eupatorifoliae Tissot, 1934, Fla. Ent. 18:20.
Holotype, USNM.

gravicornis (Patch) (**L.**)
Macrosiphum gravicornis Patch, 1919, Maine Agric. Expt. Sta. Bull. 282:213.
Dactynotus gravicornis: Olive, 1963, *in* M. D. Leonard, Proc. Rochester Acad. Sci. 10:343.
Holotype, Patch collection, Univ. of Maine.

helianthicola Olive (**U.**), 1963, Misc. Pub. Ent. Soc. Amer. 4(2):43.
Holotype, USNM.

hieracicola Hille Ris Lambers (**D.**), 1962, Canad. Ent. 94:1036.
Holotype, collection of D. Hille Ris Lambers. Paratypes, collection of A. T. Olive.

illini (Hottes and Frison) (**U.**)
Macrosiphum illini Hottes and Frison, 1931, Ill. Nat. Hist. Surv. Bull. 19:309.
Dactynotus illini: Olive, 1963, *in* M. D. Leonard, Proc. Rochester Acad. Sci. 10:344.
Holotype, Ill. Nat. Hist. Surv.

impatiensicolens (Patch) (**D.**)
Macrosiphum impatiensicolens Patch, 1919, Maine Agric. Expt. Sta. Bull. 282:210.
Dactynotus impatiensicolens: Leonard, 1963, Proc. Rochester Acad. Sci. 10:344.
Holotype, Patch collection, Univ. Maine.

katonkae (Hottes) (**L.**), new combination.
Adactynus katonkae Hottes, 1933, Biol. Soc. Wash., Proc. 46:13.
Macrosiphum katonkae: Gillette and Palmer, 1934, Ann. Ent. Soc. Amer. 27:184.
Holotype, USNM.

lanceolatus (Patch) (**D.**), new combination.
Macrosiphum lanceolatum Patch, 1919, Maine Agric. Expt. Sta. Bull. 282:215.
Holotype, Patch collection, Univ. of Maine.

leonardi Olive (**D.**), 1965, Proc. Ent. Soc. Wash. 67:41.
Holotype, USNM.

longirostris (Gillette and Palmer) (**L.**), new combination.
Macrosiphum longirostris Gillette and Palmer, 1933, Ann. Ent. Soc. Amer. 26: 360.
Holotype, USNM.

luteola (Williams) (**L.**)
Siphonophora luteola Williams, 1910, Univ. Stud. Neb. 10:166(82).
Macrosiphum luteola: Patch, 1919, Maine Agric. Expt. Sta. Bull. 282:218.
Dactynotus luteola: Olive, 1965, Ann. Ent. Soc. Amer. 58:285.
Three "type" slides in USNM.

martini (Cockerell) (**D.**), new combination.
Nectarophora martini Cockerell, 1903, Canad. Ent. 35:169.
Macrosiphum martini: Patch, 1938, Maine Agric. Expt. Sta. Bull. 393:73.
Holotype, USNM.

nigrotibius Olive (**D.**), 1963, Misc. Pub. Ent. Soc. Amer. 4(2):44.
Holotype, USNM.

nigrotuberculatus Olive (**D.**), 1963, Misc. Pub. Ent. Soc. Amer. 4(2):45.
Holotype, USNM.

obscuricaudatus Olive (**D.**), 1965, Ann. Ent. Soc. Amer. 58(6):786.
Holotype, USNM.

parvotuberculatus Olive (**U.**), 1963, Misc. Pub. Ent. Soc. Amer. 4(2):47.
Holotype, USNM.

paucosensoriatus Hille Ris Lambers (**D.**), 1960, Canad. Ent. 92:253.
Holotype, collection of D. Hille Ris Lambers. Paratypes, collection of A. T. Olive.

pepperi Olive (**D.**), 1965, Ann. Ent. Soc. Amer. 58(6):788.
Holotype, USNM.

pseudambrosiae Olive (**D.**), 1963, Misc. Pub. Ent. Soc. Amer. 4(2):48.
Holotype, USNM.

reynoldensis Olive (**D.**), 1965, Proc. Ent. Soc. Wash. 67:43.
Holotype, USNM.

richardsi Robinson (**L.**), 1964, Canad. Ent. 96:1330.
Holotype, Canadian National Collection.

rudbeckiae (Fitch) (**D.**)
Aphis rudbeckiae Fitch, 1851, Fourth Ann. Rept. State Cabinet of Nat. Hist. (New York). Family Aphidae, p. 66.
Siphonophora rudbeckiae: Thomas, 1878, Ill. State Lab. Nat. Hist. Bull. 2:4.
Nectarophora rudbeckiae: Oestlund, 1887, Minn. Geol. Nat. Hist. Surv. Bull. 4:85.
Macrosiphum rudbeckiae: Hayhurst, 1909, Ann. Ent. Soc. Amer. 2:91.
Tritogenaphis rudbeckiae: Oestlund, 1922, Nineteenth Rept. State Ent. Minn., p. 142.
Dactynotus rudbeckiae: Hille Ris Lambers, 1939, Temminckia 4:2.
Lectotype, USNM.

ruralis (Hottes and Frison) (**U.**)
Macrosiphum ruralis Hottes and Frison, 1931, Ill. Nat. Hist. Surv. Bull. 19:321.
Dactynotus ruralis: Olive, 1963, Misc. Pub. Ent. Soc. Amer. 4(2):53.
Holotype, Ill. Nat. Hist. Surv.

russellae Hille Ris Lambers (**D.**), 1960, Canad. Ent. 92:255.
Holotype, collection of D. Hille Ris Lambers.

sonchellus (Monell) (**D.**)
Siphonophora sonchella Monell, 1879, U.S. Geol. Surv. Bull. 5:21.
Macrosiphum sonchella: Davidson, 1909, Jour. Econ. Ent. 2:304.
Siphonophora muralis Buckton (misidentification), Davis, 1911, Univ. Stud. Lincoln, Neb. 11:31; Theobald, 1926, The Plant Lice or Aphididae of Great Britain. Headley Brothers, Ashford, Kent, and London, p. 93.
Macrosiphum williamsi Gillette and Palmer, 1929, Ann. Ent. Soc. Amer. 22:468.
Macrosiphum sonchellum: Hottes and Frison, 1931, Ill. Nat. Hist. Surv. Bull. 19:326.
Dactynotus sonchellus: Hille Ris Lambers, 1939, Temminckia 4:5.
Neotype, USNM.

sonchi (Linnaeus) (**D.**)
Aphis sonchi Linné, 1767, Systema Naturae, Ed. XII, Vol. II, p. 735.
Siphonophora sonchi: Ferrari, 1872, Ann. Mus. Civ. Stor. Nat. Genove 3:215.
Macrosiphum sonchi: Schouteden, 1901, Ann. Soc. Ent. Belgium 45:117.
Dactynotus sonchi: Börner, 1932, *in* Sorauer, Handb. d. Pflanzenkr., ed. IV, Vol. V, pars 2, p. 630.
No types exist.

taraxaci (Kaltenbach) (**U.**)
Aphis taraxaci Kaltenbach, 1843, Mono. d. Pflanzenläuse, p. 30.
Macrosiphum taraxaci: Schouteden, 1906, Mem. Soc. Ent. Belgium 12:240.
Megalosiphum taraxaci: Mordvilko, 1929, Food-Plant Catalogue, p. 81.
Dactynotus taraxaci: Börner, 1932, *in* Sorauer, Handb. d. Pflanzenkr., ed. IV, Vol. V, pars 2, p. 630.
No types exist.

tardae (Hottes and Frison) (**U.**)
Macrosiphum tardae Hottes and Frison, 1931, Ill. Nat. Hist. Surv. Bull. 19: 329.
Dactynotus tardae: Olive, 1963, *in* M. D. Leonard, Proc. Rochester Acad. Sci. 10:346.
Holotype, Ill. Nat. Hist. Surv.

tenuitarsis (Gillette and Palmer) (**L.**), new combination.
Macrosiphum tenuitarsis Gillette and Palmer, 1933, Ann. Ent. Soc. Amer. 26: 363.
Holotype, USNM.

tissoti (Boudreaux) (**L.**)
Macrosiphum tissoti Boudreaux, 1948, Fla. Ent. 31:100.
Dactynotus tissoti: Olive, 1963, *in* M. D. Leonard, Proc. Rochester Acad. Sci. 10:346.
Holotype, USNM.

tuataiae Olive (**U.**), 1963, Misc. Pub. Ent. Soc. Amer. 4(2):61.
Holotype, USNM.

verbesinae (Boudreaux) (**U.**)
Macrosiphum verbesinae Boudreaux, 1948, Fla. Ent. 31:100.
Dactynotus verbesinae: Olive, 1963, Misc. Pub. Ent. Soc. Amer. 4(2):44.
Holotype, USNM.

zerogutierreziae (Smith and Knowlton) (**L.**), new combination.
Macrosiphum zerogutierrezis Smith and Knowlton, 1937, Canad. Ent. 69:272.
Macrosiphum zerogutierreziae: Palmer, 1952, The Thomas Say Foundation, Vol. V, p. 331.
Holotype, USNM.

zymozionensis (Knowlton) (**L.**), new combination.
Macrosiphum zymozionensis Knowlton, 1946, Bull. Brooklyn Ent. Soc. 41:1.
One "type" slide, USNM.

M. D. Leonard (1963, Proc. Rochester Acad. Sci. 10:344) lists *Macrosiphum idahoensis* Miller (1933, Canadian Ent. 65:249) as a new combination under the genus *Dactynotus.* The determination of the listed species was on a Griswold collection of 1927, and the material was not compared with the types. The type-specimens are in the collection of Dr. F. W. Miller and are not available for examination.

The author hesitates to list *idahoensis* under *Dactynotus* because he has neither seen the types nor verified specimens of the species. Palmer's illustration of the species (Aphids of the Rocky Mountain Region, The Thomas Say Foundation, 1952, p. 310) is *Dactynotus*-like; and since it occurs on a composite, it probably belongs to the genus *Dactynotus.*

TWO SPECIES OF MICROGASTERINAE NEW TO THE UNITED STATES
(Hymenoptera, Braconidae)

Microgaster diaphaniae Muesebeck

Microgaster diaphaniae Muesebeck, 1958. Proc. U.S. Natl. Mus. 107: 414.

Two male specimens of this species were recently sent to me for identification by Frank W. Mead, Florida Department of Agriculture, Gainesville. They were reared from larvae of *Diaphania indica* Saunders at Hialeah, Dade County, Florida. Previous locality records were from Costa Rica, El Salvador, Mexico, and Brazil, and the only known host was *D. hyalinata* (L.). In Muesebeck's key to the North American *Microgaster* (1922. Proc. U.S. Natl. Mus. 61(2436): 21), *M. diaphaniae* will run to *zonaria* Say, but can be separated by its testaceous mesonotum and smoother first abdominal tergum.

Apanteles nigriceps (Ashmead)

Urogaster nigriceps Ashmead, 1900. Trans. Roy. Ent. Soc. London, 1900, pt. 2, p. 284.

I collected one female specimen of *nigriceps* at Southern Pines, Moore County, North Carolina, on August 26, 1960. This species was previously known only from the islands of St. Vincent, Grenada, and Cuba. Muesebeck included *nigriceps* in his key to the North American *Apanteles* (1920. Proc. U.S. Natl. Mus. 58: 488).
—Paul M. Marsh, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

A REVISION OF THE GENUS PARABEZZIA MALLOCH
(DIPTERA, CERATOPOGONIDAE)

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In 1951 I restudied the types of *petiolata* Malloch, which is the type species of *Parabezzia* Malloch, and clarified the taxonomic positions of several species which had been erroneously placed in the genus. At the same time I called attention to evidence pointing to the synonymy of *Stilobezzia uncinata* Johannsen (described from a female) with *petiolata* (which was known only from males). I also pointed out that the genus *Diaphanobezzia* Ingram and Macfie known only from the male sex, is a synonym of *Parabezzia*.

In the meantime a large number of specimens of *Parabezzia* from many parts of the western hemisphere have been collected and studied and 11 new species have been recognized. In the following paper I am describing these new species, and presenting a key for the separation of the 15 species now known in *Parabezzia*. A new genus is proposed for one African species erroneously placed in *Parabezzia*, but the position of a second African species in *Parabezzia* is confirmed.

The types of all the new species here described are deposited in the U. S. National Museum in Washington, D. C. Paratypes, when available, will be deposited in the British Museum (Nat. Hist.) in London and the California Academy of Sciences in San Francisco.

I am greatly indebted to Mr. Jack Scott, staff photographer of the Smithsonian Institution, for making the wing photographs.

Terminology: Wing length is measured from the basal arculus to the wing tip. Three costal sections are measured: I from the basal arculus to the tip of vein Rl, II from the tip of Rl to the tip of the radial sector (Rs), and III from the tip of Rs to the end of the thickened costa between the tips of Rs and Ml. Vein Rs is measured from its proximal juncture with r-m crossvein distad to the wing margin. The antennal ratio is the value obtained by dividing the combined lengths of the last five flagellomeres by the combined lengths of the preceding eight. The maxillary palpus, in most genera five-segmented with the sensoria borne on the third segment, is reduced in *Parabezzia* to four, and the first two are indistinctly segmented so that the proportions are measured in three divisions: the combined lengths of the first and second; the third segment which bears the hyaline sensory filaments; and the fused fourth and fifth segments.

Genus **Parabezzia** Malloch

Parabezzia Malloch, 1915, Bull. Illinois St. Lab. Nat. Hist. 10: 358.—Johannsen, 1943, Ann. Ent. Soc. Amer. 36: 782.—Wirth, 1952, Proc. Ent. Soc. Washington 54: 23. Type-species, *Parabezzia petiolata* Malloch, by original designation.

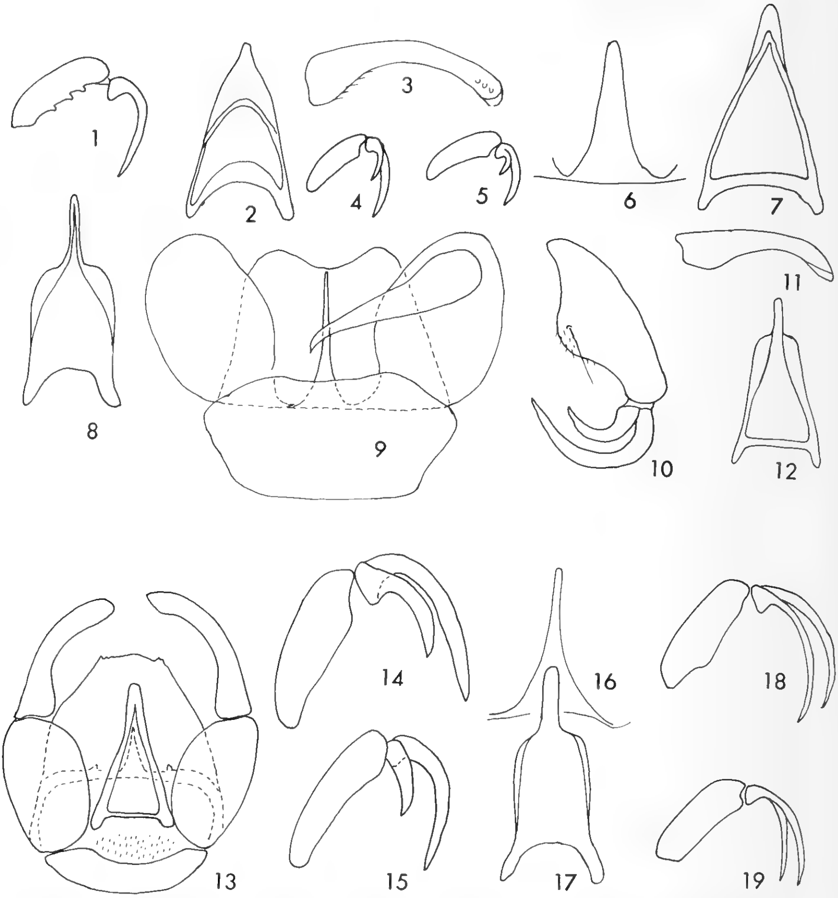


Fig. 1. *Parabezzia brunnea,* fifth tarsomere and claws of mid leg of female; fig. 2. *P. costalis,* male aedeagus; fig. 3. *P. costalis,* male dististyle; fig. 4. *P. downesi,* fifth tarsomere and claws of mid leg of female; fig. 5. *P. downesi,* same, hind leg of female; fig. 6. *P. downesi,* male parameres; fig. 7. *P. downesi,* male aedeagus; fig. 8. *P. inermis,* male aedeagus; fig. 9. *P. inermis,* male genitalia, aedeagus and one dististyle removed, ventral view; fig. 10. *P. jamaicensis,* fifth tarsomere and claws of fore leg of female. fig. 11. *P. panamensis,* male dististyle; fig. 12. *P. panamensis,* male aedeagus; fig. 13. *P. petiolata,* male genitalia, ventral view; fig. 14. *P. petiolata,* fifth tarsomere and claws of mid leg of female; fig. 15. *P. petiolata,* same, hind leg of female; fig. 16. *P. williamsi,* male parameres; fig. 17. *P. williamsi,* male aedeagus; fig. 18. *P. williamsi,* fifth tarsomere and claws of mid leg of female; fig. 19. *P. williamsi,* same, hind leg of female.

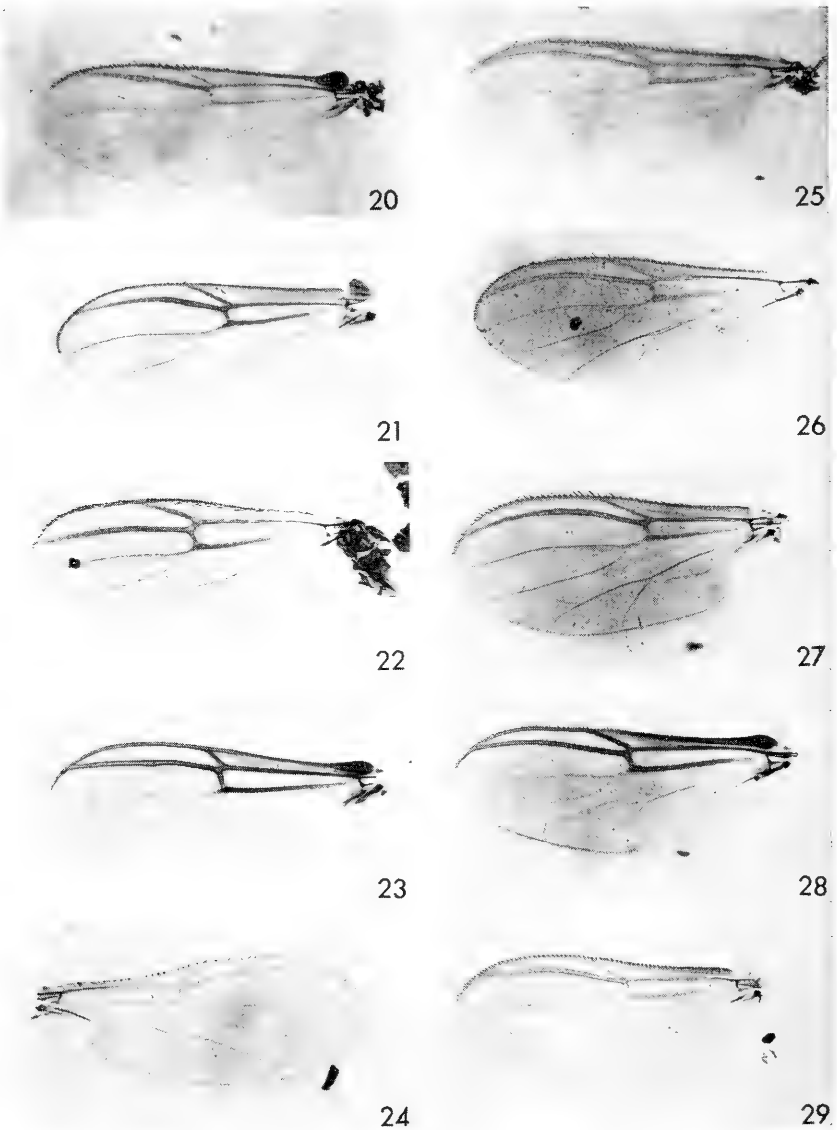
Diaphanobezzia Ingram and Macfie, 1931, Dipt. Patagonia & S. Chile, pt. 2, fasc. 4, p. 223. Type-species, *Diaphanobezzia pellucida* Ingram and Macfie, by original designation.

Diagnosis.—Body fairly stout, nearly bare. Eyes bare. Palpus 4-segmented, third without sensory seta but bearing 1–6 long slender hyaline capitate sensillae (segmentation between 1 & 2 indistinct so 1 & 2 are measured together). Female antenna with antennomeres 3–10 oval, 11–15 long and cylindrical; male antenna with well developed plumes. Scutal pits absent. Scutum without anterior spine or tubercle, with some strong erect bristles in addition to short pubescence. Legs all slender, with a few spinelike bristles; male coxae with dense long spinelike bristles; tarsi with or without ventral spines; fourth tarsomere cordate; fifth tarsomere stout and laterally compressed, sometimes swollen or tuberculate ventrally; empodium absent; claws of female long and curved, equal or unequal, of male small and equal; claws without basal tooth. Wing broad in female, narrower in male, surface with microtrichia very small, especially in males; macrotrichia absent. In female a single long radial cell nearly to wing tip, costa prolonged to wing tip halfway between ends of Rs and Ml; in male ending at 0.6 of wing length; r-m slightly oblique, tip placed slightly past base of Rl; media petiolate, the petiole about as long as crossvein; fringe on anterior margin very short or absent before middle of wing in male, long or short in female. Female with two large sclerotized spermathecae, tip of abdomen blunt. Male genitalia with aedeagus large and triangular, parameres fused in a small, pointed triangular sclerite hidden by aedeagus.

Key to the Species of **Parabezzia**[1]

1. Costa with a large beadlike or scalelike swelling at base near level of basal arculus (fig. 20) 2
   Costa without abrupt swelling at base (fig. 27) 6
2. Tibiae and femora blackish 3
   Tibiae yellowish; femora yellowish to blackish 4
3. Male dististyle bent or curved in mid portion, with blunt tip (Panama) .... **costalis** n. sp.
   Male dististyle straight in mid portion, with sharp pointed tip (Congo) .... **falcipennis** Clastrier
4. Fore femur yellowish; large species, wing 1.30–1.38 mm. long 5
   Fore femur brownish; small species, wing 1.04 mm. long (Panama) .... **blantoni** n. sp.
5. All femora yellowish (Puerto Rico) .... **spangleri** n. sp.
   Mid and hind femora brownish black (Massachusetts) .... **alexanderi** n. sp.
6. Claws subequal or very slightly unequal (figs. 18, 19) 7
   Claws moderately to very unequal, at least on mid leg (figs. 4, 5, 10, 14, 15) 8
7. Scutum dull brown, scutellum paler (Arizona) .... **inermis** (Coquillett)
   Scutum shining black, scutellum concolorous (Michigan) .... **williamsi** n. sp.
8. Legs partly yellowish, at least on hind tibia; small species, wing 0.92–1.00 mm, long 9
   All femora and tibiae uniformly blackish or brownish; large species, wing 1.06–1.20 mm. long 10
9. Female scutellum yellowish, abdomen yellowish white; claws (figs. 4, 5) very unequal, the smaller one half as long as the other or less; male

[1] Primarily for females; *pellucida* (Ingram and Macfie) from Argentina is known only from the male, and is probably closely related to *brunnea* n. sp.



Figs. 20–31, photographs of female wings of *Parabezzia* species: 20. *alexanderi*; 21. *blantoni*; 22. *brunnea*; 23. *costalis*; 24. *downesi*; 25. *inermis;* 26. *jamaicensis*; 27. *petiolata*; 28, *spangleri*; 29. *williamsi*.

aedeagus evenly tapered to apex (Ontario) .... **downesi** n. sp.
Female scutellum blackish, abdomen brown; claws only moderately unequal, the smaller one more than half as long as the other; male aedea-

gus with subapical lateral lobes and slender, peglike tip (Panama) .... **panamensis** n. sp.

10. Scutum, femora, and tibiae dull brownish; radial cell long, extending to 0.90–0.96 of wing length; wing infuscated, translucent 11
    Scutum, femora, and tibiae shining dark brown to black; radial cell extending to 0.81–0.95 of wing length; wing hyaline 12
11. Claws of all legs unequal (Panama) .... **fuscipennis** n. sp.
    Claws of fore tarsus subequal, only one claw (fig. 1) on each mid and hind tarsus (Panama) .... **brunnea** n. sp.
12. Radial cell short, extending to only 0.81–0.88 of wing length; claws extremely long and slender; flagellomeres of proximal series pale at bases (Texas and Arizona to Panama) .... **unguis** n. sp.
    Radial cell (figs. 26, 27) longer, extending to 0.95 of wing length; claws stouter; flagellomeres of proximal series all brown in *petiolata* 13
13. Fifth tarsomere (figs. 14, 15) slender or moderately swollen (Arkansas and Illinois to New York and Virginia) .... **petiolata** Malloch
    Fifth tarsomere (fig. 10) markedly swollen ventrally (Jamaica) .... **jamaicensis** n. sp.

Parabezzia alexanderi, n. sp.
(Figure 20)

Female.—Wing length 1.38 mm.

Head brown, bases of proximal flagellomeres and all of palpi yellowish. Antenna with lengths of flagellomeres in proportion of 20-13-13-14-14-14-14-14-18-20-20-20-26; antennal ratio 0.90. Palpal segments in proportion of 16-20-15, third segment with three long hyaline sensory filaments. Mandible with 9 teeth.

Thorax shining black; scutum with rather thick, short, erect brownish hairs; scutellum with 10–15 longer, stouter black hairs. Legs yellowish; coxae, mid and hind femora brownish black; hind tarsal ratio 2.4; fifth tarsomeres without marked ventral swelling or tubercles; claws very unequal on fore and mid legs, subequal on hind leg, moderately long on fore and hind legs, very long and slender on mid leg. Wing (fig. 20) grayish hyaline, the radial veins brownish; costa with large basal swelling, the thickening gradually decreasing distad of basal arculus; costal sections I, II, III in proportion of 110-65-20, Rs 85, Rs ending at 0.88 of wing length. Halter knob whitish.

Abdomen dark brown. Spermathecae collapsed and not in condition to measure, apparently subequal in size.

Male.—Unknown.

Distribution.—Massachusetts.

Types.—Holotype female, 2 female paratypes, Bedford, Mass., 20 July 1961, W. W. Wirth, swept from swamp (Type No. 66661, U.S.N.M.).

Discussion.—This species is named in honor of Dr. Charles P. Alexander, world renowned and beloved Dipterist, whose name is nearly synonymous with the Department of Entomology at the University of Massachusetts. The species is easily recognized by its large basal costal swelling and yellowish legs with only the coxae and the mid and hind femora dark.

Parabezzia blantoni, n. sp.
(Figure 21)

Female.—Wing length 1.04 mm.

Head pale brown including antennae and palpi. Antenna comparatively long and slender, lengths of flagellomeres in proportion of 26-10-10-10-11-12-13-15-20-22-25-25-32, antennal ratio 1.16. Palpal segments in proportion of 10-15-16, third segment with two moderately long hyaline sensory filaments. Mandible with 7 teeth.

Thorax shining black; available specimens rubbed and vestiture not apparent, except scutellum with four long hairs. Legs dark brown, fore femur and tibia paler brown, mid and hind tibiae and all of tarsi yellowish; hind tarsal ratio 2.6; claws of fore and hind legs subequal, long and slender, those of mid leg of available specimens broken off. Wing (fig. 21) smoky grayish brown, darker anteriorly and along radial veins; costa with a short, very broad basal swelling proximad of basal arculus, this portion very setose and distinctly separated from distal portion of costa; costal sections I, II, III in proportion of 90-60-20, Rs 70, Rs ending at 0.90 of wing length; tip of costa extending to tip of vein M_1. Halter knob slightly infuscated.

Abdomen dark brown. Spermathecae oval without sclerotized necks; unequal, measuring 0.080 mm. by 0.056 mm. and 0.061 mm. by 0.032 mm.

Male.—Unknown.

Distribution.—Panama.

Types.—Holotype female, Almirante, Bocas del Toro Prov., Panama, March 1953, F. S. Blanton, light trap (type No. 66662, U.S.N.M.). Paratype, 1 female, same data except Jan. 1953.

Discussion.—This species is dedicated to its collector, Dr. F. S. Blanton of the University of Florida, who has added many valuable Panama insect specimens to the National Collection. This species is easily recognized by the semidetached basal costal swelling and by the extension of the costa to the tip of vein M_1.

Parabezzia brunnea, n. sp.
(Figures 1, 22)

Female.—Wing length 1.19 mm.

Head brownish, including antennae and palpi. Antennae broken, not measured. Palpal segments in proportion of 13-16-15, third segment with 5–6 moderately long hyaline sensory filaments scattered along mesal margin. Mandible with 8 teeth.

Thorax dull brown, slightly shining above, scutum and scutellum with moderately numerous, fairly long, fine hairs. Legs brown, tarsi pale yellowish; femora and tibiae moderately stout, with numerous, long, very fine hairs; hind tarsal ratio 3.0; fifth tarsomeres not greatly swollen, those (fig. 1) on mid and hind legs each with 2–3 distinctive sharp brown ventral tubercles; claws moderately strong, subequal on fore leg, only one claw present on each mid and hind tarsus, the second claw absent. Wing (fig. 22) smoky brown, the veins darker brown; fringe of very numerous long hairs well developed around entire wing, especially on costa; costa without basal swelling; costal sections I, II, III in proportion of 120-60-15, Rs 95, Rs ending at 0.96 of wing length, costa extending to about midway between tips of veins Rs and M_1, vein M_1 ending slightly behind wing tip. Halter infuscated at base, dirty white on knob.

Abdomen dull brown. Spermathecae collapsed and not measured, apparently subequal, slightly ovoid.

Male.—Unknown.

Distribution.—Panama.

Types.—Holotype female, Tocumen, Panama Prov., Panama, Jan. 1953, F. S. Blanton, light trap (Type No. 66663, U.S.N.M.). Paratypes, 2 females. PANAMA: Hermita, Cocle Prov., 12 Sept. 1952, and La Jolla, Panama Prov., Sept. 1951, both collected by F. S. Blanton in light traps.

Discussion.—This species is closely related to *fuscipennis* n. sp., which, however, has a complete pair of unequal tarsal claws on each leg and the wing much more opaquely infuscated.

Parabezzia costalis, n. sp.
(Figures 2, 3, 23)

Female.—Wing length 1.38 mm.

Head brownish including antennae and palpi. Antenna very elongate and slender, lengths of flagellomeres in proportion of 22-15-15-15-15-16-16-16-30-30-30-32-36, antennal ratio 1.21. Palpal segments in proportion of 12-20-16, third segment with 4 long hyaline sensory filaments. Mandible with 9 teeth.

Thorax shining black; scutum with numerous, very fine erect brown short hairs; scutellum with 10–20 very fine short brown hairs. Legs blackish, tarsi paler brown; hairs inconspicuous; hind tarsal ratio 3.0; fifth tarsomere on fore and mid legs elongate with a distinct subbasal blunt tooth on ventral side; tarsal claws slightly unequal on all legs, extremely long and slender on fore and mid legs, small on hind leg. Wing (fig. 23) hyaline, radial veins and basal section of media very strong and brownish infuscated; costa with basal swelling gradually decreasing past level of basal arculus; costal sections I, II, III in proportion of 100-85-16, section III extending to 0.55 of distance between tips of veins Rs and M_1. Rs 90, Rs ending at 0.95 of wing length, cell Rs very broad, crossvein r-m longer than R_1. Halter slightly infuscated at base, the knob dirty white.

Abdomen dull dark brown. Spermathecae very unequal, large, oval, measuring 0.112 mm. by 0.083 mm. and 0.096 mm. by 0.064 mm.

Male.—Similar to the female, with the usual sexual differences; wing with costa extending to 0.66 of total length, basal costal swelling present; hind tarsal ratio 2.0. Genitalia with basistyle swollen on basomedian portion with strong mesal setae; dististyle (fig. 3) elongate, arcuate, not tapered to tip, the tip blunt; aedeagus (fig. 2) broad across base, not twice as long as basal breadth, with very low, rounded basal arch, slightly tapering but rather stout distally until distal fourth, where it tapers abruptly to bluntly pointed tip; details of parameres not well displayed in available slide mounts.

Distribution.—Panama.

Types.—Holotype female, Mojinga Swamp, Fort Sherman, Canal Zone, 23 July 1952, F. S. Blanton, light trap (Type No. 66664, U.S.N.M.). Allotype male, Los Santos Prov., Pan de Azucar, 1 Oct. 1952 F. S.

Blanton, light trap. Paratypes, 4 males, 37 females, all collected in Panama by F. S. Blanton in light traps: Loma Borracha, C. Z., Oct. 1951, July 1952, 2 males, 7 females; Camaron, Ft. Kobbe, C. Z., 23 June 1952, 1 female; La Jolla, C. Z., Sept.–Oct. 1952, 4 females; Madden Dam, C. Z., 21 Sept. 1952, 4 females; Mojinga Swamp, C. Z., Nov. 1951, June–July 1952, 2 males, 21 females.

Discussion.—This is the only American species with the femora and tibiae entirely dark brown and a large proximal costal swelling. *C. costalis* resembles the African species *falcipennis* Clastrier in this respect but the latter has a sharp pointed, straight, male dististyle.

Parabezzia downesi, n. sp.
(Figures 4–7, 24)

Female.—Wing 1.00 mm. long.

Head pale brown including antenna, palpi whitish. Antenna short; lengths of flagellomeres in proportion of 12-8-8-8-8-8-9-9-12-12-12-14-29, antennal ratio 1.00. Palpal segments in proportion of 10-13-11, third segment with two moderately long, hyaline sensory filaments. Mandible with 9 teeth.

Thorax shining black, scutellum yellowish; scutum with sparse, erect setose hairs, scutellum with four marginal hairs. Legs yellowish, fore femur and tibia pale brownish, mid and hind femora slightly infuscated, fifth tarsomeres brownish; hairs very sparse and fine; hind tarsal ratio 2.4; fifth tarsomeres not swollen; tarsal claws (fig. 4, 5) moderately long and stout, very unequal on all legs, the smaller one less than half as long as the other. Wing (fig. 24) faintly milky white including the veins; costa without basal swelling; costal sections I, II, and III in proportion of 75-60-10, Rs 75, radial cell very narrow, very long, Rs extending to 0.95 of wing length. Halter whitish.

Abdomen yellowish white. Spermathecae ovoid, slightly unequal, measuring 0.058 mm. by 0.054 mm. and 0.051 mm. by 0.045 mm., sclerotized deeply brownish.

Male.—Similar to the female, with the usual sexual differences; costa extending to 0.62 of wing length; hind tarsal ratio 2.0. Genitalia: Ninth sternum without caudomedian excavation, the posterior membrane with coarse spicules; ninth tergum slightly tapering, the row of long dorsal bristles situated at about proximal third. Basistyle short and stout, almost globular; dististyle curved, slightly constricted in midportion, with bluntly pointed setose tip. Aedeagus (fig. 7) nearly triangular, with very short, only slightly concave basal arch, sides of tapered portion slightly convex proximally, distal portion narrowed to a slender rounded tip. Fused parameres (fig. 6) forming a slender pointed lobe caudad of anterior transverse band connecting bases of basistyles.

Distribution.—Ontario.

Types.—Holotype female, allotype, male Algonquin Park, Ontario, 8 June 1960, W. W. Wirth, reared from sand bar in Madawaska River (Type No. 66665). Paratypes, 22 males, 23 females as follows: 14 males, 13 females, same data as types; 8 males, 10 females, same data except 8 June 1960, reared from marsh.

Discussion.—This strikingly marked species is named in honor of

Dr. J. Antony Downes of the Entomological Research Institute, Ottawa, Canada, in honor of his fine contributions to our knowledge of American and British Ceratopogonidae and his constant inspiration to many leading students of the family. This species is readily distinguished by the contrasting shining black thorax, yellowish scutellum, pale legs, and whitish wings and abdomen.

Parabezzia falcipennis Clastrier

Parabezzia falcipennis Clastrier, 1960, Arch. Inst. Pasteur d'Algérie 38: 293 (male; Congo; fig. wing, male genitalia).

A detailed study of the excellent figures and description of this African species permits its recognition as a true *Parabezzia* closely related to *costalis* n. sp. The female is still unknown. This is the only species known to occur outside the Western Hemisphere and probably represents an ancient faunal element common to the Southern Hemisphere.

Parabezzia fuscipennis, n. sp.

Female.—Wing 1.20 mm. long.

Head brownish. Antenna and palpus not measured in pinned specimen.

Thorax dull dark brown, slightly shining above; scutum with numerous long, fine, brownish hairs, scutellum with about 6 long brown hairs. Legs brownish, with numerous long fine hairs; hind tarsal ratio about 3.6; fifth tarsomere moderately swollen below, without ventral tubercles; claws long, moderately stout, very unequal on all legs, the smaller claw about half as long as the other. Wing very deeply brownish infuscated, appearing opaque, anterior veins darker brown; dense fringe of fine brown hairs around entire wing, especially numerous along costa; costa without basal swelling; costal sections, I, II, III in proportion of 120-72-20, Rs 90, Rs extending to 0.90 of wing length, costa ending 0.7 way from tip of vein Rs to tip of vein M_1; vein M_1 ending at extreme wing tip. Halter brownish infuscated.

Abdomen dull brown. Spermathecae not examined.

Male.—Unknown.

Distribution.—Panama.

Types.—Holotype female (on pin), Mojinga Swamp, Fort Sherman, Canal Zone, Nov. 1951, F. S. Blanton, light trap (Type No. 66666, U.S.N.M.).

Discussion.—*P. brunnea* is very closely related to *fuscipennis*, but has only one claw on each mid and hind tarsus, and the wing is not nearly so deeply infuscated.

Parabezzia inermis (Coquillett)
(Figures 8, 9, 25)

Ceratopogon inermis Coquillett, 1902, Proc. U. S. Nat. Mus. 25; 86 (female; Ariz.).

Bezzia inermis (Coquillett); Kieffer, 1906, Genera Insectorum, fasc. 42: 58.

Probezzia inermis (Coquillett); Malloch, 1914, Proc. Biol. Soc. Washington 27: 137.

Parabezzia inermis (Coquillett); Malloch, 1915, Bull. Illinois St. Lab. Nat. Hist. 10: 359.—Wirth, 1952, Proc. Ent. Soc. Washington 54: 25 (redescr.).

Allobezzia inermis (Coquillett); Kieffer, 1917, Ann. Mus. Nat. Hungarici 15: 328.

Female.—Wing 1.05–1.17 mm. long.

Head brown including antennae and palpi; vertex whitish pollinose. Antenna with lengths of flagellomeres in proportion of 15-10-10-10-10-10-10-10-15-15-15-17-22; antennal ratio 1.00. Palpal segments in proportion of 12-20-16, third segment with 3 long hyaline sensory filaments. Mandible with 9 teeth.

Thorax dull brown, humeri and narrow anterior margin of scutum whitish pollinose, scutum with two narrow submedian longitudinal vittae grayish pollinose; scutellum paler brown. Legs brownish, tarsomeres 1–4 whitish; femora and tibia with sparse, moderately long fine hairs; hind tarsal ratio 2.2; fifth tarsomere not markedly swollen; claws subequal on all legs, moderately long and slender. Wing (fig. 25) grayish hyaline, anterior veins brownish; fringe with short hairs; costa without basal swelling; costal sections I, II, and III in proportion of 95-70-15, Rs 90; Rs ending at 0.90 of wing length; radial cell rather narrow. Halter slightly infuscated at base, the knob whitish.

Abdomen dull brown. Spermathecae oval, unequal, measuring 0.104 mm. by 0.072 mm. and 0.072 mm. by 0.056 mm.

Distribution.—Arizona, New Mexico, ? California.

New Records.—ARIZONA: Wickenburg, Maricopa Co., June 1951, H. K. Gloyd, light, 1 female. Sycamore Canyon, Ruby, Santa Cruz Co., 22 May 1954, G. D. Butler, light trap, 1 female. NEW MEXICO: Cherry Creek, Pinos Altos, 22 June 1953, W. W. Wirth, 1 female.

Discussion.—This is the only North American species to have the dull brown thoracic color found in the Neotropical species *fuscipennis* and *brunnea*, both of which differ in having unequal tarsal claws, long hairs on the legs, and conspicuous fringe on the costa.

One male from Live Oak Park, California, 24 May 1944, A. L. Melander, may possibly be this species, the male of which has not yet been recognized. The genitalia (figs. 8, 9) are distinctive, primarily due to the shape of the aedeagus (fig. 8), which has a low, rounded basal arch; main body with broad basal portion, then abruptly constricted just beyond midlength to a long, slender stem with parallel sides and slender, rounded tip. The aedeagus of *panamensis* is very similar.

Parabezzia jamaicensis, n. sp.

(Figures 10, 26)

Parabezzia petiolata Malloch; misident., in part, Wirth, 1952, Proc. Ent. Soc. Washington 54: 24 (Jamaica records of *petiolata*).

Female.—Wing length 1.08 mm.

Head brown; antennae broken; palpal segments short, in proportion of 10-15-16, third segment with three short hyaline sensory filaments. Mandible with 9 teeth.

Thorax subshining dark brown; scutum with sparse fine dark hairs. Legs dark brown, tarsomeres 1–3 whitish; femora and tibiae with sparse long fine hairs; hind tarsal ratio 2.3; fifth tarsomeres expanded ventrally in a subbasal rounded pubescent lobe, especially prominent on fore leg (fig. 10); claws very unequal, moderately long and stout, on all legs. Wing (fig. 26) grayish hyaline, the veins brownish; costa without basal swelling, costal fringe very short; costal sections I, II, and III in proportion of 90-65-15, Rs 80; Rs extending to 0.95 of wing length; radial cell only moderately broad. Halter slightly infuscated at base, the knob whitish.

Abdomen pale brown. Spermathecae oval, very unequal, measuring 0.105 mm. by 0.069 mm. and 0.072 mm. by 0.058 mm.

Male.—Unknown.

Distribution.—Jamaica.

Types.—Holotype female, Bath St. Thomas, Jamaica, 1937, Chapin and Blackwelder (type No. 66667, U.S.N.M.). Paratype, 1 female, Spa Town, Jamaica, 3 Feb. 1937, Chapin and Blackwelder.

Discussion.—The absence of costal swelling, the dark legs, unequal stout tarsal claws, and shining dark brown thorax ally this species to the North American *petiolata* Malloch. However, in *petiolata* the claws are much longer, the fifth tarsomeres lack the distinctive subbasal swelling, and the spermathecae are subequal in size.

Parabezzia panamensis, n. sp.
(Figures 11, 12)

Female.—Wing 0.92 mm. long.

Head brown; antennae broken; palpal segments in proportion of 10-13-15, third segment with two moderately long, hyaline sensory filaments. Mandible with 8 teeth.

Thorax shining blackish; scutum with sparse, moderately long, erect coarse hairs. Legs yellowish brown; femora brownish on fore and mid legs, brownish black on hind leg; tarsomeres 1–4 yellowish; hind tarsal ratio 3.0; femora and tibiae with sparse short hairs; fifth tarsomeres not greatly swollen; claws rather long and slender, only gently curved distally, unequal, the shorter claw about two-thirds as long as the longer on each leg. Wing grayish hyaline, the anterior veins brownish; costa without basal swelling; costal sections I, II, and III in proportion of 80-50-15, Rs 65, radial cell moderately broad; Rs extending to 0.94 of wing length. Halter moderately infuscated, appearing yellowish brown.

Abdomen dull brown. Spermathecae slightly unequal, oval, measuring 0.072 mm. by 0.056 mm. and 0.064 mm. by 0.048 mm.

Male.—Similar to the female with the usual sexual differences. Genitalia with ninth sternum transverse, with shallow caudomedian excavation, the caudal membrane very finely spiculate; ninth tergum rounded caudad, the transverse row of long bristles located just beyond midlength. Basistyle short and rounded; dististyle (fig. 11) moderately curved, with moderately blunt-pointed tip. Aedeagus (fig. 12) with low, transverse basal arch, a pair of short dorsal sclerotized processes from basal arms, main portion slightly tapering, with straight sides, abruptly narrowed at distal fourth to a slender, peglike, elongated tip.

Distribution.—Panama.

Types.—Holotype female, allotype, Camaron, Ft. Kobbe, C. Z., 23 June 1952, F. S. Blanton, light trap (Type No. 66668, U.S.N.M.). Paratypes, 13 males, 6 females, same data as types.

Discussion.—This species resembles *inermis* (Coquillett) in the shape of the aedeagus, with distinct subapical lateral lobes and slender peglike tip but differs from *inermis* in its shining black thorax, and yellowish brown legs. Among the species without costal swelling, it is distinguished by its unequal tarsal claws, shining blackish thorax, and pale brown legs.

Parabezzia pellucida (Ingram and Macfie)

Diaphanobezzia pellucida Ingram and Macfie, 1931, Dipt. Patagonia & S. Chile, pt. 2, fasc. 4, p. 223 (male; Argentina; fig. wing, antenna, halter, genitalia).

Parabezzia pellucida (Ingram and Macfie); Wirth, 1952, Proc. Ent. Soc. Washington 54: 26 (combination).

This species, which is known only from the male, is probably closely related to *brunnea* n. sp. from Panama. The wing of *brunnea*, which is unfortunately known only from the female sex, is a darker brown, and the possibility that we are dealing with the two sexes of one species is reduced considerably more by the geographic separation.

Parabezzia petiolata Malloch
(Figures 13–15, 27)

Parabezzia petiolata Malloch, 1915, Bull. Illinois St. Lab. Nat. Hist. 10: 359 (male; Illinois).—Johannsen, 1934, Jour. New York Ent. Soc. 42: 344 (notes).—Wirth, 1952, Proc. Ent. Soc. Washington 54: 23 (redescr.; fig. male genitalia; syn.: *uncinata* (Johannsen).

Stilobezzia uncinata Johannsen, 1943, Ann. Ent. Soc. Amer. 36: 761 (female; Alabama; fig. wing, tarsal claws).

Female.—Wing length 1.06 mm.

Head brown including antennae, palpi paler brown. Antenna with lengths of flagellomeres in proportion of 15-10-10-10-10-11-12-12-17-20-20-22-20, antennal ratio 1.10. Palpal segments in proportion of 12-17-13, third segment with 2 long hyaline sensory filaments. Mandible with 8 teeth.

Thorax shining black; scutum with sparse, long, coarse bristly black hairs; scutellum with 4–6 long bristly black hairs. Legs blackish, tarsomeres 1–4 whitish; femora and tibiae with sparse fine hairs, a few extensor hairs on tibiae longer; hind tarsal ratio 2.4; fifth tarsomeres slender or moderately swollen, without ventral hump or tubercles; claws (figs. 14, 15) unequal on all legs, the smaller claw about two thirds as long as the other; claws long, moderately stout and curved. Wing (fig. 27) grayish hyaline; radial veins moderately infuscated; costa without basal swelling; costal fringe short; costal sections I, II, and III in proportion of 80-70-10, Rs 90, radial cell moderately broad, narrowing distally, extending to 0.95 of wing length. Halter whitish.

Abdomen dull dark brown. Spermathecae oval, without sclerotized neck, subequal, each measuring 0.080 mm. by 0.056 mm.

Male.—Similar to the female, with the usual sexual differences. Genitalia (fig. 13): Ninth sternum with very shallow caudomedian excavation, the caudal membrane with very coarse spicules; ninth tergum with transverse row of 5 long hairs just proximad of midlength. Basistyle short and stout; dististyle slender and curved, with sharp distal point. Aedeagus nearly triangular in outline, with very low, nearly transverse basal arch, the basal arms projecting only a short distance straight cephalad, sides regularly tapering to blunt distal point. Parameres with fused median sclerotization triangular, nearly as long as aedeagus.

Distribution.—Ala., Ark., Ill., Kans., Md., N. Y., Va.

New Records.—KANSAS: Liberty, Montgomery Co., 6 June 1963, N. & B. Marston, 1 female (Kans. St. Univ.). MARYLAND: Fairland, Montgomery Co., 27 May 1959, A. A. Hubert, reared from creek margin, 1 male, 2 females. NEW YORK: Blue Mountain Lake, Hamilton Co., 10 June 1960, W. W. Wirth, reared, sand bar, Mud Pond Outlet, 3 males, 5 females. Glenfield, Lewis Co., Independence River, 22 June 1963, W. W. Wirth reared, sandy side pool, 2 males, 3 females. VIRGINIA: Falls Church, July 1958, W. W. Wirth, light trap, 1 male, 1 female. 22 July 1951, W. W. Wirth, reared creek margin, 6 males, 4 females. Mount Solon, Augusta Co., 4 July 1951, W. S. Murray, reared, stream margin, 1 male, 2 females.

Discussion.—This species is very easily confused with *williamsi*, but in *williamsi* the claws are more slender and subequal in size, and the male aedeagus has very characteristic subapical lateral lobes and a slender parallel-sided distal portion.

Parabezzia spangleri, n. sp.

(Figure 28)

Female.—Wing length 1.30 mm.

Head brown; palpi and bases of proximal flagellomeres yellowish. Antenna long and slender; flagellomeres with lengths in proportion of 16-12-12-13-13-14-15-15-25-25-28-28-28, antennal ratio 1.22. Palpal segments in proportion of 14-18-20, third segment with four moderately long hyaline sensory filaments. Mandible with 9 teeth.

Thorax appearing dark brown to black in slide mounted specimen. Legs yellowish, only fifth tarsomeres brownish; hind tarsal ratio 2.8; fifth tarsomere without ventral swelling or tubercles; claws very unequal, the smaller claw two-thirds as long as the longer on fore and mid legs, about a third as long as the longer one on hind leg. Wing (fig. 28) grayish hyaline, the radial veins brownish; costa with marked basal swelling gradually decreasing distad; costal sections I, II, and III in proportion of 100-70-20, Rs 85, Rs ending at 0.92 of wing length, second radial cell moderately broad near base, gradually narrowing distad; costal fringe very short. Halter pale.

Abdomen brownish. Spermathecae poorly visible and not measured, moderately unequal, and ovoid, tapering slightly to the ducts, without sclerotized neck.

Male.—Unknown.

Distribution.—Puerto Rico.

Type.—Holotype female, Maricao Fish Hatchery, Puerto Rico, 23 Dec. 1962, P. and P. Spangler, light trap (Type No. 67384, U.S.N.M.).

Discussion.—This species is dedicated to Dr. Paul J. Spangler of the U. S. National Museum in recognition of his valuable contributions to our knowledge of aquatic insects and his keen interest in the West Indian fauna. The species is easily distinguished by its large costal swelling and entirely pale legs.

Parabezzia unguis, n. sp.

Female.—Wing length 1.12 mm.

Head brown, palpus except last segment, and bases of proximal flagellomeres whitish. Antenna long and slender; lengths of flagellomeres in proportion of 18-12-12-12-12-12-12-12-18-20-20-22-25, antennal ratio 1.03. Palpal segments in proportion of 15-20-15, third segment with 3 long slender hyaline sensory filaments. Mandible with 9 teeth.

Thorax shining black; scutum with sparse, scattered, long black bristly hairs, scutellum with 6 long hairs. Legs blackish, tarsomeres 1–3 contrasting whitish; femora and tibiae with sparse, fine hairs; hind tarsal ratio 2.6; fifth tarsomere long and slender, not swollen; claws strong, long and slender, very unequal, the shorter claw about two-thirds as long as the other on fore and mid legs, half as long on hind leg. Wing grayish hyaline, radial veins brownish; no basal swelling on costa, costal fringe very short and fine; costal sections I, II, and III in proportion of 95-50-25, Rs 70, radial cell moderately narrow; vein Rs nearly straight, not bowed, attaining 0.81–0.88 of wing length. Halter whitish, slightly brownish in some specimens.

Abdomen dull brown. Spermathecae collapsed in specimens examined and not measured, apparently large, subequal, oval in shape without sclerotized neck and not tapering to duct.

Male.—Similar to the female with the usual sexual differences. Genitalia: Ninth sternum with a broad shallow caudomedian excavation, the caudal membrane not spiculate; ninth tergum with transverse row of 8 long hairs at midlength. Basistyle short and stout; dististyle curved, slender distally with pointed tip. Aedeagus with very low, transverse basal arch, the basal arms very short and stout with distinct stout process extending caudal from dorsal side of each lateral angle; main portion moderately broad basally, tapering distally with a slightly abrupt constriction of midlength, distal portion tapered to a slender stem. Parameres with fused mid portion very slender, tapering distally to a narrow pointed process.

Distribution.—Arizona, Mexico, Panama, Texas.

Types.—Holotype female, Sabino Canyon, Pima Co., Arizona, 9 Aug. 1953, G. D. Butler, light trap (Type No. 66669, U.S.N.M.). Allotype male, same data except 4 Aug. 1958, M. S. Adachi. Paratypes, 9 males, 57 females. ARIZONA: 3 males, 7 females, same data as holotype; 1 male, 1 female, same data as allotype. Sedona, Oak Creek Canyon, 29 June 1953, W. W. Wirth, 1 male. Cave Creek, Maricopa Co., June 1952, H. K. Gloyd, light, 1 female. Yank Spring, Sycamore Canyon, Santa Cruz Co., 3 Aug. 1952, H. B. Leech and J. W. Green, 1 female (Calif. Acad. Sci.). Brown Canyon, Baboquivari Mts., 4 Aug. 1961, F. Werner, light trap, 1 female. MEXICO: Hermosillo, Sonora, 12 Aug. 1959, Werner and Nutting, light trap, 1 male, 1 female. PANAMA: Alcalde Diaz, Panama Prov., 10 Oct. 1952, 1 female. Almirante, Bocas del Toro Prov., Oct. 1952, 1 female. Camaron, Ft. Kobbe, C. Z., 23 June 1952, 1 female. El Espino, 18 Sept. 1952, 1 female. Loma Borracho, C. Z., Oct. 1951, July, Aug. 1952, 2 males, 30 females. Mojinga Swamp, Ft. Sherman, C. Z., Nov., Dec. 1951, 2 females. Pilon, Colon Prov., 25 Aug. 1952, 1 female. Portero, 11 Nov. 1952, 1 female. All collected by F. S. Blanton in light traps. TEXAS: Devils River, Val Verde Co., 13 June 1953, W. W. Wirth, 1 male, 1 female. Kerrville, Aug. 1953, May 1954, L. J. Bottimer, light trap, 6 females.

Discussion.—From the other known species without basal costal swelling, with shining black thorax and blackish femora and tibiae, and unequal tarsal claws, *unguis* is readily separated by the wing venation, vein Rs being unusually short and straight, attaining only 0.81–0.88 of total wing length.

Parabezzia williamsi, n. sp.
(Figures 16, 17, 18, 19, 29)

Female.—Wing length 0.90 mm.

Head brown, palpi and basal portions of antennal segments 3–10 yellowish. Antenna with lengths of flagellomeres in proportion of 10-7-7-7-7-8-8-8-8-15-15-16-17-20, antennal ratio 1.32. Palpal segments in proportion of 8-10-12, third segment with 3 long hyaline sensory filaments. Mandible with 7 teeth.

Thorax shining brownish black; scutum with sparse scattered long black bristly hairs, scutellum with 4 long hairs. Legs dark brown, tarsomeres 1–4 whitish; femora and tibiae with sparse fine hairs; hind tarsal ratio 2.5; fifth tarsomeres not swollen; claws (figs., 18, 19) subequal, long and more slender than usual. Wing (fig. 29) without basal costal swelling, costal fringe of very short setae; costal sections I, II and III in proportion of 70-50-15, Rs 60, radial cell moderately broad, extending to only 0.88 of wing length. Halter whitish.

Abdomen dull brown. Spermathecae oval, not tapering to duct, but with short, narrow sclerotized neck, unequal in size, measuring 0.069 mm. 0.045 mm. and 0.056 mm. by 0.040 mm.

Male.—Similar to the female with the usual sexual differences. Ninth sternum with barely perceptible caudomedian excavation, the caudal membrane spiculate; ninth tergum with transverse row of six long hairs at midlength. Basistyle short and stout; dististyle slender and curved, with sharp distal point. Aedeagus (fig. 17) with low rounded basal arch, mid portion with nearly straight sides, abruptly narrowed at distal third with distal portion a slender median process. Parameres (fig. 16) with fused median sclerotization tapering from base to a very slender, parallel-sided caudomedian process.

Distribution.—Fla., Mich., N. Y., S. D., Va.

Types.—Holotype female, allotype male, Douglas Lake, Cheboygan Co., Michigan, 8–15 July 1959, R. W. Williams, emergence trap on beach (Type No. 67385, U.S.N.M.). Paratypes, 50 males, 50 females, same data except dates June–August, 1959.

Other specimens examined.—FLORIDA: Orlando, 22 March 1954, W. E. Snow, 1 female. NEW YORK: Ellis Hollow, Tompkins Co., 15 June 1963, W. W. Wirth, reared, creek margin, 1 male, 1 female. SOUTH DAKOTA: Oral, Fall River, 4 July 1953, L. Edmunds, 1 female. VIRGINIA: Falls Church, 23 June, 1 July 1951, W. W. Wirth, reared, creek margin, 1 male, 3 females.

Discussion.—This species is almost indistinguishable from *petiolata* Malloch, except for the more delicate, long subequal tarsal claws, unequal spermathecae with short slender neck, shorter radial cell of the female, and for the subapically lobed, slender-tipped male aedeagus. It is named in honor of Dr. Roger W. Williams of Columbia University, who collected the extensive type series during his detailed investigation of the ceratopogonid fauna of Douglas Lake, Michigan.

Afrohelea, new genus

Parabezzia capensis de Meillon and Hardy (1954, Jour. Ent. Soc. Southern Africa 17: 67) from South Africa is not a *Parabezzia* but is more closely related to *Echinohelea* Kieffer. The nonplumose male antenna with the five distal flagellomeres elongated, the five segmented palpus, the male genitalia with bulbous basistyles, elongate median lobe of the ninth tergum bearing distilateral winglike plates, bell-shaped aedeagus, and separated parameres, the female fifth tarsomere with short, basally toothed claws, are very distinctive characters placing it near *Echinohelea*. On the other hand the basistyles are still separated by the ring of the ninth segment, the setiferous apicolateral lobes of the ninth tergum are well developed, there are no strong black leg spines, and the wing has only one radial cell. These characters justify the erection of a new genus, which I hereby name *Afrohelea*, with type-species *Parabezzia capensis* de Meillon and Hardy.

Reference

Wirth, W. W. 1952. The status of the genus *Parabezzia* Malloch (Diptera, Heleidae). Proc. Ent. Soc. Wash. 54: 22–26.

PTINUS VARIEGATUS IN GEORGIA AND KENTUCKY
(Coleoptera: Ptinidae)

The species *Ptinus variegatus* Rossi, 1794, was recorded by me in 1960 (Proc. Ent. Soc. Wash. 62(2):103) as occurring at various localities in North Carolina, South Carolina, and Virginia, U.S.A. Now two more States may be added. Several specimens were collected at Dunwoody, DeKalb Co., Georgia, in the Summer of 1955, at light, by E. F. Menhinick. Five specimens were collected at Barbourville, Knox Co., Kentucky, in April and May of 1965, at light and at large, by R. E. White. I thank Charles A. Triplehorn and Richard E. White for showing these specimens to me.—T. J. Spilman, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

TWO NEW CHAOBORIDAE FROM THE UNITED STATES
(DIPTERA)

ALAN STONE, *Entomology Research Division ARS, U. S. Department of Agriculture, Washington, D. C.*

There recently came to my notice, in the collection of the United States National Museum, two apparently new species of the family Chaoboridae. One represents a genus new to the United States; the other might be confused with two species, widespread in this country, which are sympatric with it.

Lutzomiops Lane 1942
Lutzomiops kerrvillensis, n. sp.

Female: Length 1.6 mm.; wing 1.52 mm. General coloration yellowish brown; hairs concolorous; head, three slender central lines and the vertical sides of the mesonotum, a spot on upper postpronotum, and a stripe from base of fore coxa across pleuron to just below base of halter subshining darker brown, the rest of mesonotum thinly paler pollinose, and the humeral area distinctly paler, but the scutal pattern not very distinct; scutellum yellowish; wings and legs unpatterned, the vestiture uniformly pale brown; stem of halter white, knob pale yellowish. Abdomen unbanded, the venter paler than dorsum. Ratio of palpal segments, 2: 3.5: 13: 7: 12; segment 3 with distal half swollen with a broad ventral depression near apex. Apex of Rs slightly beyond base of first fork cell. Ratio of hind tarsomeres, 10: 4.2: 4: 2.6: 1.8. A single sclerotized, subspherical spermatheca 0.05 mm. in diameter, with very short neck.

Holotype female, Kerrville, Texas, V.1954, L. J. Bottimer; paratypes, 4 ♀♀, same place and collector, 28.VIII.53, V.54, and 21.V.54. (USNM No. 67423).

This species resembles *L. iridescens* (Lane) 1942 and *L. manaosensis* Lane 1958, but it differs from both of these in having the knob of the halter entirely pale, not blackened. Other species have either a banded abdomen, distinctly stronger scutal pattern, or the ends of the femora with silvery scales. This is the first species of this neotropical genus reported from the United States.

Genus **Chaoborus** Lichtenstein 1800
Subgenus **Sayomyia** Coquillett 1903
Chaoborus (Sayomyia) maculipes, n. sp.

Female: Wing length 2 mm.; fore tibia 1.03 mm.; mid tibia 0.69 mm.; hind tibia 0.85 mm. Generally yellowish white. Antenna pale, the last two segments darkened basally; palpus dark, the first three segments with pale basal bands; head pale with some darkening at sides behind eyes; pronotal lobe dark brown; postpronotum with a central dark brown area; scutal pattern pale yellow brown, consisting of a median stripe narrowed behind and not quite reaching level of wing bases, and a lateral stripe above each wing base; no dark spotting between these stripes; scutellum entirely pale; pleura with some small irregular dark

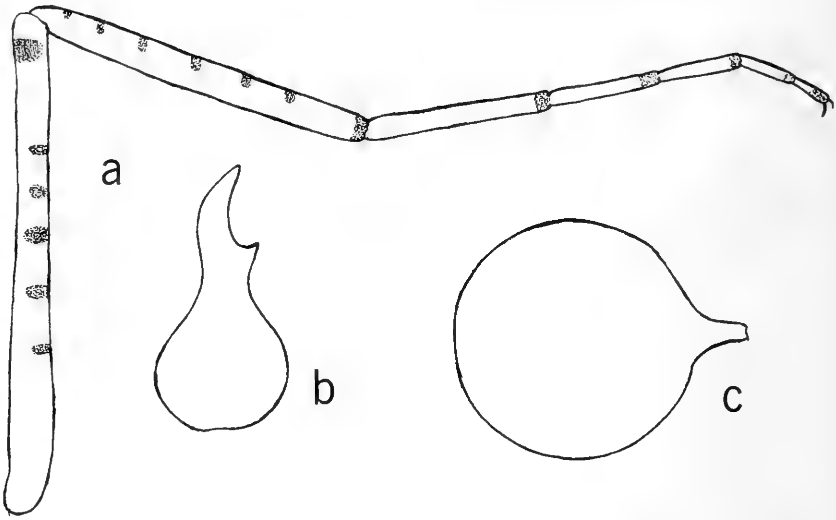


Fig. 1. *Chaoborus maculipes* n. sp. (a). Hind leg, anterior view (holotype); (b). penis valve (Baton Rouge paratype); (c). spermatheca (paratype).

marks. Wing pattern pale yellow brown, consisting of spots at base of Rs, apex of subcosta and R_1, base of each fork cell, margins of cross veins from base of R3 to base of Cu2, middle of vein Cu, and faintly at apices of all veins from R2 to A. Halteres nearly white. Legs (fig. 1a) nearly white, each femur and tibia with dark brown spots usually not crossing segments; 7 on fore tibia, 5 or 6 on other femora and tibiae; hind femur with a large apical spot; tarsomeres of all legs with narrow apical dark bands. Abdomen yellow, the sides of all terga with many of the setal bases darkened. Spermatheca 3, dark, spherical, 0.06 mm. in diameter, each with stem about one-fifth as long as diameter of spermatheca (fig. 1c).

Male: Essentially same as female except for usual sexual differences; flagellar nodes darkened. Genitalia with apical half of each basimere darkened; distimere about 0.71 length of basimere; basimere with no subapical lobe or enlarged setae; penis valve curved with a subbasal tooth (fig. 1b).

Holotype female, Hot Springs National Park, Arkansas, 28.IX.63, B. C. Marshall collector; paratypes, 4 ♀♀, 1 ♂, same locality and collector, 16.IX.63, 28.IX.63, and 18.X.63; 4 ♂♂, Baton Rouge, Louisiana, IV.47 and 23.IV.57, light trap, W. W. Wirth collector. (USNM, No. 67424).

This species resembles *C. punctipennis* (Say) in wing pattern and spotting of legs although the spots are few and smaller; it resembles *C. albatus* Johnson in lacking dark spots between the scutal stripes, but *albatus* also lacks the leg spots and usually the dark setal spots on the sides of the abdomen. The dark spots of the legs are much stronger in *maculipes* than in the western *astictopus* Dyar and Knab, and the wing pattern is very different from *annulatus* Cook from Florida and Georgia.

Chaoborus albatus has been found from Minnesota to Quebec and Massachusetts south to Louisiana and Georgia, and also in Washington. *C. punctipennis* is found in southeastern Canada and probably throughout the United States. These two species and *maculipes* were collected at the same time in light traps in Baton Rouge.

THE IDENTITY OF COLPOCEPHALUM HOFFMANNI ZAVALETA
(MALLOPHAGA: MENOPONIDAE)

In a study of the *Colpocephalum* of the Galliformes (Price and Beer, 1964, Ann. Ent. Soc. Amer. 57: 391–402), *C. hoffmanni* was included as a *species sedis incertae* due to its reported type-host, *Oreophasis derbianus* G. R. Gray (Galliformes: Cracidae). Its described morphology was suspiciously divergent from the other galliform *Colpocephalum*, but no other action could then be taken without available specimens. Recently, however, through the courtesy of Dr. Leonila Vazquez, University of Mexico, I received a ♀ and 2♂♂ of Zavaleta's type-series of *C. hoffmanni* and placement of this species is now possible.

These specimens are morphologically closest to *Colpocephalum fregili* Denny of the Corvidae (Passeriformes) (see Price and Beer, 1965, Proc. Ent. Soc. Wash. 67: 7–14), agreeing in all features but the following: (1) margin of metanotum with 1 long, 4–7 short setae on each side, with median third devoid of setae; (2) ♀ without any anterior abdominal tergal setae; (3) each end of ventral anal fringe of ♀ with 4 conspicuously longer and heavier setae over twice length of adjacent setae; (4) ♂ with 1–9 anterior abdominal tergal setae on each of I–VIII, all setae very short, separated by at least own length from posterior margin of tergite; and (5) last tergite of ♂ same width but longer, 0.15–0.16 mm long vs. 0.11–0.14 ($\overline{X} = 0.12$) mm for *C. fregili*.

Zavaleta (1944, An. Inst. Biol. Mex. 15: 193–211) associates *Colpocephalum hoffmanni* with *O. derbianus* collected on 4 June 1943 (slide available to me indicates Chiapas as locality). In the same paper, she includes *Degeeriella illustris* (Kellogg), *Docophorus incisus* Kellogg, and *Menopon distinctum* Kellogg and Chapman for specimens supposedly from the corvid, *Calocitta formosa azurea* Nelson (Chiapas, 4 June 1943 for the first 2, and only June 1943 for the last). *Myrsidea chiapensis* Zavaleta is described from *O. derbianus* (Chiapas, June 1943) and *C. formosa azurea* (Chiapas, April 1942), the first host being in error. Therefore, it seems most likely that *Colpocephalum hoffmanni* is represented by specimens incorrectly ascribed to *O. derbianus*. The true host is postulated to be a corvid, perhaps *Calocitta formosa*, and *C. hoffmanni* should be considered as a recognizable species within the corvid *Colpocephalum*.—ROGER D. PRICE, *Department of Entomology, Fisheries, and Wildlife, University of Minnesota, St. Paul, Minnesota 55101.*

MASS FLIGHTS OF THE ELM SPANWORM MOTH, ENNOMOS SUBSIGNARIUS (HUBNER) IN THE SOUTHEASTERN UNITED STATES

HORACE O. LUND, *Department of Entomology, University of Georgia*

In the spring of 1954, populations of the elm spanworm, *Ennomos subsignarius* (Hubner), began to build up in the hardwoods on ridge tops in the North Georgia mountains (Drooz, 1960). In 1958, infestations occurred on over 500,000 acres in Georgia, North Carolina and Tennessee (Speers, 1958). In 1961, the outbreak in the Southern Appalachian Mountains covered an estimated one and one-half million acres of noticeable defoliation. (Anonymous, 1962).

In the mountains of North Georgia and North Carolina, the species passes the summer, fall, and winter as diapausing eggs which hatch in April and May as the leaf-eating spanworms. The adult moths emerge from the pupae in June. Rearings indicate that the sexes are produced in almost equal adult numbers (Hogan, 1959). Apparently very shortly after emergence begins in mid-June, large numbers of the moths take off on mass flights in various directions from the areas of heavy infestation. Broadwell (1908 and 1909) reported two mass flights in New York and New Jersey during July. In a sample of 200 moths captured in Newark, New Jersey, after a flight of 70 air miles from an area of infestation around Cook Falls, New York, he found that only four were females.

In 1958, large numbers of moths flew north, presumably from the nearest heavily infested areas in the southeast corner of Tennessee[1] to Knoxville (Speers, 1958), a distance of approximately 65 miles. At the same time, a flight carried them southeast to Athens, Georgia (about 60 miles from the nearest infestation near Dahlonega, Georgia), and south to Atlanta (about 65 miles). The white moths around the service station lights in Gainesville, Georgia, were described in newspaper accounts as resembling a dense snowstorm and the proprietors of several gasoline service stations were reported to have found it necessary to close down their businesses, because of the interference of the moths with clear vision. The moths appeared in Gainesville on June 16, in Commerce (15 miles farther southeast) on June 17 and in Athens (15 miles still farther south) on June 18. This would seem to indicate, then, that the moths flew about 15–20 miles per night.

In 1959, however, the moths were first noticed in Athens (60 miles S.E. of the heavily infested areas), Atlanta (60 miles S.W.) (Scott), and Macon (130 miles south) on the same night, June 14. Only a few moths were taken, however, so the main flight may have been

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[1] Data on areas of infestation were kindly provided by the U.S. Forest Service from their Forest Insect Survey Reports. Names following collection data are those of the persons contributing the information.

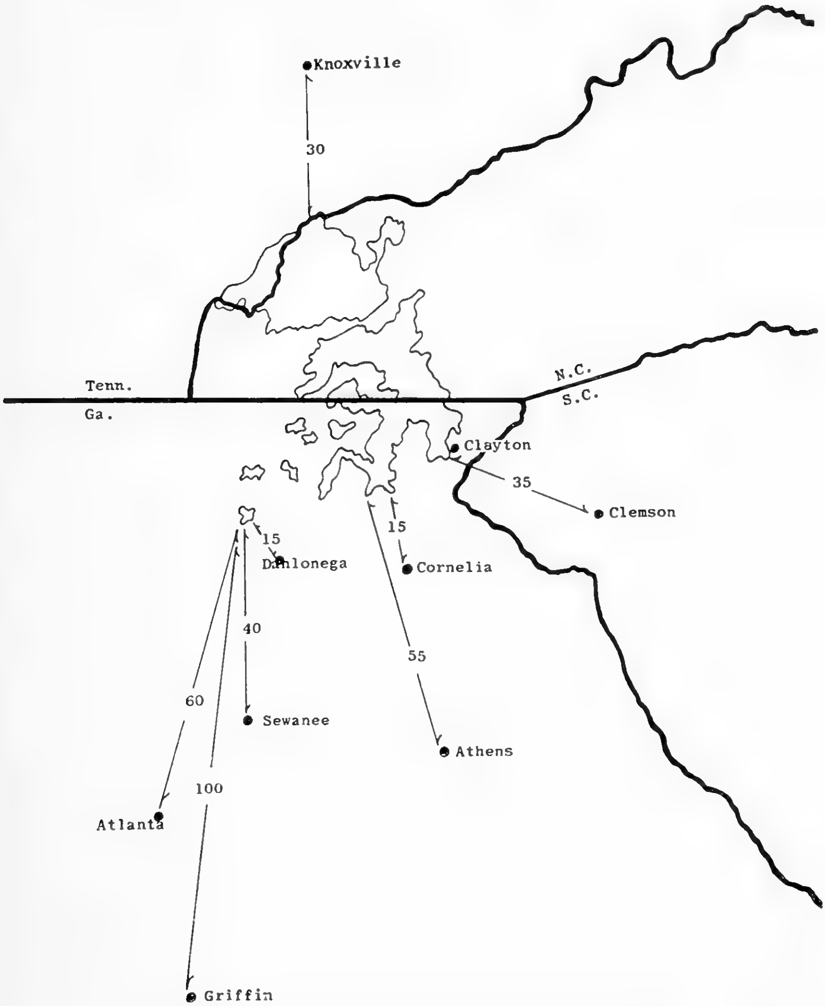

Fig. 1. Recorded flights of the elm spanworm in 1961.

missed. All the moths examined during 1958 and 1959 were males.

On June 29, 1960, however, 784 moths were caught in a light trap in Athens (60 miles S.E. of the nearest area of moderate to heavy infestation) and the catch included six females, all gravid. The following morning, 794 more moths were caught on shrubbery and one here also was a female (gravid). The following day, July 1, sixteen more moths were taken on shrubbery. These represented the last of the 1960 flight and all were males.

In 1961 (see figure), the peak population of moths was noticed (J.

F. Welsh) at Clayton, Georgia, on the margin of a center of moderate infestation on July 7 and they were nearly all scattered and gone by July 10–12. The first specimens were taken in a light trap at Clemson, South Carolina (35 miles S.E.) (J. H. Cochran) on June 25 and were captured "in numbers" on July 3. Forty-eight specimens were caught as late as July 17. The moths were first observed in small numbers in Knoxville, Tennessee (A. C. Cole), 30 miles north of a heavily infested area, on July 3. Peak numbers were seen on July 5 and 6 and three days later the flight had ended. Of 69 specimens collected, one was a gravid female. The 1961 flight appeared in great numbers in Cornelia, Georgia (15 miles south of an area of heavy defoliation), on July 6 (J. Ridley) and the next morning the "sidewalks were white with them." Nine males were collected, no females.

July 5–7, 1961, 209 moths were taken at Dahlonega, Georgia, only 10 to 15 miles from areas of moderate defoliation (H. B. Forrester). Only four were females.

On July 3 and 4, moths appeared in large numbers around the lights of a miniature golf course in Athens, Georgia, about 55 miles south of the nearest area of moderate infestation. Almost none were present on July 5, but they reappeared in large numbers again on July 8. Large numbers were collected in a light trap three miles from the golf course on July 3–4, but only one specimen subsequently (July 10). This would suggest that the second flight had a narrower front than the first. Of the 622 moths collected in Athens, two were females and only one of these was gravid.

On July 8, 20 male moths were collected (W. E. Blasingame) at Suwanee, Georgia, about 40 miles south of the nearest area of moderate to heavy defoliation, and the same night 36 males were collected in Atlanta, Georgia, 25 miles farther south (C. Scott). The following evening (July 9), the moths were reported as "very abundant" in Atlanta.

The longest flight recorded (J. Roberts) in 1961 was to Griffin, Georgia, where two males were caught on July 4 and eight on July 9. Griffin is about 100 miles south of the nearest area of moderate to heavy infestation.

The 1962 flights, both to Athens, Georgia, and to Clemson, South Carolina (F. McAlister), appear to have been both earlier and lighter than previous flights. Thirty-four adults were taken on June 21 and 29 adults on June 26 in Athens. Moths flew between these dates, but failure of the light trap to function prevented their capture. Two of the 63 moths were lightly gravid females.

Moths were collected at Clemson, South Carolina, from June 13 through July 7. Of the 120 moths collected, 88 were captured on or before June 25. Seven were gravid females.

Moths were again collected (J. Roberts) at Griffin, Georgia, on

June 22 and 25 (three males) and one male was collected at Asheville, on July 3 (G. Amman).

On December 28, 1961, a dead specimen of this species was found on the gravel drive of a camping area in Big Pine Key, Florida, at least 700 airline miles south of the infested areas in North Georgia. The specimen was dry and brittle but in good condition, unrubbed with all appendages intact. It seems incredible that it could have been carried several hundred miles on the radiator of a car and could have arrived in such perfect condition. It seems equally incredible that it could have flown or been blown such a distance.

Conclusions:

1. Mass flights of the elm spanworm, *Ennomos subsignarius* (Hubner) in the Southeastern U.S. occurred in late June and early July and apparently travelled in all directions (at least north, east and south) from the areas of infestation.
2. Observations in 1958 suggested that flight was at the rate of about 15–20 miles per night.
3. Of the 2,755 moths captured on their flights and examined, only 23 or 0.8 per cent were females, 22 of which were gravid. Unpublished studies by Tsao (personal communication, 1962) show the body fat of these moths to be only 2–3 per cent of the dry weight of the females but 20–30 per cent of the dry weight of males. This—and the greater body weight of the female moths—may account for the greater ability of the male moths to fly long distances. The low proportion of female moths taken even very close to areas of heavy infestation would suggest that these mass flights are not an effective means of dispersal of the species.
4. The longest flight recorded was 130 miles (from the infested areas in North Georgia to Macon in 1959).
5. No distant infestations of the caterpillars are known to the writer to have resulted from the eggs of the few long-flying females.
6. Evidence from the flights through Athens in 1961 suggests that more than one wave of moths may pass over an area in the same summer and that the width of the flight front may be quite narrow.

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NOTES ON AN ICHNEUMONID PARASITE (HYMENOPTERA) OF PARASA CONSOCIA (LEPIDOPTERA)

SETSUYA MOMOI, *Museum of Zoology, University of Michigan, Ann Arbor, Michigan and* KIICHIRO OKAMOTO, *Hyogo University of Agriculture, Hyogo, Japan*

This paper gives taxonomic and biological accounts of an ichneumonid parasite of *Parasa consocia* Walker, a moth that defoliates poplar in Japan.

This parasite, *nohirai* Uchida, was originally described in *Plectocryptus*, but it differs from the type-species *Plectocryptus digitatus* (Gmelin) in several important characters. These are: a shorter mandible with the upper tooth longer than the lower one, the areolet of the forewing being large and parallel-sided, and the dorsal valve of the ovipositor with transverse apical ridges. It differs also in several minor characters. Because there seems to be no real reason for placing this species in *Plectocryptus* a new genus is described herein with *nohirai* Uchida as type-species.

Biological investigation on this ichneumonid was done mainly in the fall of 1954 at Sasayama, Hyogo, Japan by Momoi and supplemental accounts were gathered in the fall of 1962 at the same place with the aid of Okamoto.

We are greatly indebted to Dr. Henry Townes of the American Entomological Institute and Miss Luella Walkley of U.S. National Museum for their kind suggestions and for reading the manuscript.

Litochila, genus novum

"Undescribed genus" Townes et Gupta, 1962. Mem. American Ent. Inst. 2: 6.

This genus belongs to the tribe Hemigasterini of the subfamily Gelinae. Judging from the shape of the mandible and the ovipositor tip, it is most closely related to *Mansa* and *Hemigaster* as noted by Townes and Gupta (1962) under the name of "undescribed genus from the eastern Palearctic." *Litochila* may be distinguished from them as well as the other genera of the tribe by the following combination of characters:

Mandible rather short, with lower tooth distinctly shorter than the upper. Clypeus weakly convex, large, its apical margin thin and straight. Flagellum cylindrical, broadened medially in ♀, the tyloids on male flagellum long-oval to linear, beginning on segments 12 to 15 and occurring on about 4 to 10 segments. Notaulus distinct. Sternaulus complete to posterior rim of mesopleurum and ending just below lower posterior angle of the pleurum. Propodeum short, the dorsal face distinctly set off from the posterodorsal face by a sharp angulation, and much shorter than the latter. Apophyses only weak crests. Propodeal spiracle elongate oval, about twice as long as wide. Areolet very large, pentagonal, parallel-sided, receiving second recurrent approximately at middle. Ovipositor straight, sagitate at apex, its dorsal valve with some distinct apical transverse ridges.

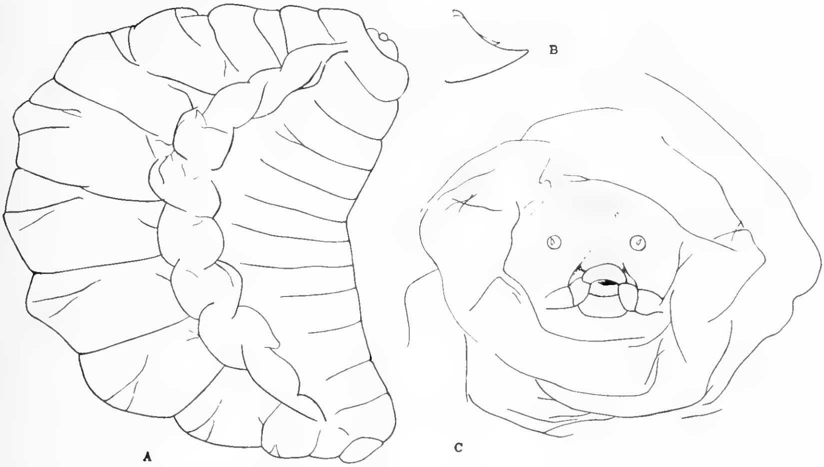


Fig. 1. *Litochila nohirai*, overwintering mature larva. A, whole body in side view; B, right mandible; C, face in frontal view.

Type-species: *Plectocryptus nohirai* Uchida

Three described species referable to this genus are: *Plectocryptus nohirai* Uchida, *Plectocryptus jezonicus* Uchida and *Cryptus carbonarius* Smith (= *Plectocryptus saitamensis* Uchida, **new synonymy**[1]). These species are new combinations in *Litochila*.

Litochila nohirai (Uchida)

Plectocryptus nohirai Uchida, 1930. Jour. Faculty Agr., Hokkaido Imp. Univ. 25: 324. ♂, ♀.

Redescription of the species from available material is as follows:

Body covered with golden hairs. Face and frons shagreened, with fine and very dense punctures. Temple and cheek dull in ♀, shiny in ♂, with fine dense punctures, the punctures becoming more dense on the upper portion, and on vertex. Malar space shagreened, without punctures. Clypeus shagreened basally, polished apically, with fine dense punctures except on its apico-median portion, its apical portion flattened and with no transverse impression along the apical margin. Frons with a nearly triangular impression just below median ocellus, its antennal scrobe concave and rugose. Flagellum 34 to 38-segmented, with tyloids on segments 13 to 22 of ♂. Mesoscutum mat in ♀, polished in ♂, with fine and very dense punctures. Scutellum weakly convex, weakly narrowed backwards, with a lateral carina at extreme base. Mesopleurum of ♀ rugose and rugose-punctate, the sculpture becoming somewhat coarser and reticulate below speculum and being replaced with weak punctures before speculum. Meso-

[1] I am indebted to Dr. H. Townes who confirmed this synonymy by comparing representatives of *saitamensis* with the type of *carbonarius* at the British Museum (Nat. Hist.) in London.

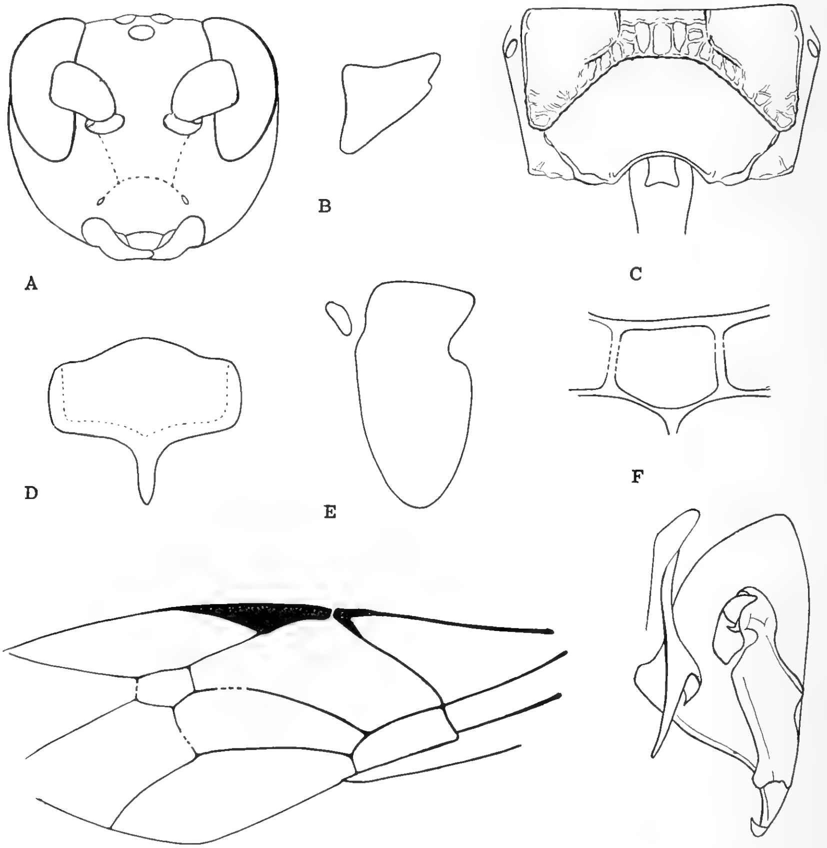


Fig. 2. *Litochila nohirai*, adult. A, head in frontal view; B, right mandible; C, propodeum in dorsal view; D, ♂ subgenital plate; E, ♂ postgenital plate; F, areolet of forewing; G, part of forewing; H, right half of ♂ genitalia.

pleurum of ♂ essentially similar to that of ♀ but much less strongly sculptured, with an unsculptured area just before speculum. Metapleurum reticulate-rugose. Propodeum finely reticulate-rugose, the first lateral area densely punctate rather than reticulate-rugose. Areola usually with four longitudinal rugae. Basal area strongly transverse, smooth. Tergites polished, with fine, very dense punctures. Postpetiole with a distinct unsculptured median area at apex. Tergite 2 with no median unsculptured area. Nervellus broken at lower 0.2. Ovipositor sheath about 0.4 as long as forewing. Forewing of ♀ ca. 12 to 15 mm., of ♂ ca. 10 to 13 mm.

♀. Black. Palpi, mandible except teeth, clypeus apically, a small spot on orbit of vertex, tegula, subtegular ridge, apical half of tergites 1 and 2, and greater part of tergite 8, reddish brown. Tergite 3 with a reddish brown postmedian transverse band. Face with a small reddish tinge along orbit near antennal socket. Lateral crests of propodeum, reddish. Ovipositor sheath yellow at apex. Antenna reddish brown, paler toward apex, the segments beyond 13 black. Legs reddish brown. Hind and middle coxae black; fore coxa usually black or nearly so; wings tinged with yellow.

♂. Black. Palpi, mandible, clypeus, face, cheek, frontal orbit to top of head, pronotum along anterior margin, humeral angle, tegula, scutellum, propodeum in greater part, tergite 1 except base, and apical half of tergites 2 and 3, reddish brown. Antenna reddish brown, the flagellar segments beyond 13 or 14 black. Legs reddish brown. Fore and middle coxae blackish in part. Hind coxa black with a reddish brown mark of variable extent. Wing tinged with yellow.

Specimens examined: Numerous ♂, ♀, reared from *Parasa consocia* in 1954 and 1962 at Sasayama, Hyogo, Japan.

Distribution: This species occurs in Japan on Honshu and Shikoku islands, in Korea and in northern China.

Litochila nohirai may be distinguished from the other congeneric species by the following key:

1. Body covered with golden hairs; wing tinged with yellow; scutellum, postscutellum and apical half of tergite 2 reddish brown; clypeus flat apically, with no preapical transverse impression; ♀ : Mesoscutum strongly mat between dense punctures; tergite 2 with no unsculptured area. ♂ : Tyloids on approximately 10 median flagellar segments; face and hind tarsus reddish brown throughout .... **nohirai** (Uchida)
   Body covered with fuscous to black hairs. Wing hyaline. Scutellum, postscutellum and tergite 2 completely black. Clypeus with a distinct preapical transverse impression and its apical margin more or less reflexed 2
2. Face black with white orbital area. ♀: Mesoscutum strongly mat between dense punctures. Tergite 2 with no unsculptured area. ♂: Tyloids on approximately 7 median flagellar segments. Hind tarsus black throughout .... **jezonica** (Uchida)
   Face completely black. ♀ : Mesoscutum polished between dense punctures. Tergite 2 with a large unsculptured area medially. ♂ : Tyloids on approximately 4 median flagellar segments. Hind tarsus black, with a white median ring .... **carbonaria** (Smith)

Bionomics

Litochila nohirai is a solitary ectoparasite. It attacks larvae of *Parasa consocia* in the overwintering cocoon stage parasitizing a high percentage of them. The host insect is one of the serious defoliating pests of poplar in the Kinki district of Japan. According to our own observation it seems to have only one generation a year, hibernating in the larval stage within its cocoon on the ground near the host plant.

Parasitization and general behavior.—In the summer and the early fall of the years 1954 and 1962, a total of 263 cocoons of *Parasa consocia* were collected on the campus of the Hyogo University of Agriculture.

Of these cocoons, 113 contained larvae of *nohirai*; 45 contained larvae of the host dead in their mature stage; and only 105 contained living mature larvae of the host. The percentage of parasitism by the ichneumonid thus averaged 46.8% in these years. The number of the cocoons collected and their contents are as follows:

	1954	1962	Total
No. cocoons collected	54	209	263
No. cocoons containing living *consocia* larva	3	102	105
No. cocoons containing dead *consocia* larva	20	25	45
No. cocoons containing living *nohirai* larva	31	82	113

The ichneumonid larvae pupated from middle to late October, and adults emerged from the cocoons from early to middle November. The emergence of adults from the collected cocoons are as follows:

	1954	1962	Total
No. adults emerged	28 ♂♀	21 ♂, 32 ♀	81 ♂♀
No. larvae or pupae died	2	25	27
No. living larvae	1	4	5

From 113 parasitized cocoons only 81 ichneumonids emerged; the other larvae or pupae died of disease or by accident except 5 which were still in the larval stage after the other larvae had become adults. Of the 53 adults that emerged from the cocoons in the fall of 1962, 32 were females. We fed the ichneumonid females with diluted honey. Some of them lived more than one month, until the middle of December, in captivity. Without mating they oviposited in cocoons containing hibernating larvae of *Parasa consocia* given them nearly one month after their emergence, paralyzing the host larvae by penetrating the host cocoons with the ovipositor. Eggs were laid loosely on the host larva or between the host body and the cocoon wall. About 6 to 8 days after the deposition of the egg, the first instar larva eclosed. It fed externally on the paralyzed host larva and grew very slowly. When its prey had been sucked, the parasite larva spun a large oval cocoon inside the host cocoon, discharged a dark brown meconium at the bottom of the cocoon, and rested in the cocoon until the fall of the next year.

Egg-laying habits.—Egg-laying habits were observed in a small glass cylinder of about 10 cm in diameter. When host cocoons were put into the vessel with females of the ichneumonid that had been kept alive for a long time after emergence, each female soon showed interest in a cocoon, walking about on it tapping it with her antennal tips and raising her abdomen and curving it strongly downwards the ovipositor with its sheath stretched straight under her body. When a suitable point was found, she made a serious effort to penetrate the cocoon with the ovipositor, roundly turning the ovipositor and stress-ing her body again and again toward the host cocoon. At first the sheath enclosed the ovipositor but when the tip of the ovipositor penetrated the cocoon wall, the sheaths curved gradually away, leaving only the ovipositor tip at the working point, and at last curled backward. The female keeping her ovipositor in the small hole she had made inserted it farther inward twice or thrice. In three instances the time spent to oviposit in a single host was about 50 to 60 minutes. In general, only a single egg was deposited in a host cocoon, although it was not rare to find two or three, or sometimes four or five eggs on a single host. In each case, only a single ichneumonid larva remained alive. On December 2 and 3 of 1954, five eggs were deposited on a host larva by a female. Six days later, we found the young larva that first eclosed devouring the other eggs laid by the same mother wasp.

On December 4 of 1954, we put two cocoons of *Parasa consocia*, each containing a mature larva of *Litochila nohirai*, into a vessel with a female of the ichneumonid that had emerged on November 9 of 1954. After two days, we found three eggs on one of the ichneumonid larvae. The larva was not paralyzed at all.

Egg, larva and cocoon.—The egg is spindle-shaped, glossy and lemon yellow in color, measuring about 2.3 to 2.5 mm in length and about 0.5 to 0.8 mm in width across the broadest section. The first instar larva is of the vesicle-bearing form with distinct antennae, lemon yellow in ground color with the cephalic and caudal segments white. The final instar larva is of a normal form for ectoparasitic Hymenoptera, and is also glossy and of lemon yellow color. Each of dorsal segments 1 to 10 has a transverse median swelling, those of segments 3 to 9 composed of numerous small rugulae. The mandible has a small tooth and inconspicuous pectination on the inner side of the blade. The antenna is subconical and distinct. On the upper side of the face there is a pair of fuscous spots. The cocoon is composed of a few thin layers, of which the outer one is dark brown and the rest almost white. In general form, the cocoon is short ovoid and in its greater part is attached to the inner side of the host cocoon. Between the walls of the host and parasite cocoons are found always the host remains. The caudal end of the parasite cocoon contains a brown meconium.

Parasa consocia Walker (Heterogeneidae) is the only host known

STUDIES ON IDIOCERINAE LEAFHOPPERS: III. ON SINGH-PRUTHI'S INDIAN SPECIES OF IDIOCERUS

(HOMOPTERA, CICADELLIDAE)

JENARO MALDONADO-CAPRILES, *College of Agriculture & Mechanic Arts, Mayagüez, Puerto Rico*

Thanks to the courtesy of Mr. K. S. Pradhan, Superintending Zoologist, Zoological Survey of India, Calcutta, I was able to study paratypes of *Idiocerus bimaculatus* Singh-Pruthi and *I. confuscous* Singh-Pruthi. The study of the genitalia of both species indicates that they should be transferred to *Idioscopus* Baker.

In my paper (Maldonado: 1964) I redescribed *Idioscopus* and said "aedeagus elongate, curved, with four (two long and two short) apical filaments." In order to include *I. bimaculatus* this character is herein modified as follows: aedeagus with two or four preapical filaments.

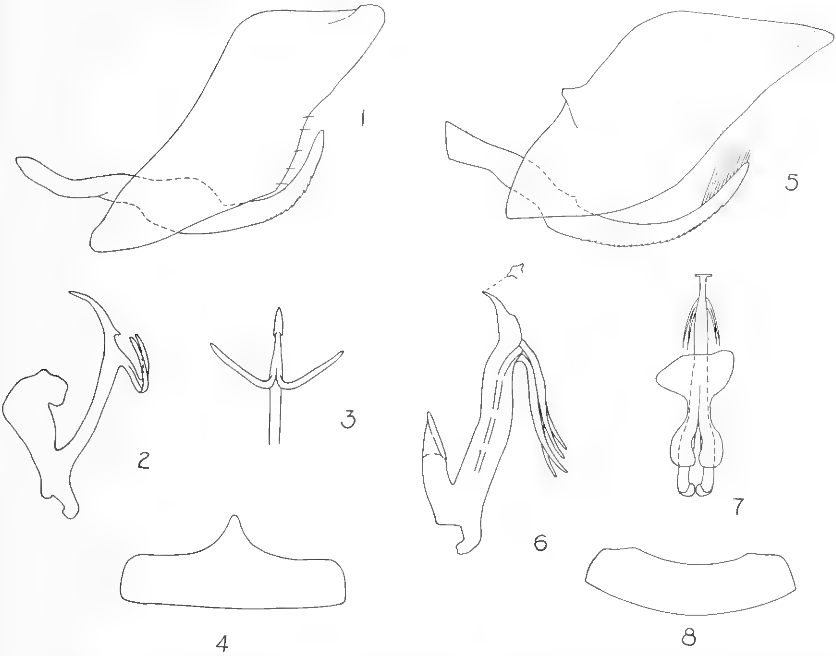
Examination of two specimens each of the type series of both abovementioned species shows that Pruthi switched the drawings and consequently the descriptions of the genitalia. Text figure 117b of his paper (Singh-Pruthi, 1936) illustrates the genitalia of *I. confuscous* and not *I. bimaculatus* as stated, and text figure 118 illustrates the genitalia of *I. bimaculatus* and not of *I. confuscous*. The descriptions of the genitalia, on pages 103 and 104, correspond to the mixed-up drawings and thus have to be interchanged.

Idioscopus bimaculatus (Singh-Pruthi) **n. comb.**

Idiocerus bimaculatus Singh-Pruthi 1936: 102.

Singh-Pruthi's description follows: "Pale yellow, yellow or pale brown (old specimens). Vertex short, about six times as broad as long in the middle, smooth, medially finely sulcate. Eyes small, chestnut brown. Face pale, convex, slightly longer than broad, frons fairly raised, clypeus large, broader in the apical region; lorae conspicuous; genae comparatively narrow. Ocelli shining and conspicuous; tip of the proboscis marked with black. Pronotum three times the length of the vertex, smooth, without any markings; the anterior and posterior margins slightly convex and concave respectively. Scutellum almost as long as the pronotum, transversely deeply impressed in middle, with a large black round marking near each basal angle. Tegmina much longer than the body in both sexes, transparent except in the region of the clavus where they are more deeply coloured and opaque; veins distinct but inconspicuous, only three apical and one ante-apical cells. Wings transparent, whitish, nervures distinct. Posterior tibiae thickly spinulose; all tarsi black."

Male genitalia as in figures 1 to 4; aedeagus with one pair of stiff abruptly bent cephalad preapical filaments. Drawn from specimen No.



Idioscopus bimaculatus (Singh-Pruthi) male. 1, style and pygofer, lateral view; 2, aedeagus, lateral view; 3, tip of aedeagus, caudal view; 4, valve. *Idioscopus confuscous* (Singh-Pruthi), male, 5, style and pygofer, lateral view; 6, aedeagus, lateral view; 7, aedeagus, cephalad view; 8, valve.

5527/H7 6,000 ft., Almora District, Kumaon, U. P., May 1930, H. S. Pruthi collector.

In my key (1964) to other Indian species of *Idioscopus* this species runs to *I. scutellatus*. These can be separated as follows:

Aedeagus with two preapical filaments, style with lower margin serrate .... **I. bimaculatus** (Singh-Pruthi)

Aedeagus with four preapical filaments, style with lower margin smooth .... **I. scutellatus** (Distant)

Idioscopus confuscous (Singh-Pruthi) **n. comb.**

Idiocerus confuscous Pruthi 1936: 104.

Singh-Pruthi's description follows: "Vertex short, about eight times as broad as long in middle, medially deeply sulcate at base, anteriorly broadly rounded, ochraceous, with a conspicuous minute black dot near each eye, the two dots connected by an irregular dark grey stripe in some specimens. Eyes small, dark grey. Face ochraceous, with brownish patches in the lateral regions of frons. Ocelli colourless, rather inconspicuous. Pronotum dark ochraceous, diffused with piceous markings near eyes, about three times as long as vertex. Scutellum about as long as pronotum, ochraceous, with a large angular dark brown or piceous spot near each basal angle. Tegmina long, much longer than the body in both sexes, semitransparent, castaneous; veins dark brown and conspicuous. Abdomen black on dorsal side in both sexes, ventrally brown in the female and marked with extensive black patches in the male. Legs brown, long; posterior tibiae thickly spinulose."

Male genitalia as in figures 5 to 8; aedeagus with four preapical filaments. Drawn from specimen No. 5530/H7, Almora District, Kumaon, U. P., May 1930, H. S. Pruthi collector.

In the above-mentioned key this species runs to *I. clypealis* because of the small dot near each eye. These can be separated as follows:

With two minute dots high on the face, one near each eye .... **I. confuscous** (Singh-Pruthi)

With two large black spots on the vertex .. **I. clypealis** (Lethierry)

Discussion: Of a total of 12 species previously assigned to *Idiocerus* and reported as found in India and the Philippine Islands I have transferred nine to other genera, namely, *Balocha astuta* (Melichar), *Idioscopus atkinsoni* (Lethierry), *I. clypealis* (Lethierry), *I. fasciolatus* (Distant), *I. incertus* (Baker), *I. niveosparsus* (Lethierry), *I. scutellatus* (Distant), *I. confuscous* (Singh-Pruthi), and *I. bimaculatus* (Singh-Pruthi). I have not been able to study specimens of the remaining three, namely, *Idiocerus unimaculatus* Melichar, *I. subopacus* Motschulsky, and *I. nagpurensis* Singh-Pruthi. Judging by the descriptions in Distant (1908:188) and Singh-Pruthi (1930:17) these species do not belong in *Idiocerus*, but probably in *Idioscopus*. I think that it will be safe to make the statement that the genus *Idiocerus*, as known for the Holarctic Region, does not occur in the Oriental Region.

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ON A SMALL COLLECTION OF FLEAS FROM TURKEY (SIPHONAPTERA)[1]

ROBERT E. LEWIS *and* JOANNE H. LEWIS, *American University of Beirut, Beirut, Lebanon*

During a brief visit to Turkey in late June of 1963, it was possible to make limited collections of the small mammals and their fleas. These, plus a few specimens taken by Mrs. Gerald Miller, lately of Samsun, constitute some interesting records of fleas from a country of which the fauna is very poorly known.

In the past there seems to have been some confusion concerning localities in Turkey. The majority of the localities listed below are self-explanatory. The term Gölü means lake in Turkish. Thus, the collections from Abant and Tuz were taken near these two lakes. Geleman State Farm is an experimental farm situated 18 km. east of Samsun in the coastal plain of the Black Sea. The remaining two collections came from within the respective cities.

The following is a brief annotated list of the twelve species collected during our visit. Unless otherwise noted collections were made by the authors.

Pulex irritans Linnaeus 1758

Amasya, Amasya Prov., ex author, 1 ♂, June 23, 1963

Judging from the number of bites received during our visit, this species is certainly more common in the country than our single record indicates.

Hystrichopsylla talpae orientalis Smit 1956

Abant Gölü, Bolu Prov., ex *Apodemus sylvaticus*, 1 ♂, June 26, 1963

This specimen came from the mixed forest on the banks of Lake Abant in what Neuhäuser (1936) calls the Pontic Mountain biological province. The region is very southeast European in its flora and, as the following records show, in at least parts of its fauna.

Neopsylla setosa spinea Rothschild 1915

40 km. W. Ankara, Ankara Prov., ex *Citellus citellus xanthoprymnus*, 1 ♂, June 29, 1963

The host is a typical steppe animal which abounds throughout the Middle Anatolian high steppe of Neuhäuser (1936). The flea certainly must be common earlier in the year and perhaps even in late June. Lack of time and equipment did not permit the excavation of nests.

Ctenophthalmus proximus (Wagner 1903)

Abant Gölü, Bolu Prov., ex *Apodemus sylvaticus*, 2 ♂ and 3 ♀, June 26, 1963; 1 ♂ and 1 ♀, June 27, 1963

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[1] Publication number 9 of the American University of Beirut Museum of Natural History.

These specimens do not agree completely with specimens from the Caucasus in the British Museum (Natural History) collection of fleas. Larger series are needed before specific affinities may be accurately determined. The species appears to be an ectoparasite of forest rodents.

Ctenophthalmus bifidatus Smit 1960

Abant Gölü, Bolu Prov., ex *Microtus arvalis*, 1 ♂, June 25, 1963; ex *Clethrionomys glareolus*, 1 ♂ and 2 ♀, June 27, 1963; ex *Apodemus sylvaticus*, 4 ♀, June 26–27, 1963

Abant is the type locality of this species and it has only been taken from this area. A single male was taken from the moist, grassy area near the lake while the remaining specimens came from the surrounding mixed coniferous-deciduous forest. Judging from this collection, plus the records from the type series, it is mainly an ectoparasite of forest rodents.

Ctenophthalmus congener asiaticus Argyropulo 1935

Abant Gölü, Bolu Prov., ex *Microtus arvalis*, 4 ♂ and 7 ♀, June 25, 1963; ex *Microtus guentheri*, 4 ♂ and 5 ♀, June 26, 1963; ex *Apodemus sylvaticus*, 1 ♂ and 1 ♀, June 26, 1963; ex *Pitymys* [*Clethrionomys*?], 1 ♀, June 27, 1963

The nine males and fourteen females of this series agree in all respects with paratype specimens from Azerbaydzhan in the British Museum (Natural History) collection at Tring, as well as with material from the same locality collected by Hoogstraal in August of 1953. They further resemble specimens from the Republic of Lebanon with which they are surely conspecific. The range of the subspecies thus includes not only Asia Minor and parts of the Caucasus but the Lebanon Mountains as well. It is the most frequent ectoparasite of microtine rodents in this area, occurring both in forested and unforested locales.

Ctenophthalmus parvus Argyropulo 1935

Geleman State Farm, 18 km. E. Samsun, Samsun Prov., ex *Microtus arvalis*, 1 ♂ and 2 ♀, Feb. 22, 1962 and March 1, 1962 (L. Miller)

While the modified genital segments of the single male in this collection do not agree completely with material from the Caucasus, additional specimens are needed before the degree of individual variation in this species can be determined. In the meantime I prefer to refer these specimens to this species.

Amphipsylla rossica Wagner 1912

Abant Gölü, Bolu Prov., ex *Microtus arvalis*, 1 ♂ and 2 ♀, June 25, 1963

Microtus arvalis seemed to be restricted to the low, moist area around the margin of the lake. Here the ground cover consisted of various species of grass, sedges and annual herbs, and rodent runways were numerous.

Citellophilus simplex (Wagner 1902)

40 km. W. Ankara, Ankara Prov., ex *C. citellus xanthoprymnus*, 2 ♂ and 2 ♀, June 29, 1963; Tuz Gölü (100 km. S.E. Ankara), Ankara Prov., ex *C. citellus xanthoprymnus*, 3 ♀, June 30, 1963

Excluding the animal from Tuz Gölü the hosts were trapped with large snap-traps. Traps were checked every half hour and the catch was placed in plastic bags. The fur of the host is so short that even brief exposure to sunlight apparently causes the fleas to leave the body. Thus the incidence of fleas was low. The specimen from Tuz Gölü was picked up as soon as it was killed and possessed three fleas. Doubtless the flea is a common parasite of *Citellus* in the spring and may be so throughout the year. Excavation of the nests and burrows of this host should be most rewarding.

Megabothris turbidus (Rothschild 1909)

Abant Gölü, Bolu Prov., ex *Apodemus sylvaticus*, 2 ♂ and 1 ♀, June 26, 1963; ex *Microtus guentheri*, 1 ♀, June 26, 1963; ex *Clethrionomys glareolus*, 1 ♀, June 27, 1963

A typical small-rodent flea, this species is found throughout Europe and western Asia. It has not, to my knowledge, been reported from Turkey and Peus (1954, 1958) makes no mention of it from Greece. Additional collecting will probably show it to be a common species in Turkey where satisfactory ecological conditions prevail.

Nosopsyllus (Nosopsyllus) fasciatus (Bosc 1800)

Samsun, Samsun Prov., ex *Rattus rattus*, 1 ♂, Feb. 26, 1962 (L. Miller)

This species was certainly to be expected since Samsun is a port city and apparently both *R. rattus* and *R. norvegicus* are common there.

Ceratophyllus hirundinis hirundinis (Curtis 1826)

Abant Gölü, Bolu Prov., ex nest of *Delichon urbica*, 29 ♂ and 34 ♀, June 26, 1963

This common species occurred in the nests of the House Martin, over one hundred of which were plastered under the eaves of one of the large wooden hotels. All of the males were carefully examined but none of them resembled *C. hirundinis oiticus* Peus, 1954 from Greece.

Certainly additional collecting in this interesting country is indicated and mammalogists who happen to be working in the area should take advantage of their opportunities to contribute not only to their own field, but to entomology as well, by collecting ectoparasites. Detailed collection and preservation instructions are available upon request.

The authors wish to acknowledge the services of Mrs. G. Miller in collecting material from Samsun and those of Mr. F. G. A. M. Smit in confirming our identifications as well as assisting in the more difficult determinations. We further thank the Trustees of the British Museum (Natural History) for permission to study specimens in the Tring collection of fleas.

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BOOK REVIEW

Monographie der Scarabaeidae und Aphodiidae der palaearktischen und orientalischen Region (Coleoptera: Lamellicornia). Vol. 3, by Vladimir Balthasar. Verlag der Tschechoslowakischen Akademie der Wissenschaften, Prague. Vol. 3, pp. 1–652, 224 figs., 2 plates, 1964.

This third volume, continuing the systematic treatment presented in the greater part of the first volume and all of the second, is devoted entirely to the Aphodiidae (See review of first two volumes—Proc. Wash. Ent. Soc., vol. 67, no. 1, p. 62).

Here again, Dr. Balthasar follows a few others of recent date in elevating a generally recognized subfamily of the Scarabaeidae to full family rank. I see no justification, and none is given, for such unnecessary proliferation and elevation of groups much better retained in a single recognized family. Surprisingly in this case he omits a subfamily classification and reverts to tribes, adding two to those usually recognized. *Aphodius*, one of 15 genera he places in Aphodiini, is organized into 64 subgenera to cover this enormous, unwieldy and difficult assemblage of species.

As in the first two volumes, there is ample evidence of the rejection of or unfamiliarity with recent work of others in the Scarabaeidae. For instance the genus name *Psammobius* Heer (1841) he uses has been shown at least three times by other authors to have been preceded by *Psammodius* Fallén (1807). And as previously pointed out, Jerath, Ritcher, and Landin have all shown his family "Aegialidae" (vol. I, p. 131) really includes aphodiine beetles, which therefore should have been included and discussed in this third volume.

Despite the errors, omissions, and disregard of the work of other authors, Dr. Balthasar has written an extremely valuable and useful volume in the "Aphodiidae." He is to be congratulated on completing a major important contribution in bringing together so much information and in constructing keys to the enormous numbers of species found in a very large, relatively unknown area of the world.—O. L. Cartwright, *Curator, Division of Coleoptera, Department of Entomology, U.S. National Museum, Smithsonian Institution.*

ADDITIONAL RECORDS OF PHLEBOTOMUS TEXANUS
(DIPTERA: PSYCHODIDAE)

R. B. EADS, H. A. TREVINO *and* E. G. CAMPOS, *Public Health Service, Quarantine Station, U.S. Department of Health, Education and Welfare, Brownsville, Texas*

The genus *Phlebotomus* is of interest throughout the world, since many species attack man and other warm-blooded animals—causing annoyance, allergic reactions, and transmitting such diverse disease-producing organisms as the virus of phlebotomus fever and the *Leishmania* of kalar-azar. A majority of the species in the Western Hemisphere are confined to the tropics, with only 10 forms known to occur in the United States, primarily along the southern border. They are *Phlebotomus vexator* Coquillett, *P. v. occidentis, P. shannoni* Dyar, *P. diabolicus* Hall, *P. texanus* Dampf, *P. stewarti* Mangabeira and Galindo, *P. anthophorus* Addis, *P. californicus* Fairchild and Hertig, *P. aquilonius* Fairchild and Harwood and *P. oppidanus* Dampf.

P. texanus was described from specimens collected from the nest of the leaf-cutting ant, *Atta texana*, near San Antonio, Texas, December 20, 1934. To our knowledge, there has been no additional report of this sand fly in the United States, although Vargas and Díaz Nájera (1953) have recorded it from the Mexican States of Tamaulipas, Guerrero, Morelos, Oaxaca and Jalisco.

P. texanus have been taken in two additional Texas localities, Brownsville and Del Rio, in New Jersey light traps operated along the U.S.–Mexican border in connection with vector surveillance activities. A trap located at a nursery just outside the Brownsville city limits took a male in February 1963 and specimens have been recovered each subsequent month through March 1964, as shown in the table. A total of 211, 117 females and 94 males, were taken during this period.

In Del Rio, the light trap is located at the Quarantine Station, adjacent to the International Bridge. Ninety-one female and three male *P. texanus* were recovered in October 1963 and 54 females and three males were taken in November, together with numerous *P. diabolicus*. This trap was not operated during the summer of 1963; consequently, the initial recovery date has no seasonal significance. However, it was run continuously in December 1963 through February 1964, and no *Phlebotomus* were taken. This suggests that the adults of *P. texanus* are not active throughout the winter months in Del Rio, as they are in the vicinity of Brownsville.

The relationship of *P. texanus* and the leaf-cutting ant remains to be clarified. Although the type specimens were taken in one of these ant nests, the recovery was in December, and the sand flies may have been merely seeking shelter from the cold. The nursery near Browns-

Table. *Phlebotomus texanus* taken by a light trap operated in Cameron County, Texas

Month	No. Taken	Female	Male
February 1963	1		1
March	3	2	1
April	6	6	
May	15	7	8
June	22	9	13
July	9	3	6
August	15	7	8
September	24	12	12
October	19	14	5
November	29	12	17
December	6	3	3
January 1964	14	10	4
February	31	21	10
March	17	11	6
Total	211	117	94

ville, at which the *P. texanus* were taken, is adjacent to a wildlife refuge with a fairly dense stand of native thorn scrub. *Atta texana* nests have been found to be prevalent in the sandy soil of the refuge and in fields near the nursery greenhouses, formerly in cultivation. Light traps operated around Brownsville in areas in which the leaf-cutting ant nests are not in evidence have never taken *P. texanus*.

We have excavated a number of the leaf-cutting ant nests but have discovered neither adult nor larval *Phlebotomus* in them. Emergence cages placed over openings to the ant nests have been equally unsuccessful in taking adult sand flies. We have not been able to collect adults in cone traps baited with different kinds of warm-blooded animals, or from our persons during the day or night. Continued efforts will be made to determine the sites of larval development and adult feeding habits. None of the *P. texanus* taken at Del Rio or Brownsville were engorged with red blood cells, although gravid specimens were occasionally encountered.

Dr. Alan Stone, U.S. National Museum, kindly read this note and provided data concerning the species of *Phlebotomus* recorded from the United States.

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APHIDS ON A ROOFTOP—1963

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During 1962 the writer kept a Moericke trap on the roof of his 10-story apartment house in Washington, D.C. The location of the building and the nature of the surrounding area, with a list of the aphids caught in the trap, are given in a paper published in 1964[1]. During an exposure of 118 days, between May 4 and October 18, nearly 1000 winged aphids were collected representing 50 species.

In an effort to repeat the experiment in 1963, the same trap was placed in the same place starting May 5 and ending October 12. However, owing to my absences, the total exposure was only 59 days. The periods of exposure were May 5–7 and 23–31, June 1–18, July 1–22, and October 8–11. A total of about 250 aphids were caught, representing 40 species specifically determined and 3 named only to genus. Nine of the species had not come to the trap in 1962 and one of them, *Chaitophorus nigra* subsp. *tranaphoides* Hille Ris Lambers, was not previously known to occur in the District of Columbia and vicinity. Only 25% as many aphids were caught in about 40% of the time as in 1962.

The most striking difference between catches in the two years was the number of oak aphids. Seven of the 8 species appearing in 1962 were also caught in 1963, but they totaled only about 100 specimens while in 1962 there were about 500. *Myzocallis punctata* (Monell), the most abundant species in 1962, with a total of 245 specimens, showed only 10 in 1963. In making the determinations for 1963, however, Dr. Tissot called my attention to the intergrading of specimens of *Myzocallis alhambra* Davidson and *M. punctata* (Monell), and stated that Dr. R. W. Richards of the Canadian Department of Agriculture believes *alhambra* may be simply a melanistic form of *punctata*.

The aphids, the number caught, and month in which they appeared, are as follows: *Aphis* sp., 4 May–July; *A. craccivora* Koch, 2 July; *A. fabae* Scopoli, 1 June; *A. gossypii* Glover, 12 May, 1 June; *A. spiraecola* Patch, 2 June; [2]*Brachycaudus middletonii* (Thomas), 14 May–July; *B. rumexicolens* (Patch), 6 May–June; *Brevicoryne brassicae* (Linnaeus), 3 Oct.; [2]*Calaphis betulaecolens* (Fitch), 1 July; *C. betulella* Walsh, 5 May–3 July; [2]*Capitophorus elaeagani* Del Guercio, 1

[1] In this paper, I stated, "No trap has been operated elsewhere in such a location as far as I know." In acknowledging receipt of my reprint, Dr. Otto Böhm, Bundesanstalt für Pflanzenschutz, Vienna, called my attention to his 1960 paper (Pflanzenschutz Berichte 25: 107–108) in which he reported that large numbers of aphids were caught in 1957 in four yellow dishes exposed on the outside of two windows of an apartment house, about 75 feet above street level in the densely built-up center of Vienna. Dr. Böhm died suddenly in mid-January of 1965.

[2] Not found in the trap in 1962.

Oct.; [2]*Chaitophorus nigrae* subsp. *tranaphoides* Hille Ris Lambers, 1 Oct.; *Drepanaphis acerifolii* (Thomas), 1 June; *D. carolinensis* Smith, 4 May–July; [2]*Eriosoma americana* (Riley), 1 May; *E. lanigerum* (Hausmann), 1 May; *Euceraphis mucida* (Fitch), 2 July; [2]*E. punctipennis* (Zetterstedt) (= *betulae* (Koch)), 1 July; *Hyadaphis pseudobrassicae* (Davis), 5 May; *Hyalopterus atriplicis* (Linnaeus), 8 May–July; [2]*Hysteroneura setariae* (Thomas), 1 Oct.; *Melanocallis caryaefoliae* (Davis), 14 May, 4 June; *Monellia* sp., 2 June–July; *Myzocallis* sp., 1 May, 1 ♂ Oct.; *M. alhambra* Davidson, 9 May, 24 June, 6 July; *M. discolor* (Monell), 51 May, June, July; *M. exultans* Boudreaux & Tissot, 16 June, July; *M. granovskyi* Boudreaux & Tissot, 1 June; [2]*M. kahawaluokalani* Kirkaldy, 2 July; *M. multisetis* Boudreaux & Tissot, 5 May, 1 June, 2 Oct.; *M. punctata* (Monell), 10 May; *M. tiliae* (Linnaeus), 1 July; *M. walshii* (Monell), 6 May, 1 June, 22 July; *Myzus persicae* (Sulzer), 7 May, 15 June, 1 July; [2]*Nasonovia ribisnigri* (Mosley), 1 May; *Neosymydobius annulatus* (Monell), 3 May; *Pleotrichophorus glandulosus* (Koch) (formerly in *Capitophorus*), 2 May; *Prociphilus* sp., 2 Oct.; *Rhopalosiphum maidis* (Fitch), 1 July; *Schizaphis graminum* (Rondani), 1 July; *Sipha flava* (Forbes), 1 Oct.; *Tuberculatus punctatella* (Fitch), 1 July; *T. ulmifolii* (Monell), 1 May, 13 June, 3 July, 2 ♂♂ Oct.

In the 1964 paper *punctatella* (Fitch) and *ulmifolii* (Monell) were put in *Myzocallis.* They are here placed in *Tuberculatus.* In determining my specimens as *Brachycaudus middletonii* (Thomas), Tissot and Pepper say that the aphid to which this name is applied belongs to the genus *Brachycaudus*, but that there is a question as to whether *middletonii* is the same as *maidiradicis* (Forbes). The species *rumexicolens* (Patch) also is placed in *Brachycaudus* following Tissot and Pepper.

My thanks are extended to A. N. Tissot of the University of Florida and to J. O. Pepper of Pennsylvania State University for the determination of most of the aphids recorded in this paper, and to Louise M. Russell, Entomology Research Division, A.R.S., U.S. Department of Agriculture, who has reviewed the manuscript.

Reference

Leonard, M. D. 1964. Aphids on a rooftop. Proc. Ent. Soc. Wash. 66(3): 167–168.

THE SYSTEMATIC POSITION OF THE PSAMMINAE
(Heteroptera: Lygaeidae)[1]

JAMES A. SLATER[2] and MERRILL H. SWEET[3]

Bergroth (1921) erected the tribe Psammini to include two monotypic genera, *Psammium* Breddin from South Africa and *Sympeplus* Bergroth from India. The tribe was placed by Bergroth in the lygaeid subfamily Geocorinae chiefly because of the large protruding "reniform" eyes possessed by members of this latter subfamily.

We have recently had occasion to examine members of both genera of Psammini and find that they do not belong to the Geocorinae and cannot be placed within any existing subfamily of Lygaeidae on the basis of our present subfamilial concepts. In this paper we review the relationships of these curious insects in an attempt to ascertain their systematic position and conclude that they are lygaeids rather than members of related "lygaeoid" families, and that they should constitute a distinct subfamily.

Both *Psammium* and *Sympeplus* are very small insects, not exceeding 2½ mm. in length. The mesothoracic wings are highly modified into a complete "coleopteroid" shell which lacks a membrane, has the clavus and corium indistinguishably fused, completely covers the abdomen, is strongly convex and meets in a straight line down the middle of the dorsum. The hind wings are lacking. The body is nearly uniformly coarsely punctate, the eyes large and reniform, the antennae short and subclavate, the legs short and rugose but not distinctly fossorial. It seems evident that both genera are adapted for some type of cryptic habitat, although nothing is known of their biologies.

The systematic position of these insects is very difficult to ascertain for not only do they have a number of features which appear to be of phylogenetic significance, but they also present a number of other characters which may be better interpreted as reduction phenomena. Some of these modifications may be associated with the wing modifications for a specialized habitat.

We propose in the following discussion to compare the Psamminae to allied families of Lygaeoidea and then to subfamilies of the family Lygaeidae itself.

a. *Family Position*:

Both *Psammium* and *Sympeplus* possess dorsally located spiracles on all abdominal segments normally bearing these structures which

[1] This work was supported by grants from the National Science Foundation and the University of Connecticut Research Foundation.

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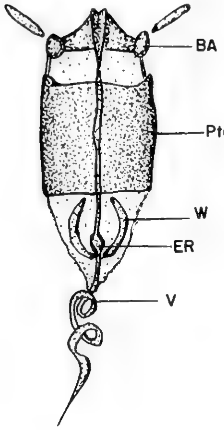

Fig. 1

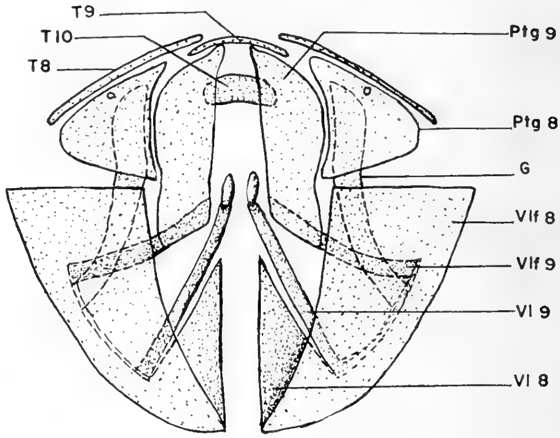

Fig. 2

Fig. 1. Aedeagus of *Psammium*. BA—Basal apparatus; Ptc—Phallotheca; W—Wings; ER—Ejaculatory reservoir; V—Vesica. Fig. 2. Ovipositor of *Psammium* slightly spread; posterior view. T—Tergum; Ptg—Paratergite; Vlf—Valvifer; Vl—Valvulae; G—Gonagulum.

indicates possible relationships to the Berytinidae, where all spiracles are dorsal, or to the Piesmatidae where only spiracle seven is ventral (*McAteella*, *Miespa*), or six and seven are ventral (*Piesma*). However, it is at once apparent that the Psamminae cannot be derived from either of these families (or the reverse) for the psammines have the dorsal scent gland orifices located between terga 4–5 and 5–6, whereas both the Berytinidae and Piesmatidae possess these openings between terga 3–4 and 4–5. This fundamental character is definite evidence that the psammini have been independently derived from the generalized condition of orifices between terga 3–4, 4–5 and 5–6 and thus cannot be considered as belonging to either the Berytinidae or the Piesmatidae.

The Psamminae show no direct relationship to the Berytinidae other than the presence of dorsal spiracles. The relationship to the Piesmatidae, however, is more interesting and more complex. Both taxa show marked reduction in the trichobothrial pattern with no trichobothria on segments four and seven, and a single one located mesally on segment five. The reduction phenomenon has gone even further in the Piesmatidae where segment six also has a single trichobothrium, whereas two are present in the Psamminae. Both taxa also have only two tarsal segments, lack ocelli, and agree in such features of the phallus as the lack of phallothecal lobes, helicoid process, and in having only a small thickening to represent the sperm reservoir. However, the piesmatids have a coiled spermatheca (Drake and Davis 1958) whereas in the psammines it is a short duct with a terminal bulb; the psammines lack the characteristic propleural cavities and paranota of the piesmatids; the inner laterotergites are absent in piesmatids and present in the psammines (although reduced) and the phallus of the piesmatids lacks long wings and has a long coiled gonoporal process.

We consider, therefore, that the seeming similarities between the Piesmatidae and Psamminae are parallel evolutionary developments rather than indications of phylogenetic relationship. The fact that all of the similarities are reduction phenomena—some of which, such as two-segmented tarsi and trichobothrial reduction are already known to be attained quite independently several times in the Heteroptera—strengthens our contention that these two taxa cannot be considered as belonging to a single family.

b. *Subfamily Position*:

(1.) *Spiracles*:

Within the Lygaeidae itself the position of the abdominal spiracles has been used extensively to delimit subfamilies and it appears to conform very well to newer evidence recently brought forward from studies of the phallus, hind wings, chromosomes, nymphal morphology, inner laterotergites, etc. In the Geocorinae the spiracles are dorsal on abdominal segments 2, 3, and 4, and ventral on segments 5, 6, and 7. The only other lygaeid taxa with this arrangement are the Bledionotinae (inclusive of the Pamphantini) and the rhyparochromine tribe Myodochini. As noted above, in *Psammium* and *Sympeplus* the abdominal spiracles on segments 2 to 7 are all dorsal and if this character is to be considered fundamental in lygaeid classification then these genera must be considered in relation to those subfamilies possessing dorsally located spiracles. These subfamilies are the Lygaeinae, Orsillinae, Ischnorhynchinae, Cyminae, Malcinae and Chauliopinae. The Blissinae and Slaterellinae possess dorsal spiracles on segments 1 through 6 with the seventh segment possessing ventrally located spiracles.

c. *Trichobothria*:

All of the lygaeid subfamilies with spiracles 2–7 dorsal (except the Psamminae) also possess one anterior and two posterior trichobothria on both abdominal segments 5 and 6. In the Psamminae only a single trichobothrium is present on segment 5 and this is placed nearly midway between the anterior and posterior margins; segment 6 possesses two trichobothria, one placed anteriorly, the other posteriorly. This combination is unique among the lygaeoid taxa. In *Slaterellus* (the only genus of the Slaterellinae) and *Heinsius* (Blissinae) the trichobothria of segment 6 are as in Psamminae, but the fifth segment also possesses two trichobothria arranged as are those on segment 6.

Both psammines lack trichobothria on segment 4, a condition also found in the Chauliopinae, Malcinae and Cyminae.

Both genera of Psamminae lack trichobothria on segment 7. In *Slaterellus* and *Heinsius*, a single trichobothrium is present on the seventh segment. In all the other subfamilies of the Lygaeidae (except the Idiostolinae which has 3) two trichobothria are present on segment 7 which is the pattern otherwise found in the Trichophora.

The variability in trichobothrial number seen in this section of the Lygaeidae is unusual as the trichobothrial number is one of the more stable characters among trichophorous Pentatomomorpha. Since the variability results from reduction, the similarities seen may be due to convergence.

d. *Abdominal scent glands*:

The dorsal abdominal scent glands of the nymphs of Lygaeidae (visible as "scars" in the adults) are generally consistent within a given subfamily or tribe. (Exceptions are known in the Ischnorhynchinae and Rhyparochrominae.) The Psamminae agree with most lygaeid subfamilies in possessing gland openings between terga 4–5 and 5–6. Of the subfamilies with spiracles 2–7 dorsal, the following possess the same scent gland arrangement: Chauliopinae, Orsillinae, Lygaeinae and some Ischnorhynchinae. The Slaterellinae and Blissinae also have the two posterior scent glands present. In the Malcinae and some Ischnorhynchinae three gland openings are present—between segments 3–4, 4–5, 5–6—which represents a more generalized condition.

The nymphs of Malcinae are unique among Lygaeidae in possessing long spines on the abdomen. The Ischnorhynchinae, although more generalized, differ in lacking inner laterotergites and having quite different genitalia.

In the Cyminae the openings are between segments 3–4 and 4–5 as noted previously for the Berytinidae and Piesmatidae. Indeed, on this basis and others, Southwood and Leston (1959) have placed the cymines in the family Berytinidae. We consider the position of the scent gland orifices a fundamental feature, and one which excludes the Psamminae from consideration as berytinids or piesmatids and obviously from the Cyminae as well.

e. *Inner laterotergites*:

The connexivum has been little used in the classification of the Hemiptera, but appears to be of considerable significance. In the Psamminae, consistent with extensive desclerotization of the terga, the inner laterotergites are reduced and apparently in the process of being lost. In *Psammium* they are present on segments 3–6, but weakly developed. In *Sympeplus* they are absent with the exception of a vestige on segment 7. This is unusual since inner laterotergite 7 is usually absent. Of the taxa with dorsal spiracles only the Orsillinae and the Lygaeinae have inner laterotergites present on segments 2–6. The Lygaeinae are unusual in having the tergum further divided by two lateral sutures. The other lygaeid subfamilies, in contrast to the Psamminae, have the inner laterotergites absent although the terga are heavily sclerotized. The Blissinae and Slaterellinae have well-developed laterotergites present on segments 3 to 6.

f. *Tarsi*:

In the Psamminae the tarsi are two-segmented—in contrast with all other Lygaeidae. The significance of the number of tarsal segments has been the subject of some controversy in hemipterological literature. It has proven to be a useful character when taken in conjunction with other characteristics, but is variable within several families such as the Reduviidae and Miridae. The two-segmented tarsi can be looked on as primitive (nymphs of Heteroptera generally possess two-segmented tarsi), a reduction phenomenon, or a neotenic condition, and must be evaluated against a character complex.

g. *Genitalia*:

The genitalia of the Psamminae are unique and have no close parallel. In the male (fig. 1) the phallotheca has no lobes and is separated from the basal apparatus by a membrane. The ejaculatory reservoir is simple and minute and the wings elongate and curved. The conjunctiva is short with no appendages present, and the vesica is short with only 2–3 turns present. There is no helicoid process present. In *Sympeplus* the vesica is distally expanded.

Of the subfamilies with dorsal spiracles, only the Malcinae and Orsillinae lack both the dorsal lobes on the phallotheca and the helicoid process, as do the Psamminae. The phallus otherwise is very different in the orsillines which possess a ring sclerite on an elongate conjunctiva and an asymmetrical vesica. The Malcinae have a large and well-developed ejaculatory reservoir with two sclerotized rods attached to it. *Slaterellus*, like the Blissinae (Ashlock 1957), also lacks processes on the phallotheca, and from the illustration (Drake and Davis 1959) probably lacks the helicoid process.

In the female the terminal abdominal segments of the psammines are as follows: the eighth tergum is composed of two widely separated sclerites; the ninth tergum is reduced to a narrow transverse sclerite with no sutures; tergum ten is relatively large and covered by the 9th valvifers. The terminal segments are rather flattened posteriorly, so that the eighth and ninth paratergites appear posterior rather than lateral to their terga, and the ninth paratergites meet behind the ninth tergum (fig. 2). The first valvifers are large, elongate, and bear short broad triangular first valvulae. The second valvifers are slender and attached by rami to the second valvulae which are elongate and slender. In *Psammium* a small moveable appendage is present at the apex of the second valvulae. The two pairs of valvulae are *not* coadapted to each other by the usual tongue-in-groove mechanism. The spermatheca consists of a short duct with a terminal bulb. A flange runs around the proximal part of the bulb.

The cleft nature of tergum 8 is very unusual and has no parallel in the other lygaeoid groups considered here. The concealed condition of tergum 10 is also unique.

The Chauliopinae and the Malcinae have short triangular first valvulae but the second valvulae are similar, not narrow and elongated as in the Psamminae. The other subfamilies considered here have long laciniate valvulae. Moreover, the Chauliopinae differ in having an anomalous triangular sclerite present between tergum 8 and paratergite 8, and in having the ninth paratergite divided in half by a dorsoventral suture. The Malcinae have the eighth valvifers narrow and elongate and fused ventrally to each other and the ninth paratergites large and ridged to form closing valves over the genitalia.

In the lygaeid subfamilies with dorsal spiracles a spermathecal bulb with a flange is found only in the Chauliopinae. The Slaterellinae, like some Blissinae, also have a spermathecal bulb with a flange (Drake and Davis 1959).

The evidence from the genital segments is contradictory and emphasizes the isolated position of the Psamminae.

h. *Abdominal sterna*:

Sternum 7 is completely cleft in the Psamminae as is the case in all the lygaeid taxa considered, except the Malcinae and the Chauliopinae where there is no trace of a cleft. These latter subfamilies also have sterna 4 and 5 completely fused, while the psammines agree with the other lygaeid taxa in having the conjunctival membrane present between sterna 4 and 5 in the females.

i. *Additional features of the Psamminae*:

The Psamminae possess peculiar waxy scale-like hairs similar to those found in the Malcinae, Chauliopinae, Slaterellinae, and *Heinsius* (Blissinae). Similar hairs are also found in the rhyparochromine *Sisamnes*, which indicates the strong possibility of convergence.

The head lacks ocelli as is frequently the case in flightless Lygaeidae. The bucculae extend forward to meet one another and form a bulbous area, almost a "false tylus." The head is short but porrect and the juga are very short, so much so that the antenniferous tubercles extend beyond them. The head lacks all traces of long setae or spines. The bucculae are large in the Malcinae and Chauliopinae but do not extend anteriorly, and the head is extremely declivent.

The coxae are widely separated and the thoracic sterna deeply grooved to receive the labium.

j. *Conclusions*:

Within the large and heterogeneous family Lygaeidae the Psamminae occupy an isolated position and cannot be directly related to any particular subfamily and each subfamily is too specialized to give rise to the Psamminae. The Psamminae can be derived from the group of subfamilies having spiracles 2–7 dorsal, and having at least two posterior scent glands and inner laterotergites present. This group includes the subfamilies Orsillinae and Lygaeinae, each of which has some specialized characteristics. The lygaeines have a specialized subdivided terga and have connexivum 7 completely fused with tergum 7. The Orsillinae have an asymmetrical aedeagus and lack the flange on the spermatheca. This relationship probably simply reflects the more generalized condition of the Orsillinae and Lygaeinae.

The other subfamilies are highly specialized, as are the Psamminae themselves. The Malcinae and the Chauliopinae appear related to the Psamminae because of their waxy hairs, reduced ovipositor, presence of the posterior (5–6) scent gland, and in the Chauliopinae, a spermatheca with a flange. However, they could not have given rise to the Psamminae because of the fused condition of sterna 4 and 5 in the female, the uncleft condition of sternum 7, and the highly specialized genitalia present in these taxa. It should be noted that although the Malcinae and the Chauliopinae resemble each other, they are quite dissimilar in the number of scent glands, type of spermatheca, and structure of the aedeagus and abdominal terga.

Except for the crucial ventral position of spiracle 7 the Slaterellinae appear quite similar to the Psamminae. *Slaterellus* possesses inner laterotergites, the posterior scent gland, a similar spermatheca, and lacks phallothecal lobes on the helicoid process on the aedeagus.

The Slaterellinae appear to be closely related to (if not members of) the Blissinae by their closed coxal cavities, spiracle position, presence of inner laterotergites, and are distinguished by their anastomosing veins in the membrane and the presence of scale-like hairs (Drake and Davis 1959). Scudder (1962) erroneously quoted these authors as describing *Slaterellus* as having a simple aedeagus which lacks an ejaculatory reservoir. In actuality the aedeagus could not be inflated. *Heinsius* (Blissinae) has the normal blissine membrane venation, shares the scale-like hairs, spermatheca type, the peculiar loss of one trichobothrium on each segment as in *Slaterellus*, and appears to closely relate these two subfamilies.

The very different blissine habitus of *Slaterellus* suggests no very close relationship to the Psamminae, as indicated by the spiracle positions, and some similarities are probably due to convergence. This would be consistent with the zoogeographical evidence that the Slaterellinae are a specialized Australian offshoot of the Blissinae.

In view of all the features discussed above it appears that the

Psamminae is another of the small lygaeid subfamilies whose specific relationships are obscure. The phylogenetic relationships among the lygaeoid taxa are complicated by large evolutionary gaps and the occurrence of considerable convergence.

Key to the Genera of **Psamminae**

1. Antennal segments 2 and 3 subequal in length, the third segment markedly narrowed at base; metasternum with a deep median groove; claspers pointed at apex; abdominal inner laterotergites present on segments 3–6; eyes large and ovoid, not strongly reniform and not extending back over the anterolateral pronotal angles (S. Africa) .... **Psammium**

   Antennal segment 3 considerably longer than segment 2 and markedly narrowed at base to give a clavate appearance; metasternum lacking a deep median groove; claspers broad and truncate at apex; abdominal inner laterotergites absent on segments 3–6, a vestige present on segment 7; eyes more strongly reniform and extending caudad over the anterolateral pronotal angles (India) .... **Sympeplus**

Acknowledgments

We would like to express our sincere appreciation to the following persons for allowing us the opportunity of examining material present in their respective institutions: Dr. W. E. China (British Museum of Natural History), Dr. E. Kjellander (Stockholm Museum) and Dr. Hakan Lindberg (Helsinki Museum).

Material Examined

Psammium mica Breddin

18 Specimens: SOUTH AFRICA: Cap. B. Sp. (De Vylder). CAPE PROVINCE: Ceres, 1–12 Nov. 1924 (R. E. Turner). In Stockholm Museum, British Museum (Nat. Hist.) and J. A. Slater collections.

Sympeplus curculiunculus Bergroth

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THE USE OF FROTH MASSES IN COURTSHIP OF EUTRETA
(DIPTERA: TEPHRITIDAE)

W. B. STOLTZFUS *and* B. A. FOOTE, *Kent State University, Kent, Ohio*

Sound production, various wing movements, stylized body maneuvers and distinctive wing patterns have been considered important in the courtship of fruit flies. Recently, Oldroyd (1964, p. 198) reported that males of an African species, *Afrocnerus mundus* (Loew), use small balls of foam as mating lures. This past summer we observed somewhat similar behavior by species of *Eutreta* in which froth masses formed by the males were fed upon by females.

In all, seventeen observations of froth masses, each attended by a male *Eutreta*, were made in July, August, and early September in Medina, Portage, and Wayne Counties of northeastern Ohio. Most of the masses were found on leaves of tall goldenrod (*Solidago altissima* L.), although two were on rough-leaved goldenrod (*Solidago rugosa* Mill.). Masses were situated 15 to 30 mm. out from the main stem on the upper surface of leaves arising from the upper half of the plant. The masses usually were cone-shaped and varied from 3.0 to 7.0 mm. in height (fig. 1), although peculiarly shaped and unusually large masses were found occasionally (fig. 2). The material composing a mass was clear and mucus-like and contained numerous small bubbles of air. When probed with a dissecting needle, masses collapsed to small, whitish, viscid deposits.

Remaining near the froth mass, the male seemed to attract the attention of a female by making quick sideways dashes on the leaf while holding his wings partially spread and somewhat elevated. Frequently the wings were flicked upward, and occasionally one wing would be extended at right angles to the body and held perpendicular to the leaf surface. Following several of the sideways dashes, the male usually touched the froth mass almost as if enticing the female to feed. A female commonly observed the antics of the male for 15 minutes or more before slowly approaching the mass. She paused frequently and even retreated, particularly if distracted by other males. As the female neared the mass, she usually extended the wings alternately at right angles to the body. After a lapse of a half hour or more, the female finally reached the mass and began feeding. When this occurred, the male approached the female from the rear and initiated copulation. Although the female ceased feeding periodically, she always returned to the froth mass while coitus progressed. However, very little of the mass appeared to be consumed.

Competition between males obviously occurred, as several males and often more than one female frequently were seen near any one froth mass. Interloping males attempted to drive a male away from his

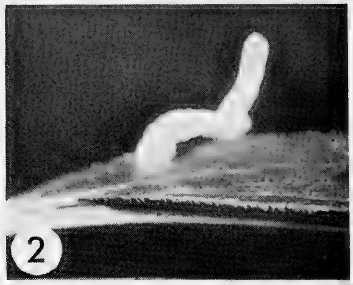

Fig. 1. Froth mass of *Eutreta sparsa* on leaf of goldenrod. Female is on the main stem; fig 2. Unusually large and peculiarly shaped froth mass of E. *sparsa*.

froth mass, and several apparent battles between males were observed. While fighting, the combatants usually dropped off the leaf and fell 50 cms. or more before breaking contact. Occasionally during these battles, a third male was seen to approach and begin feeding on the froth mass. Whether any male was successfully displaced was not determined.

As *Eutreta* needs revising, the determination of species utilizing froth masses is strictly tentative. Several males taken near masses on tall goldenrod were determined as *E. sparsa* (Wied.).

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THE

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ON THE SYSTEMATIC POSITION OF PROTOMELOE
(Coleoptera, Meloidae)

Richard B. Selander, *Department of Entomology, University of Illinois, Urbana*

The present note, offered in advance of the publication of a comprehensive study of the classification of the Eleticinae, is prompted by the fact that certain taxonomic proposals made recently by M. Abdullah (1965a, 1965b) are conducive to a proliferation of specific synonymy in this subfamily. Most of the difficulty stems from Abdullah's (1965a) assumption that his genus *Protomeloe* represents a radically distinct type of meloid beetle. This genus was proposed originally for *P. argentinensis* Abdullah (1965a); at the time of its proposal Abdullah did not assign *Protomeloe* to tribe but rather placed it in the subfamily Meloinae with the comment that a new tribe could be proposed for the genus. Shortly thereafter he (1965b) used the tribal designation Protomeloini in reference to the genus but this time indicated (p. 46) that "there is good reason for placing *Protomeloe* in a distinct subfamily." Although he (1965a) alluded to distinctive features of wing venation and the structure of the metendosternite and male genitalia in *Protomeloe*, he did not specify them. Rather, he placed great taxonomic and phyletic weight on the presence in the male of *P. argentinensis* of pitlike elytral organs which he apparently interprets as being homologous with certain elytral structures occurring in some Anthicidae. A crucial fact that has escaped him is that elytral modifications of the sort found in *Protomeloe* occur also in other Meloidae, most notably in species of *Spastica* Lacordaire, where their presence has been noted both by Haag-Rutenberg (1879), who used them extensively as a source of taxonomic characters, and by Kaszab (1955).

The evident relationship that exists between *Protomeloe* and *Spastica* is dramatically reflected in the fact that *P. crowsoni*, the second species to be named in *Protomeloe* by Abdullah (1965b), is assignable properly to *Spastica*. Thus it appears that should Abdullah continue to regard *P. argentinensis* and *P. crowsoni* as congeneric, he will be led eventually to conclude that *Protomeloe* is a junior synonym of *Spastica*. It is my interpretation, however, that *Protomeloe*, if properly restricted by the removal of *P. crowsoni*, is a recognizable genus of Meloidae, although, under the circumstances, it should be quite apparent that it is not assignable to a tribe or subfamily apart from *Spastica*. In the classification of Kaszab (1959) *Spastica* is assigned to the tribe Eleticini, subtribe Spasticina; in my classification (Selander, 1964) it is placed in the subfamily Eleticinae, tribe Spasticini.

Protomeloe contains, in addition to its type-species, at least one undescribed species from Argentina. *Spastica* has some 30 described species, most of which are so poorly characterized in the literature that I am unable to determine at present whether S. *crowsoni* (Abdullah), new combination, is to be regarded as a valid specific name.

The more striking differences between *Protomeloe* and *Spastica* in the adult stage are outlined in the paragraph that follows. The distinctions made are based on information in the published literature as well as an examination of a male that I have tentatively assigned to *P. argentinensis*, a male of the undescribed *Protomeloe* mentioned above, the holotype of the type-species of *Spastica* [*S. flavicollis* (Chevrolat)], and representatives of some 16 additional species of that genus. Both genera will be treated in some detail in a forthcoming review of the genera and higher taxa of Eleticinae (Selander, *in press*).

Protomeloe and *Spastica*, so far as known (the female of *Protomeloe* has not been discovered), are typical members of the subfamily Eleticinae as I have defined that taxon (Selander, 1964). They are separable as follows: Antennae slender in *Protomeloe*, relatively heavy (segment X at least ⅓ as wide as long) in *Spastica*; pronotum and prosternum longer than wide in *Protomeloe*, wider than long in *Spastica*; male abdominal tergum VIII excavate and crossed by two fixed pleats in *Protomeloe*, not excavate and crossed by a single, flexible pleat in *Spastica*; male gonostyli (lateral lobes) fused at immediate base only in *Protomeloe*, fused from base nearly to apices in *Spastica*; aedeagus (median lobe) straight and armed with two ventral hooks apically in *Protomeloe*, strongly bent near middle and either unarmed or with only a single ventral hook apically in *Spastica*; ejaculatory duct opening apico-dorsad and provided with a heavy, straight, exposed sclerotized rod in *Protomeloe*, opening mediodorsad and provided with a thin sclerotized rod enclosed in a membranous sheath in *Spastica*.

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AN INSTANCE OF GASTEROPHILUS MYIASIS OF MAN IN GEORGIA
(DIPTERA: GASTEROPHILIDAE)

On September 22, 1965, a 20 year-old Caucasian male preveterinary student at the University of Georgia, delivered to us four small dipterous larvae. These larvae had been surgically removed from the skin of his right armpit by his wife with a sewing needle. The larvae were identified as *Gasterophilus intestinalis* (DeGeer), the common horse bot. Further investigation into the case revealed that the student supplemented his income by shoeing horses. The day before he had noted an itching sensation under his arm while preparing one of the front hooves of a horse on a farm in Madison County, Georgia. Subsequent observation on this individual has revealed no further infestation or secondary infections. This apparently is the first reported case in man caused by this fly in Georgia.

Determination was verified by personnel of the Entomology Research Division, ARS, U. S. Department of Agriculture.—HORACE O. LUND *and* ROBERT DAVIS, *Department of Entomology, University of Georgia, Athens, Georgia.*

A NEW FLOWER-FEEDING SPECIES OF DROSOPHILA
(Diptera : Drosophilidae)

Sarah Bedichek Pipkin, *Department of Biology, The Johns Hopkins University, Baltimore, Md.*

A new flower-feeding species of *Drosophila*, closely related to *D. hansoni* Pipkin 1964, was collected in Rio Raposo, Colombia, in June, 1963, from *Heliconia collinsiana* Griggs. The plant host observed for *D. hansoni* in Cerro Campana, Panama, was *Heliconia vellerigera* Poepp. Specific differences involving both body color and genitalia distinguish the *Drosophila* species. Evolutionary implications of the difference in host plants between the two drosophilids are discussed in Pipkin, Rodríguez, and León (in press, *The American Naturalist*). A description of the new species follows:

Drosophila hansonioides, new species.

External characters of imagines—♂, ♀. Arista with 4 dorsal and 2 ventral branches in addition to the terminal fork. Antenna yellowish tan; 3rd joint covered with short pale hairs. Ocellar triangle and orbits semi-shining yellowish-brown; ocelli amber; frontal triangle dull yellow; three frontal hairs on each side of the apex of the frontal triangle. Proclinate orbital bristle about the length of the posterior reclinate; anterior reclinate minute, ¼ the other two; 5 orbital hairs. Post verticals well formed, crossed. Face straw-colored; carina narrow above, widening below, flattened. Cheeks yellowish; distance from eye margin to base of oral bristles less than ⅛ the greatest diameter of the eye. One pair of prominent oral bristles, the 2nd less than half the first. Eyes dull red with yellow pile; eye index 1.3. Palpi straw-colored with one strong subapical bristle, one shorter bristle, and additional hairs; proboscis yellow.

Acrostichal hairs in six rows; no prescutellars. Anterior scutellars widely divergent. Distance from anterior to posterior dorso-central bristles ⅗ the distance between the two dorso-centrals. Mesonotum and scutellum shining yellowish tan; pleura straw-colored; halteres yellow. Anterior sternopleural bristle ⅗ the posterior; mid-sternopleural thin, ⅕ the anterior. Legs unicolorous yellowish; some recurved hairs on first tarsi. Apicals on 1st and 2nd tibiae; preapicals on all three. Wings unicolorous tan; posterior crossvein unclouded. Costal index 2.6; 4th vein index 1.9; 4c index, 1.0; 5x index, 1.5. Third section of the costal vein with heavy hairs on the basal half. One prominent bristle at apex of the 1st costal section.

♂, abdominal tergites yellowish tan; tergites 2, 3 with narrow black apical bands, widely interrupted medially and fading at the lateral bend of the tergite; tergites 4, 5 bare; tergite 6 with a strong black trapezoidal median mark, extending the width of the tergite. Female, with similar apical bands on 2, 3, 4; tergite 5 bare; narrow black stripe on tergite 6; tergite 7 yellow.

Body length, ♂, 2.33 mm; ♀, 2.33 mm.

Wing length, ♂, 0.98 mm; ♀, 0.98 mm.

Genitalia—♂, apodeme of penis a straight rod; penis simple, expanded apically like the bowl of a pipe with a shallow projecting hook, apparent in side view; bow of hypandrium with a prominent horn; gonapophyses each with a long medial bristle. Forceps with a sinuous row of 12 primary teeth of which 5 are borne on a proximal lip and 7 along the medial edge of the forceps in a lower lip; no prominent gaps between the bristles of upper and lower lips; 9 marginal bristles; no well developed toe; anal plates separate from the genital arch. ♀, ovipositor plates acuminate distally, golden, with 17 primary teeth and three additional teeth medial to the dorsal edge of the ovipositor and proximally situated.

Relationship.—Very close to *D. hansoni* Pipkin (1964) from which it differs in a restriction of the black abdominal markings in both sexes, fewer medial teeth on the ovipositor; absence of a pronounced gap in the primary teeth of the forceps; and small differences in wing indices.

Ecology.—Aspirated from inflorescence of *Heliconia collinsiana* Griggs on June 7, 1963 at Rio Raposo, Colombia.

Types.—Holotype male (2R1), Rio Raposo, Colombia, and 4 paratypes in U. S. National Museum.

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A NEW SYNONYM OF TAENIOTHRIPS EUCHARII (WHETZEL)
(Thysanoptera: Thripidae)

Study of a paratype of *Taeniothrips rohdeae* Kurosawa (1937, Kontyu 11 (3): 273–274, figs. 5–7), in the U. S. National Museum, shows that it is the same as *Taeniothrips eucharii* (Whetzel, 1923) (new synonymy). The host, *Rohdea japonica* Roth, may be added to the plant list given in my paper on synonyms and habits of *eucharii* (1963, Ent. Soc. Amer. Ann. 56: 399–401). When I prepared the paper on *eucharii,* the paratype of *rohdeae* was not available, and I overlooked Kurosawa's excellent description and figures of the species.—Kellie O'Neill, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

ON THE GENERIC NAMES ALPHITOBIUS, PHTORA, CLAMORIS, AND CATAPHRONETIS
(COLEOPTERA: TENEBRIONIDAE)

T. J. SPILMAN, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

Many generic names in the Tenebrionidae have been incorrectly credited to various authors, incorrectly dated, or misapplied. An attempt to correct North American names will be made in the proposed catalogue of North American beetles. However, a few are too involved to be explained in simple catalogue synonymies. The following names fall into that category. The first of two problems involves a change of type-species and a change of the date of publication of a generic name; the second involves an overlooked generic homonymy.

I thank Mrs. Patricia Vaurie of the American Museum of Natural History for help with a Germar description.

The Genus **Alphitobius**

The name *Alphitobius* has been stable for a long time; it has always been associated with the stored-grain pests which are today known as *diaperinus* (Panzer), the lesser mealworm, and *laevigatus* (Fabricius), the black fungus beetle. The generic name *Alphitobius* has usually been credited to Stephens of 1832, with *Tenebrio mauritanica*: Fabricius, not Linnaeus (= *laevigatus* Fabricius) as type-species. However, the generic name was actually first published by Stephens in 1829a (p. 19). Under the name *Alphitobius*, Stephens in 1829 listed "*picipes*, Pan." No descriptions accompanied the generic or specific names. Surely the generic name must be considered valid as of 1829, for Stephens included a previously described species in the genus. But what is "*picipes*, Pan."? Only two species of beetles were named *picipes* by Panzer; one was in *Elater*, the other was the tenebrionid *Helops picipes* Panzer, 1794 (p. 4, fig. 4). It seems obvious that Stephens was referring to the tenebrionid and not to the elaterid when he listed *picipes* Panzer in *Alphitobius*. The type-species of *Alphitobius* is, therefore, [*Helops*] *picipes* Pan[zer, 1794], by monotypy.

What has happened to the name *Helops picipes* Panzer? What is its present position? The specific name appears to have dropped from sight almost immediately after its mention by Stephens. I have searched the specific indices in all parts of Junk and Schenkling's Coleopterorum Catalogus and have checked many European catalogues and lists, but my searches have been in vain. I can not locate the name, not even in a synonymy. Thus, I turned back to original sources for a solution to this problem. *Helops picipes* Panzer, if we may rely on the original description and illustration, is most likely a synonym of *Alphitobius laevigatus* (Fabricius), originally described as *Opatrum laevigatum* Fabricius, 1781 (p. 90). I propose herein to sink *Helops picipes* Panzer, 1794 to the status of junior synonym of *Opatrum laevigatum* Fabricius, 1781, until their true relationship can be known from comparisons of holotypes [**New Synonymy**].

This action does not in any way change the concept of the genus *Alphitobius*. In fact, only the date of proposal of the generic name is changed, for the zoological species now known as *laevigatum* (Fabricius) is in effect still the species on which the genus is based. The synonymizing of *picipes* Panzer under *laevigatum* assures the continuity.

The remaining nomenclatural story of *Alphitobius* concerns us only because it contains what other students thought were the first proposals of the generic name and because it involves the disappearance of Panzer as the author of *picipes*.

Stephens started the *picipes* confusion soon after his 1829a publication. A month later Stephens (1829b p. 243) placed under *Alphitobius* the name "*picipes*", this time without an author for the species name. However, as a synonym of this *picipes* he gave "*Te. Fagi*. Panz. F. lxi. F.3?". Once again, no descriptions of any kind accompanied the scientific names.

Finally, Stephens in 1832 (pp. 4 and 11) presented a morphological description of the genus *Alphitobius*. In the genus he placed *picipes* Stephens and *mauritanicus* of Fabricius. Each species is described morphologically, and each specific name has synonyms appended. Unfortunately Stephens misidentified the two species; this is shown by the transposed names for the two species in recent catalogues, *e.g.*, Gebien's Katalog der Tenebrioniden in 1940 (p. 778).

Since 1832 the names *Alphitobius* and *picipes* have been credited to Stephens' 1832 Illustrations. The few subsequent type-species designations are hopelessly involved in the misidentifications of Stephens. In addition, some of the specific names used by Stephens are now used in different tenebrionid genera or in different families. But all of these misidentifications need not bother us and we need not change any names when we accept Stephens' 1829 Nomenclature as the first valid publication of *Alphitobius* and if we accept the synonymy of *Opatrum laevigatum* Fabricius and *Helops picipes* Panzer.

In summary of the above paragraphs, no names are changed, the date of the generic name is changed, the type-species is cited, and a new synonymy for one species is made. This may be shown as follows:

Alphitobius Stephens, 1829. Type: [*Helops*] *picipes* Pan[zer, 1794]; by monotypy.

laevigatus (Fabricius).

Opatrum laevigatum Fabricius, 1781.

Helops picipes Panzer, 1794 [**New Synonymy**].

The Generic Names **Phtora**, **Clamoris**, and **Cataphronetis**

For a species of beetle now placed in the Ulomini, Dejean in 1834 (p. 199) used the generic name *Cataphronetis* and the specific name *brunnea*, with *crenata* Parreyss as junior synonym; the generic name and the two specific names were *nomina nuda*. Then, Germar in 1836 (no. 11) gave a specific description for this beetle, using the binomen *Phtora crenata*. Finally, Lucas in 1846 (p. 342) gave generic and specific descriptions for this beetle, using the generic name *Cataphronetis* and the specific name *Levaillantii*.

Most systematists have rejected Germar's use of the generic name *Phtora* because he did not present a generic description. So, this genus has been known by the name *Cataphronetis* Lucas. However, Germar's *Phtora* was validly proposed because of the inclusion of a newly described species. Thus, the correct name for the ulomine genus in question is *Phtora* Germar, 1836, not *Cataphronetis* Lucas, 1846. The type-species of *Phtora* Germar is *Phtora crenata* Germar, 1836, by monotypy.

The other use of the name *Phtora* was in a different tribe of the family. For a species now placed in the Phrenapatini, Dejean in 1834 (p. 200) used the generic name *Phtora* and the species name *crenata*; both generic and specific names were *nomina nuda*. Then, Mulsant in 1854 (pp. 228 and 229) gave a generic and specific description for the beetle, using the generic name *Phtora* and the specific name *crenata*. Mulsant knew of Germar's earlier (1836) usage of *Phtora* for a different genus but rejected it because Germar did not give a generic description. Mulsant's rejection was an incorrect action, according to our present rules of nomenclature, so *Phtora* Mulsant, 1854, is a junior homonym of *Phtora* Germar, 1836. Gozis in 1886 (p. 25), knowing of this generic homonymy, proposed the new name *Clamoris* for Mulsant's *Phtora*. Thus the correct name for the phrenapatine genus in question is *Clamoris* Gozis, 1886, not *Phtora* Mulsant, 1854. The type-species of *Clamoris* is *Phtora crenata* Mulsant, 1854, because the replacement name assumes the type-species of the name replaced.

Most authors have overlooked or disregarded the *Phtora* homonymy, but Portevin in 1934 (p. 27) did make the proper corrections, using *Phtora* Germar for the ulomine genus and *Clamoris* Gozis for the phrenapatine genus. Only one of the two genera, *Clamoris*, has a member in America north of Mexico; *Clamoris americana* (Horn) occurs in the Pacific Northwest. The Old World genus *Phtora* Germar is discussed above only because it is involved in homonymy with the New World genus.

Three minor problems bear directly or indirectly on the above names. First, the name *Phtora* of both Germar and Mulsant is now usually spelled *Phthora*. Agassiz in 1846 (p. 126) was the first to change the spelling to *Phthora*; his action could probably be considered an emendation, but he referred to *Phtora* Dejean, a *nomen nudum*, and his new spelling is thus also a *nomen nudum*. However, many authors used Agassiz's works, and *Phthora* became the accepted spelling. But, should *Phtora* have been emended? Germar used the spelling *Phtora* at least three times in his article. Mulsant left no doubt as to his derivation of *Phtora*; he gave the Greek word on which the Latin name *Phtora* is based. His first two characters of the Greek word are phi and theta, but he transliterated the theta into the Latin 't'. This use of 't' for theta was not an inadvertent error—it occurs in six different places in Mulsant's article—but is an incorrect transliteration. Article 32(a) (ii) of the International Code of Zoological Nomenclature states that incorrect transliterations are not to be corrected. Thus, the correct spelling of the generic names in question is *Phtora*. Second, the gender of *Clamoris* can not be ascertained from the original description, for Gozis definitely indicated that his new generic name was without etymology. However, Portevin in 1934 (p. 27) established *Clamoris* as feminine by using it with the feminine specific name *crenata*. Third, apparent but not actual specific homonymy exists. Two different species were named *Phtora crenata*, a phrenapatine by Mulsant and a ulomine by Germar. This coincidence does not enter into the problem of homonymous generic names; the two generic names do not have the same type-species. Furthermore, the two specific names *Phtora crenata* are not homonyms, for Article 57 (c) of the International Code of Zoological Nomenclature says that homonymy does not exist between identical specific names in homonymous genera.

In summary of the above paragraphs: *Phtora* Germar, 1836, is a senior homonym of *Phtora* Mulsant, 1854; *Phtora* Germar, 1836, is the correct name for the ulomine genus usually known as *Cataphronetis* Lucas, 1846; *Clamoris* Gozis, 1886, is the correct name for the phrenapatine genus usually known as *Phtora* Mulsant, 1854; and the emendation of *Phtora* to *Phthora* is unjustified. These conclusions plus their effect on North American species may be shown as follows:

Clamoris Gozis, 1886. [Old and New World genus.]
- *Phtora* Dejean, 1834. [*Nomen nudum*.]
- *Phtora* Mulsant, 1854. [Preoccupied.] Type: *Phtora crenata* Mulsant, 1854; by monotypy.
- *Clamoris* Gozis, 1886. [New name for *Phtora* Mulsant, not Germar.] Type: *Phtora crenata* Mulsant, 1854; assumes type of replaced name.
  - *americana* (Horn). [Only species in America, north of Mexico.]

Phtora Germar, 1836. [Old World genus.]
- *Cataphronetis* Dejean, 1834. [*Nomen nudum*.]

Phtora Germar, 1836. Type: *Phtora crenata* Germar, 1836; by monotypy.

Cataphronetis Lucas, 1846. Type: *Cataphronetis Levaillentii* Lucas, 1849 [= *Phtora crenata* Germar, 1836]; by monotypy.

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LARVAE OF THE GENUS NIGRONIA BANKS
(NEUROPTERA: CORYDALIDAE)[1]

H. H. NEUNZIG, *Entomology Department,*
North Carolina State of the University of North Carolina, Raleigh

The genus *Nigronia* Banks contains two North American species, *Nigronia fasciatus* (Walker) and *Nigronia serricornis* (Say). The adults of these fishflies are readily distinguished from other corydalids and from each other on the basis of wing coloration (Davis, 1903). However, the larva of *N. serricornis* has been inadequately described, and a description of the larva of *N. fasciatus* has not appeared in the literature.

In 1901, Needham and Betten briefly described the first-instar larva of *N.* (*Chauliodes*) *serricornis.* They also published a key in which characters of the larva of *N. serricornis* were incorrectly attributed to *Chauliodes pectinicornis* (Linnaeus). Davis (1903) presented information on the biology of *N. serricornis*, but added little to the description of the larva presented by previous authors. Recently, Cuyler (1956) undertook a study of the immature stages of the Corydalidae of the United States. In this unpublished work, he described the last-instar larva of *N. serricornis*, and what he believed, by supposition, to be the last-instar larva of *N. fasciatus.*

In the present study, through the collection and rearing of immatures, the identity of larvae of both species was definitely established in order that detailed descriptions and notes on biology could be made available.

METHODS OF STUDY

Last-instar larvae of *N. fasciatus* and *N. serricornis* were collected in April and May from streams located in Reedy Creek State Park and Umstead State Park in North Carolina. Some of the larvae were killed and preserved, and others were placed in aquaria and adults obtained. Pupae, along with larval exuviae, were also collected and adults reared from the pupae.

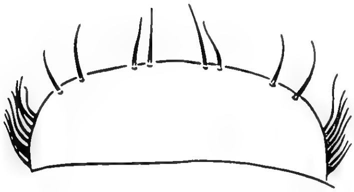
The descriptions are based on larvae killed in K.A.A.D. Information on color applies to recently killed material. The overall length of larvae is based on measurements taken from the distal margin of the mandibles to the distal margin of the anal prolegs. The length of the head includes the region between the occiput and the base of the anteclypeus.

Nigronia fasciatus (Walker)

Chauliodes fasciatus Walker, Cat. Brit. Mus. Neur. p. 201. 1853.

Material Examined.—One larva, in last instar, labeled: Nature Trail Creek,

[1] Contribution of the Entomology Department, North Carolina Agricultural Experiment Station, Raleigh. Published with the approval of the Director of Research as Paper No. 1898 of the Journal Series.



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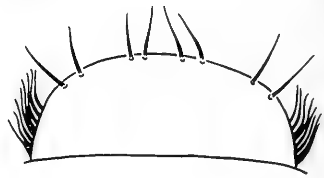

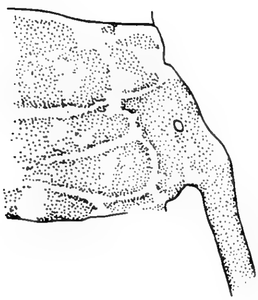

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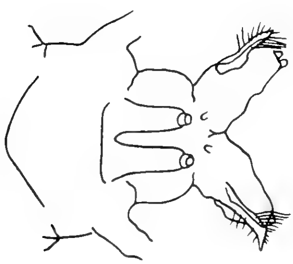

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Fig. 1, Labrum of larva of *N. fasciatus* (Walker); fig. 2, Labrum of larva of *N. serricornis* (Say); fig. 3, Dorsal view of right side of 3rd abdominal segment of larva of *N. fasciatus* (Walker); fig. 4, Dorsal view of right side of 3rd abdominal segment of larva of *N. serricornis* (Say); fig. 5, Dorsal view of caudal segments of larva of *N. fasciatus* (Walker); fig. 6, Dorsal view of caudal segments of larva of *N. serricornis* (Say). All figures are of last-instar larvae.

Table 1. Measurements (in mm.) of last-instar larvae of *Nigronia fasciatus* (Walker) and *Nigronia serricornis* (Say).

Body Length	Head Length	Head Width	Labrum Length (along meson)	Labrum Width (at base)	Pro-notum Length	Pro-notum Width	Lat. Append. 1st Seg. Length	Lat. Append. Last Seg. Length	8th Ab. Seg. Length	8th Ab. Seg. Width	Resp. Tubes Length
Nigronia fasciatus											
26.2	2.31	3.54	0.38	1.16	3.38	3.69	4.60	1.10	1.38	2.32	1.16
35.4	2.62	4.16	0.43	1.23	3.85	4.31	5.35	1.19	1.69	2.78	1.31
33.1	2.62	4.24	0.39	1.18	4.08	4.46	4.92	1.15	2.00	2.78	1.20
Nigronia serricornis											
29.3	2.77	4.16	0.54	1.16	3.85	4.24	5.38	1.62	1.54	2.32	0.46
30.8	2.93	4.00	0.46	1.08	3.87	4.28	4.92	1.44	1.85	2.32	0.45

Reedy Creek State Park, North Carolina; 21-IV-64; H. H. Neunzig and C. D. Mampe. Larva and associated adults in N.C.S.M.[2] Two larvae, in last instar, labeled: Nature Trail Creek, Reedy Creek State Park, North Carolina; 5-V-64; H. H. Neunzig. Larvae and associated adults in N.C.S.M.

Head.—Frons and vertex reddish-brown, minutely punctate, with smooth, weakly defined maculae which are but slightly darker than ground color. Genal region convex. Labrum (fig. 1) light brown, weakly angulate, about two and one-half times as wide as long. Anteclypeus yellowish with obscure median and lateral longitudinal white lines, width about four and one-half times length. Mandibles reddish-brown, asymmetrically toothed. Maxillae reddish-brown, surpassing mandibles by slightly over one-third length of mandibles. Antennae 4-segmented, basal segment one-half as long as 2nd segment, 3rd segment slightly less than one-half 2nd segment, 4th segment about twice as long as 3rd segment.

Thorax.—Pronotum yellowish-brown to reddish-brown with many short, fine setae and a few moderately long, slender setae, maculation distinct and darker than ground color, width slightly greater than length. Mesoscutum and metascutum yellowish-brown with dark brown maculae, covered with light colored setae and numerous clavate papillae, width four and one-half to five times length (along meson). Thoracic legs light brown, with numerous setae.

Abdomen.—Mostly purplish with numerous white blotches and spots (fig. 3), sparsely covered with light brown setae and light brown clavate papillae. Third segment about two and one-quarter times as wide as long. Eighth and ninth segment each about one and one-half times as wide as long. Lateral appendages, except at base and distal region, a uniform, minutely granulate purple (fig. 3), sparsely covered with setae and clavate papillae. Lateral appendages on first segment about as long as width of segment. Lateral appendages on last segment surpassing anal hooks by one-half length of hooks. Respiratory tubes on eighth segment about three times as long as wide, appproximate basally (fig. 5).

Comments.—See table 1 for measurements. In addition to the three last-instar larvae of *N. fasciatus* collected in Reedy Creek State Park, North Carolina, several other larvae, without associated adults, but believed to be this species, have been briefly examined from Rockhouse Creek, Edgemont, North Carolina.

[2] North Carolina State of the University of North Carolina Museum.

Table 2. Insects associated with larvae of *Nigronia fasciatus* and *Nigronia serricornis*. North Carolina.[3] 1964.

Species of *Nigronia*	Odonata	Ephemeroptera	Plecoptera	Trichoptera	Coleoptera	Diptera
fasciatus	*Cordulegaster erroneus* Hagen	*Stenonema* sp.	*Acroneuria* sp.	*Pycnopsyche* sp.	*Anchytarsus bicolor* Melsh.	*Eriocera fultonensis* Alex.
	Lanthus albistylus Hagen			*Psilotreta* sp.		
	Agrion sp.					*Tipula* sp.
serricornis	*Cordulegaster maculatus* Selys	–	*Perlesta placida* (Hagen)	*Cheumatopsyche* sp.	*Anchytarsus bicolor* Melsh.	*Tipula* sp.
	Boyeria vinosa Say				*Helichus* sp.	
	Agrion sp.				*Psephenus* sp.	

[3] *N. fasciatus* and associated insects were collected from Nature Trail Creek in Reedy Creek State Park, North Carolina. *N. serricornis* and associated insects were collected from Sal's Branch in Umstead State Park, North Carolina.

Nigronia serricornis (Say)

Chauliodes serricornis Say, Long's Exp. 2: 307, 1824.

Material Examined.—Two larvae, in last instar, labeled: Sal's Branch, Umstead State Park, North Carolina; 18-IV-64; H. H. Neunzig. Larvae and associated adults in N.C.S.M.

Head.—Frons and vertex brown to dark reddish-brown, minutely punctate with weakly defined maculae which are frequently lighter than ground color. Genal region convex. Labrum light brown to brown, semielliptical (fig. 2), approximately twice as wide as long. Anteclypeus yellowish with distinct median and lateral longitudinal white lines, width about four and one-half times length. Mandibles asymmetrical, brown to dark reddish-brown. Maxillae brown, surpassing mandibles by about one-third length of mandibles. Antennae 4-segmented, 1st segment about one-half as long as 2nd segment, 3rd segment slightly less than one-half 2nd segment, 4th segment about twice as long as 3rd segment.

Thorax.—Pronotum brown to dark reddish-brown, minutely punctate, with many short, fine setae and a few moderately long setae, markings usually obscure and either lighter or darker than ground color, width slightly greater than length. Mesoscutum and metascutum light brown with brown markings, covered with many light colored setae, devoid of clavate papillae, width about four and one-half times length (along meson). Thoracic legs light brown, clothed with numerous setae.

Abdomen.—Bicolorous, mostly purpureous with numerous white blotches and spots (fig. 4), clothed with light brown setae and light brown clavate papillae. Length of third segment slightly less than one-half width of segment. Eighth and ninth segment each about one and one-half times as wide as long. Anterior lateral appendages mostly whitish (fig. 4) and sparsely covered with setae and clavate papillae. Posterior lateral appendages more darkly pigmented but with similar vestiture. Length of lateral appendages on first segment slightly greater than width of segment. Lateral appendages on last segment surpassing anal hooks by about one and one-half to two times length of hooks. Respiratory tubes on eighth segment about one and one-half times as long as wide, widely separated at base (fig. 6).

Comments.—See table 1 for measurements. Other *N. serricornis* larvae, without associated adults, have been examined from the following localities in North Carolina: Wilson Creek, Edgemont; Davidson River, Pisgah National Forest; Crabtree Creek, Raleigh. Several of the larvae collected in Crabtree Creek were about 5 mm. longer in overall length than the larvae described above in detail.

Key to Last Instar Larvae of **Nigronia**

Respiratory tubes on eighth abdominal segment about three times as long as wide, bases approximate (fig. 5) .... **fasciatus**
Respiratory tubes on eighth abdominal segment about one and one-half times as long as wide, bases widely separated (fig. 6) .... **serricornis**

Biology

Contrary to the statement by Chandler (1956) that "*Nigronia* is found in quiet or stagnant water," both *N. fasciatus* and *N. serricornis* occur in lotic habitats.

N. fasciatus appears to have a rather precisely defined habitat, whereas, *N. serricornis* is less discriminating in its choice of developmental sites. *N. fasciatus* is confined to small, cool, woodland streams. *N. serricornis* usually abounds in medium to large woodland streams, and at times, is found in certain portions of rivers.

Near the origin of a small stream (Nature Trail Creek) in Reedy Creek State Park, North Carolina, larvae of *N. fasciatus* were found to be particularly abundant. The stream near its source is only about 1 to 2 feet wide and about 1 to 6 inches deep. The bed of the stream consists mostly of sand, silt, and small quartz rocks. Temperature of the water was found to fluctuate throughout the year only slightly, from 58 to 65 degrees Farenheit. Much of the habitat is densely shaded by beech (*Fagus grandifolia* Ehrh.), oaks (*Quercus* spp.), and a heavy growth of mountain laurel (*Kalmia latifolia* L.). An interesting insect fauna (table 2) was found associated with *N. fasciatus*, including several species such as *Lanthus albistylus* Hagen which is confined to rocky spring-fed brooks.

A typical habitat of *N. serricornis* is Sal's Branch which is located in Umstead State Park, North Carolina, and is only about ten miles away from Nature Trail Creek in Reedy Creek State Park. The section of the stream inhabited by *N. serricornis* consists of approximately the lower two-thirds where it is about 10 to 20 feet wide and the depth of the water varies usually from about 1 to about 24 inches deep. Large slabs of rock as well as numerous smaller stones form the principal substrate. Water temperature was found to vary, on a yearly basis, from 55 to 74 degrees Farenheit. The habitat is bordered by trees and shrubs, but the growth is not dense and there is only moderate shading of the water. Insects associated with *N. serricornis* in Sal's Branch include several which were found to be associated with *N. fasciatus* (table 2). However, forms tolerating a rather narrow range of environmental conditions were noticeably absent.

Larvae of both *N. fasciatus* and *N. serricornis*, when collected and temporarily placed in enamel trays, were observed to feed on associated *Tipula* larvae. These Diptera were subsequently collected in numbers and successfully fed to *Nigronia* larvae in aquaria.

The earliest date at which last-instar larvae of *N. fasciatus* were observed to pupate at Reedy Creek State Park was May 5. The peak of pupation occurred the following week. All pupae were found about 6 to 12 inches from the stream under moss in shallowly constructed earthen cells.

N. serricornis last-instar larvae were also found to pupate under moss and to a lesser extent under various debris near the edge of the stream. Pupae of *N. serricornis* were first found at Umstead Park in late April.

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THREE NEW SPECIES OF PROCTOTRUPOIDEA (HYMENOPTERA)

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This article presents descriptions of three new species of Proctotrupoidea, the first belonging to the family Scelionidae and the other two to the Diapriidae. Of particular interest is *Ceratobaeus ovivorus*, n. sp., reared from an egg case of the Brazilian spider *Ctenus rufibarbis* Franganillo, carried by the mother spider on bananas in a grocery store in St. Paul, Minnesota. The author is indebted to Professor Clarence E. Mickel for the opportunity to study this material and that of *Synacra insoleta*, n. sp.

Family SCELIONIDAE

Ceratobaeus ovivorus, n. sp.

This differs from *binotatus* Ashmead in having the body light reddish brown, without a dark spot on each side of the second tergite, and in having the anterior wing fasciate. In *binotatus* the head and thorax are very dark brown, the abdomen yellowish brown with a dark spot on each side of the second tergite, and the wings are not fasciate.

Female.—Length 1.95 mm. Head three times as high as thick, 1.2 times as wide as the thorax, 1.3 times as wide as high, and as seen from above flattened in front and deeply concave behind; ocelli small, the lateral ones touching the eye margins and less than their diameters distant from the sharp carina separating the vertex from the occiput; eye distant by 0.7 of its length from the base of the mandible; eye large, nearly circular, closely covered with short erect hairs; frons, vertex, mesonotum and scutellum closely irregularly punctate, subopaque, thickly covered with short hairs; scape nearly straight, cylindrical, about as long as the club, slightly thicker than the pedicel, the latter twice as long as thick and a little thicker than the funicular joints; third joint about as thick as long and as thick as any of the following three joints which are distinctly transverse; club composed of one piece but with three faint transverse lines indicating segmentation, about three times as thick as the pedicel; thorax 1.25 times as long as wide, as long as thick, strongly convex above; notauli short, widely separated; propodeum short, near perpendicular and provided with a thin lamella curving around the upper edge and extending straight down to the bases of the coxae on each side; this continuous thin plate, projecting at right angles to the surrounding surface, is widest above on each side and narrower medially and below; flattened surface enclosed by the lamella is of a proper size and shape to receive the anteriorly flattened horn of the petiole when the abdomen is raised to a horizontal position; abdomen 2.8 times as long as wide and 2.4 times as long as the thorax, depressed, twice as wide as thick, fusiform, pointed apically, flattened and with a narrow lateral flange below, finely and evenly longitudinally striate dorsally and laterally, the striae curving downward on the side beyond the middle; second tergite as long as wide basally, 1.7 times as wide at apex as long, the sides straight, deeply grooved on the basal two-fifths, the grooves shortening progressively toward the sides, the surface behind the grooves finely longitudinally striate as is also the surface of the third tergite; third tergite 1.2 times as wide as long, 1.5 times as long as the second and nearly as long as the following three segments combined, the sides slightly curved; tergites four and five subequal in length, a little shorter than the sixth, finely reticulate except apically; last tergite one and one-fourth times as long as wide at base, triangular, pointed at apex, the surface with a faint indeterminate sculpture medially; wings extending a little past the apex of the third tergite and light brownish with a narrow fuscous band across the middle; body light reddish brown, the antennae (except club which is brownish) and legs yellowish brown.

Type locality.—Possibly Brazil.

Type and paratypes in the University of Minnesota collection; other paratypes in the U. S. National Museum and in the author's collection.

Described from thirty female specimens reared February 16–19, 1935 by D. Denning from an egg sac of *Ctenus rufibarbis* Franganillo. The spider, with its egg sac was found with bananas in a grocery store in St. Paul, Minnesota. W. J. Gertsch, authority on spiders, informed Professor Mickel that *Ctenus rufibarbis* occurs only in Brazil; so it is possible that both the spider and its parasites came from that country.

Family Diapriidae

Synacra insoleta, n. sp.

This may be distinguished from *S. canadensis* (Whittaker), the only other known Nearctic species of the genus, by its protruding mandibles and conspicuously abbreviated wings, and by having the propodeal carina incomplete and the propodeum and first tergite thickly hairy.

Female.—Length 2.29 mm. Head a little thicker (occiput to frons) than wide, with a prominent frontal ledge, somewhat longer (vertex to clypeus) than thick; frons rugulose just below insertion of antennae; head otherwise without sculpture; clypeus with a prominent ridge, on either side of which is a large deep fovea; mandibles long, directed downward, the tips barely crossing; maxillary palpus 3-jointed as in the type species, *S. brachialis* (Nees); the mandibles, however, very different from those of that species, narrow, bidentate at tips, the teeth blunt, the outer one slightly the longer; scape thick, not curved, slightly thinner basally, and with two short tooth-like projections opposite each other at apex, these projections, especially the outer one, distinct in both sexes; antennal joints beyond the fifth narrowed neck-like basally; length–width ratios of antennal joints: $\frac{30}{8}\frac{13}{7}\frac{12}{6}\frac{8}{6}\frac{8}{7}\frac{8}{7}\frac{8}{8}\frac{9}{10}\frac{10}{10}\frac{10}{10}\frac{10}{10}\frac{18}{11}$; antennal pubescence short, mostly less than half the width of the joints; thorax somewhat narrower than head, twice as long as wide and thicker than wide; notauli complete, more finely impressed behind; scutellum transverse, subconvex, with a deep fovea between it and mesonotum; propodeum broadly transverse, with a smooth, rounded, median carina on anterior half; inferior face perpendicular, smooth; front wing abbreviated, extending a little past middle of abdomen, about twice as long as wide, broadly rounded apically, hyaline, thickly pubescent; tip of marginal vein nearly midway between base and apex of wing; marginal vein linear, about seven times as long as wide and about four times as long as the oblique radius; basal vein about as long as the marginal, light brownish, the median vein still paler brown;

abdomen 2.7 times as long as wide, 1.9 times as long as the thorax and 1.35 times as wide, widest on about apical third of second segment, gradually narrowing to a point distally; petiole 1.5 times as long as wide, second segment 1.7 times as long as the following segments combined; propodeum and petiole covered with rather long whitish hairs, which are less dense medially on both segments; body dark reddish brown; legs light yellowish brown; scape and pedicel light brownish, the flagellar joints much darker brown.

Male.—Length 2.01 mm. Similar to the female except as follows: Thorax as wide as head, 1.84 times as long as wide and a little thicker than wide; abdomen 2.3 times as long as long as wide, 1.16 times as wide as the thorax and 1.4 times as long as the thorax, elliptical as seen from above, gradually tapering to a blunt tip; second tergite 1.45 times as long as wide and about four times as long as the petiole; length–width ratios of antennal joints: $\frac{28}{8}\frac{13}{8}\frac{20}{8}\frac{12}{8}\frac{12}{7}\frac{12}{7}\frac{12}{7}\frac{12}{7}\frac{12}{7}\frac{12}{7}\frac{12}{7}\frac{12}{7}\frac{12}{7}\frac{14}{6}$; length of antennal pubescence less than half the widths of the joints; third joint excised on proximal 0.7, 31 microns wide near base, gradually widening to apical 0.4; legs somewhat darker than in female; scape brown, flagellum fuscous. One male paratype differs somewhat from the allotype described above: The thorax is 1.73 times as long as wide; the abdomen is apparently swollen and is 1.75 times as long as wide, widest at apex of second segment, 1.3 times as wide and 1.3 times as long as the thorax, abruptly narrowing to a point posteriorly, the tip curved downward.

Type locality.—St. Paul, Minnesota.

Type and allotype in the collection of the University of Minnesota; paratypes in the author's collection and in the U. S. National Museum. Described from five females and three males reared in 1935 from galls on raspberry roots.

Synacra canadensis (Whittaker)

Paratelopsilus canadensis Whittaker, 1930. Proc. Ent. Soc. Wash. 32:73; Muesebeck and Walkley, 1951. *In* Muesebeck *et al.*, U. S. Dept. Agr., Agr. Monogr. No. 2:690.

Synacra canadensis Masner, 1964. Acta Soc. Ent. Cechosl. 61: 131.

The differences between this species and *insoleta*, n. sp., as detailed under the description of the latter just above, seem too significant, in the author's opinion, to be merely specific, although Dr. Masner, in the paper cited, indicates that such differences occur among other species now included in *Synacra.* Further study of these forms would seem to be indicated.

Miota conformis, n. sp.

This species differs from Ashmead's description of *glabra*, to which it seems to be closely related, in having the last antennal joint one and one-half times (not twice) as long as the penultimate joint, and the body color dark brown to yellowish brown rather than black.

Female.—Length 3.3 mm. Body generally, except the petiole above and on the sides and the gaster, rather thickly clothed with short whitish hairs; head 1.3

times as wide as long, as wide as high and almost as wide as the thorax, 1.2 times as wide as the abdomen; antennae slender, filiform, with short whitish hairs; ratios of lengths of antennal joints: 35 : 7 : 25 : 18 : 16 : 15 : 14 : 12 : 11 : 10 : 10 : 10 : 10 : 10 : 14; average thickness of all joints 6; thickness of scape and last joint 7; thorax 1.6 times as long as wide, as wide as high and twice as long as the head; abdomen twice as long as the thorax; petiole three times as long as wide, smooth and shining, without sculpture except for a longitudinal carina on each side and two short inconspicuous carinae above near the apex; viewed from the side the petiole is slightly but distinctly bowed upward; it is, however, of approximately uniform thickness throughout; gaster 3.2 times as long as wide, as wide as high, decidedly compressed laterally toward apex, and composed of three segments, the first 1.7 times as long as the second and third together, and the third 1.8 times as long as the second; marginal vein 1.6 times as long as the radial cell, 1.3 times as long as the basal vein and as long as the cubitus, which is straight and parallel with the basal vein, continuing the line of the second abscissa of the radius; second abscissa of the radius about three times the length of the first; head, thorax and petiole blackish; first segment of gaster dark brown, second and third segments light yellowish brown, the extreme tip darker brown; antennae brown, the proximal three joints yellowish brown, the scape darker medially.

Type locality.—Westwood, California.

Type.—U. S. National Museum No. 67628

Described from twenty-five female specimens collected by the author in Stone Canyon, adjacent to the University of California campus, October 24 to November 8, 1935. They were on, or slowly flying around, various small plants at the borders of a little stream. Paratypes in the U. S. National Museum and in the author's collection.

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A NOTE ON ZANCHISME KIRKALDY
(HEMIPTERA : MIRIDAE)

J. MALDONADO-CAPRILES, *Department of Biology, College of Agriculture and Mechanic Arts, Mayagüez, Puerto Rico.*

The author wants to thank Dr. T. H. Farr, at the Institute of Jamaica, at Kingston, for the loan of most of the material treated in this paper. We are also grateful to Dr. R. C. Froeschner, at the United States National Museum, for comparing our material with that under his care. This paper was made possible through Grant No. NSF-G15891, from the National Science Foundation. In the measurements that follow 20 units are equivalent to 0.5 mm.

Zanchisme belongs to the myrmecomorphic orthotyline mirids of the tribe Pilophorini. It was established by Kirkaldy in 1904 with *Schizonotus dromedarius* Reuter 1892 as type species. At present it includes only *Z. illustris* Reuter and *Z. dromedarius* Reuter.

In Carvalho's key to the mirid genera of the world (1955), page 80, *Zanchisme* is included in couplet 15. Because Carvalho overlooked the scale-like hairs on the hemielytra of members of this genus his key has to be corrected as follows:

11. Hemielytra with scale-like or transversal silvery scale-like pubescent bands 12
    Hemielytra without scale-like hairs or silvery bands 15
12. Pronotum noticeably constricted at middle, anterior lobe with three tubercles (Jamaica, Venezuela). .... **Zanchisme** Kirkaldy
    Pronotum not constricted, anterior lobe without tubercles 13
13. Hemielytra with long erect bristles and scale-like hairs; pronotum not strongly narrowed in front 14
    Hemielytra with semiadpressed pubescence plus scale-like hairs; pronotum strongly narrowed in front (Bolivia) .... **Lepidotaenia** Poppius
14. Pronotum covering mesoscutum and part of scutellum (Central and North America) .... **Renodaeus** Distant
    Pronotum not covering mesoscutum (North America) .... **Pilophoropsis** Poppius
15. Pronotum noticeably constricted at middle; femora usually somewhat curved 16
    Pronotum not noticeably constricted at middle; femora straight 26

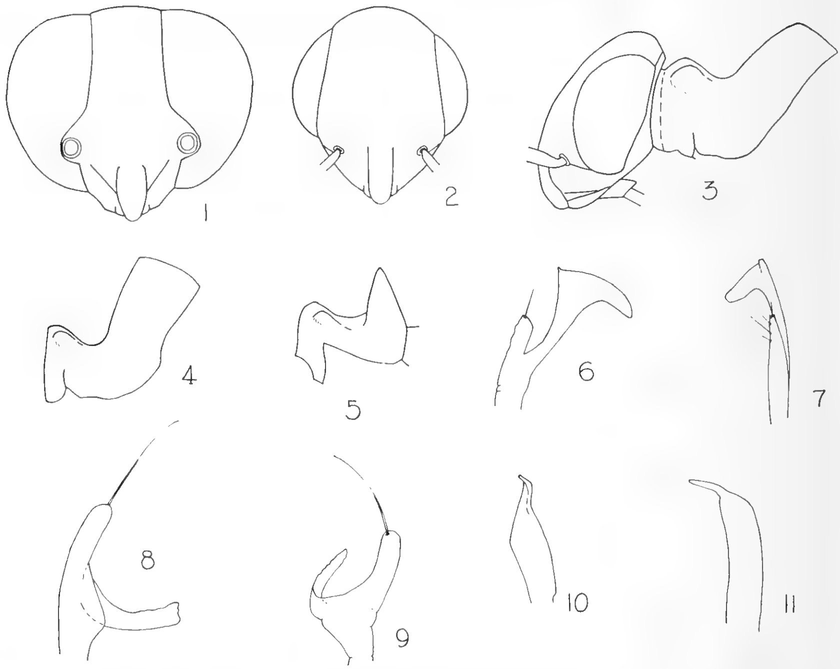
Zanchisme Kirkaldy

Schizonotus Reuter, 1892. Ann. Soc. Ent. Fr. 61:401.

Zanchisme Kirkaldy, 1904. Ent. 37:280.

Schistonotellus Reuter, 1905. Ofv. F. Vet. Soc. Forh 47:32.

Orthotylinae, Pilophorini. Sparsely haired; pronotum and legs with sparse semidecumbent pilosity, hemielytra and sometimes scutellum with scale-like silvery pubescence in addition; pronotum shiny, smooth, strongly constricted before middle, anterior lobe narrower than head, with three tubercles on anterior margin; posterior lobe gibbose, higher and wider than anterior.



Zanchisme illustris Reuter. 1. Head of male, frontal view; 2. Head of female, frontal view; 3. Head and pronotum, female, lateral view; 4. Pronotum, male, lateral view; 5. Pronotum, female ? nymph, lateral view; 6. Right clasper, ventral view; 7. Right clasper, outer lateral view; 8. Left clasper, dorsal view; 9. Left clasper, outer lateral view; 10. Tip of aedeagus, outer lateral view; 11. Tip of aedeagus, dorsal view.

Frons inconspicuously striated above clypeus, vertex smooth; eyes relatively large in males, smaller in females, reaching posterior margin of head. Antenna with second segment longest, first shortest, segments of subequal thickness and somewhat subfusiform; base of antenna partially surrounded by eyes in males, about midway from eyes to clypeus in females. Rostrum slender, thinner than antenna; apex reaching to before middle coxa; first segment partially hidden by bucculae. Hemielytra opaque, costal margin concave; embolium widening to apex; cuneus longer than wide, inner margin semicircular; with sparse long semidecumbent pubescence and silvery scale-like hairs arranged in bands and stripes on clavus and corium; membrane rounded apically, two-celled. Mesoscutum exposed; scutellum triangular, with or without silvery scale-like hairs. Coxae and trochanters well developed; mid- and hindfemora slightly curved, forefemora straight. Abdomen constricted at base, gradually widening from base to last or genital segment.

Type of genus *Schizonotus dromedarius* Reuter 1892.

Zanchisme illustris Reuter.

Zanchisme illustris Reuter. Ofv. F. Vet. Soc. Forh. 49 (5):11.

Male—general body color brown; first three antennal segments pale brownish, first brownish along inner margin, fourth brownish. Beak shiny brown. Fore-coxa brownish, second and third grayish-white. Trochanters grayish-white. Femora brownish, mid and hind grayish-white at base. Tibiae brownish, paler apically. Tarsi pale brownish basally, darker apically. Thorax dorsally and ventrally shiny brown, posterior lobe darker than anterior, osteolar peritreme grayish-white. Mesoscutum and scutellum brownish. Hemielytra with embolium and cuneus reddish brown; clavus, corium, and membrane brownish; two transverse bands of silvery scale-like hairs on anterior half of pronotum, four or five transverse bands on clavus connected by a diagonal stripe along anal margin; cells of membrane grayish-white. Abdomen dark brown.

Head broader than long (29:17), nearly twice as wide as anterior lobe of pronotum (29:15). Eyes relatively large; interocular space above and in front nearly half the width of eye (6:11 and 7:11 respectively), as in figure 1. Antennal segments as follows: I, 8; II, 25; III, 15; IV, 15; very finely and inconspicuously pilose. Anterior lobe of pronotum dorsally with three conical elevations along anterior margin; posterior lobe gibbose, as in figure 4, posterior margin roundly convex. Mesoscutum exposed; scutellum triangular, wider than long (17:12), tranversely rugose. Exposed genital structures as in figures 6 to 11. Overall length 3.0 mm.

Female—general coloration as in male, dark and lighter parts more contrasting. Second antennal segments reddish brown along inner margin. First visible abdominal segment whitish.

Eyes smaller than in male, interocular space over one and one-half times as wide as width of eye on vertex (13:8), as in figure 2. Pronotum with constriction and elevations as in male, posterior lobe roundly gibbose. Hemielytra with overall color and pattern of silvery scales as in male; clavus, corium, and membrane darker than in male. Legs as in male. Antennal segments: I, 6; II, 22; III, 12; IV, 12. Length 3.0 mm.

Nymph, instar unknown, female (?), general coloration as in the adult stage; body shiny brown; first three antennal segments straw-colored, first and second segments with inner margin reddish, last segment brown. Legs brown, mid and femora grayish-white basally, paler apically.

Eyes as in the female adult; bucculae not well developed; antenna with second segment longest, first shortest, segments of subequal thickness and slightly subfusiform. Pronotum strongly constricted after middle; anterior lobe with three conical lobes on anterior margin, the median not well developed; posterior lobe shorter and narrower than anterior, upwardly produced into a tall cone as in figure 5. Wing pads extending to second or third abdominal segment; metanotum shortly elevated above wing pads. Length 2.2 mm.

The two known species can be separated as follows:

Z. illustris: second antennal segment uniformly pale brownish, scutellum without scale-like hairs, and elevations on anterior lobe of pronotum less prominent, forming low convexities.

Z. dromedarius: second antennal segment dark brown with yellow apical third, scutellum with a band of scale-like hairs, and elevations on anterior lobe of pronotum more prominent, forming conical elevations taller than diameter of antennal second antennal segment.

Eight specimens at hand: two males, four females, and one nymph:

Jamaica, St. Catherine and St. Andrew Parish; the specimens from St. Catherine associated with *Crematogaster* sp. (Formicidae, Hymenoptera), T. H. Farr collector, in the collection of the Institute of Jamaica, Kingston; one female, from Kingston, T. H. Farr and J. Maldonado-Capriles collectors, on *Ipomea fistulosa*, in the author's collection.

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TYPE DISPOSITION OF SOME RECENTLY DESCRIBED HEMEROBIIDAE
(NEUROPTERA)

Waro Nakahara has recently published two papers in the Proceedings of the U. S. National Museum (vol. 116, pp. 205–223, and vol. 117, pp. 107–122) on the New World Hemerobiidae. The types of all the new species were deposited in the collection of U. S. National Museum. Unknowingly, however, I had mixed in with material from the National Museum many specimens that had been borrowed from the California Academy of Sciences many years before. To further compound the problem, holotypes of three species were designated from the Academy's material. The holotypes of these three species, *Sympherobius brunneus*, *Nusalala krugeri*, and *Pseudomicromus fuscatus*, have now been returned to the California Academy of Sciences, Golden Gate Park, San Francisco, California.—OLIVER S. FLINT, JR., *Department of Entomology, Smithsonian Institution, Washington, D. C.*

FURTHER DESCRIPTIONS OF TWO ERYTHRAEIDS PREDACEOUS UPON COTTON BOLLWORM EGGS
(ACARINA: ERYTHRAEIDAE)

ROBERT L. SMILEY, *Entomology Research Division, A.R.S., U. S. Department of Agriculture, Washington, D. C.*

Smiley (1964) briefly described two erythraeids, *Balaustium dowelli* and *Erythraeus whitcombi*, without figures because the names were needed quickly. The opportunity is taken here to give a more detailed description and figures for each. Whitcomb and Bell (1964) reported that adults of both species were taken feeding on bollworm eggs and one individual was observed to destroy 15 out of 25 eggs in 5½ hours. They also found that these mites appeared to be most numerous under hot, dry conditions.

Balaustium dowelli Smiley
(Figs. 1–4)

Balaustium dowelli Smiley, 1964. Proc. Ent. Soc. Wash. 66 (2): 110.

Female. Palpus typical for family; palpal tibia with short stout claw possessing a single tooth (fig. 1); palpal setae slender and slightly ciliated. Setae of propodosoma ciliated and subequal in length, sparsely scattered over integument. A single pair of lenslike eyes and a single pair of sensory pits located at about posterior level of crista (fig. 2). Crista long, broad, punctate, with strongly sclerotized ribbonlike longitudinal median band; a pair of slender ciliated sensory setae on anterior portion of crista, and a pair of longer and stronger setae laterad of these; a pair of slender ciliated sensory setae on posterior of crista, and with several pairs (varying in number between individuals) of shorter ciliated setae on shield between anterior and posterior sensory setae (fig. 3). Setal pattern of hysterosoma similar to that of propodosoma. Legs I and IV longer than body; legs II and III about length of body; claws with comblike pattern; empodia absent; leg setae short and numerous. Tarsus I with strongly ciliated setae ventrally, with solenidia and nude setae intermixed laterally and dorsally; tibia I with slender nearly nude setae laterally and ventrally, mixed with slender solenidia dorsally (fig. 4). Other legs with similar patterns, but with fewer solenidia. Tarsus I 191 μ long and tibia I 300 μ long. Length of body, not including gnathosoma, 1066 μ.

Male. Not known.

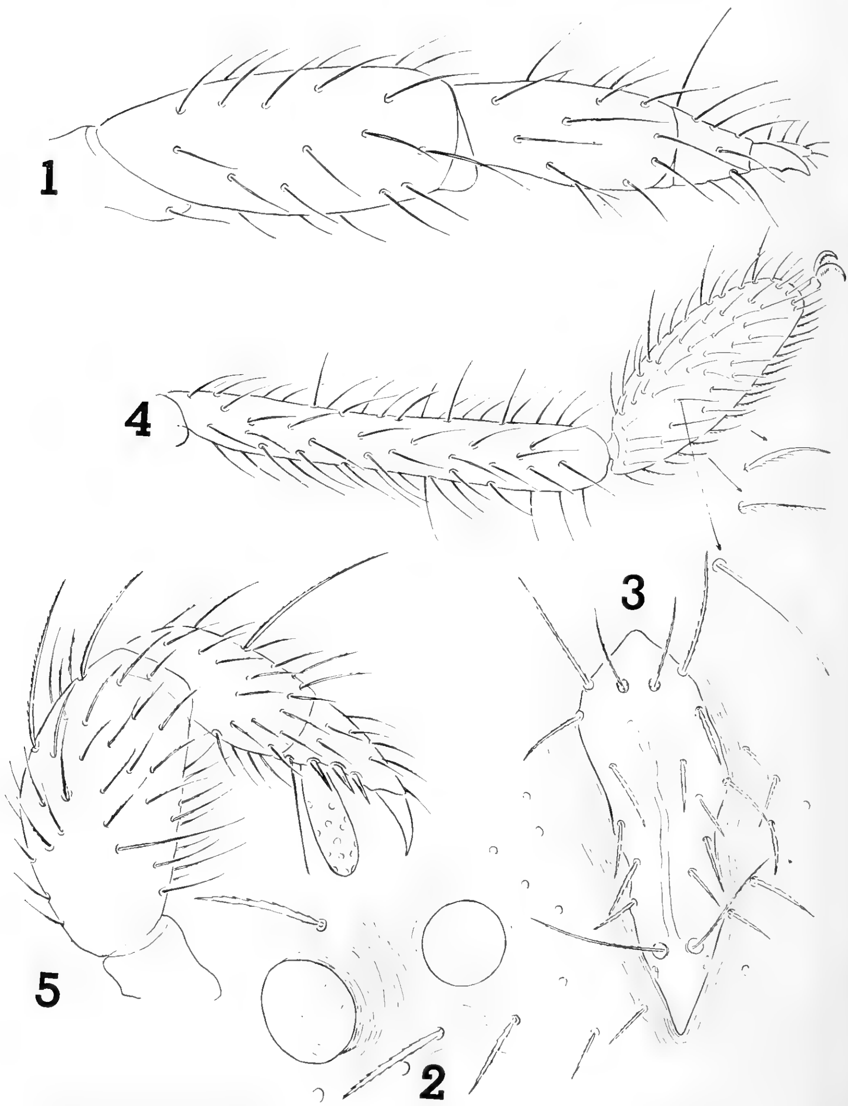
Described from specimens collected on cotton, Conway County, Arkansas, July 26, 1963 by W. H. Whitcomb.

Erythraeus whitcombi Smiley
(Figs. 5–9)

Erythraeus whitcombi Smiley, 1964. Proc. Ent. Soc. Wash. 66 (2): 110.

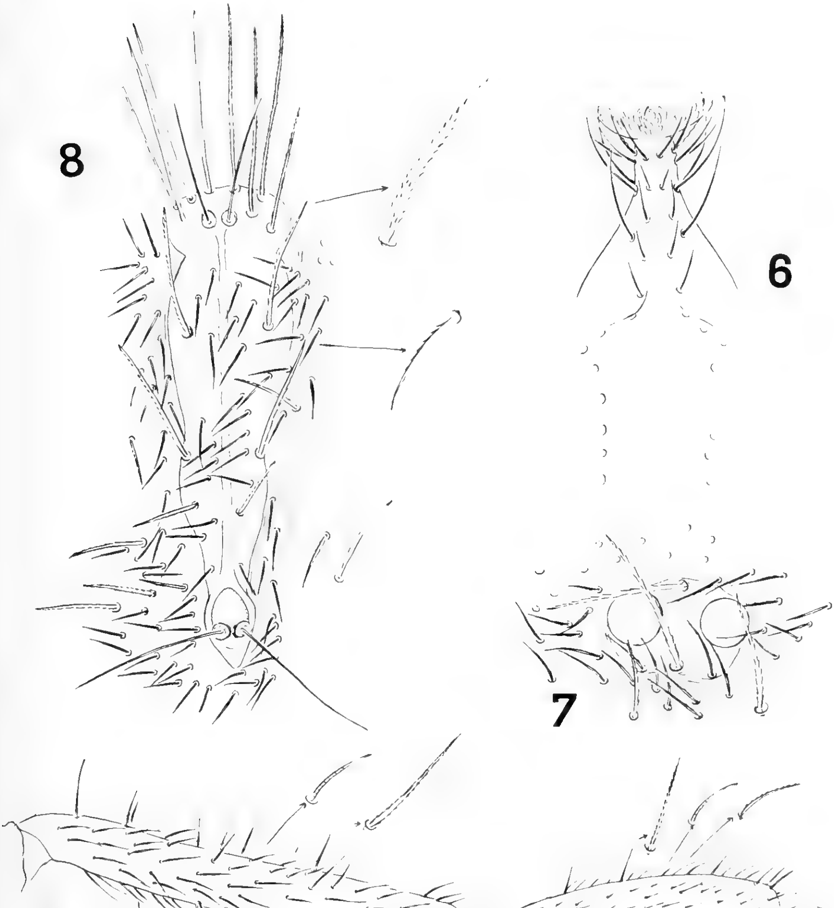
This species is distinctive in the shape and setal pattern of the crista metopica.

Female. Palpi strong; palpal femur pitted, with finely serrated setae; palpal genu with a few short slightly ciliated setae, and one strong serrate dorsal seta; palpal tibia with short, stout distal claw, a few short, slender, slightly ciliated setae, and three short stout inner spines; palpal claw simple, not greatly enlarged;



Balaustium dowelli Smiley. 1. palpus; 2. eye and sensory pit region; 3. crista metopica; 4. tibia and tarsus I. *Erythraeus whitcombi* Smiley. 5. palpus.

palpal tarsus slender and about reaching to tip of claw (fig. 5). Anterior of gnathosoma expanded and with fingerlike projections; ventrally with 11 pairs of setae anteriorly and 8 pairs posteriorly as figured (fig. 6). Dorsal body setae dense, simple and serrate and of two lengths. Eyes set on platelets possessing a lateral pair of strong serrate setae and one to three short serrate setae; eyes set



Erythraeus whitcombi Smiley. 6. venter of gnathosoma; 7. eye platelet; 8. crista metopica; 9. tibia and tarsus I.

behind middle of crista (fig. 7). Crista long, narrow, rounded anteriorly and pointed posteriorly, with a narrow, ribbonlike, strongly sclerotized, longitudinal band; anteriorly with a pair of slender, slightly ciliated sensory setae, and three pairs of stronger ciliated setae; posterior with a single pair of slightly ciliated sensory setae only; median lateral area of crista with three pairs of strong setae of medium length and six pairs of much smaller setae, all ciliated (fig. 8). Legs densely covered with setae. Tarsus I with short, strongly ciliated setae ventrally, a few simple setae and many slender solenidia laterally, and many short solenidia and a few short and slightly serrate and long serrate setae dorsally; claws with comblike pattern; tibia I with many ventral and lateral serrate setae and a few long ventral and dorsal simple setae; many small solenidia dorsal-distally (fig. 9). Other segments of leg I with many serrate setae but without solenidia. Other legs similar, but segments with fewer solenidia than leg I. Tarsus I 395 μ long and tibia I 446 μ long. Length of body, not including gnathosoma, 1866 μ.

Male. Not known.

Described from specimens collected on cotton, Conway County, Arkansas, July 26, 1963 by W. H. Whitcomb.

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A NEW JAMAICAN BLOOD-SUCKING MIDGE FROM LACEWINGS
(Diptera, Ceratopogonidae)

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This note is prompted by the receipt of a series of biting midges found attached to the wings of *Chrysopa* near Kingston, Jamaica by Dr. Thomas H. Farr of the Institute of Jamaica. These midges, identified as a new species of *Forcipomyia*, subgenus *Pterobosca*, are the second species of this subgenus, and the first from the Western Hemisphere, known to feed on lacewing flies. Three other *Forcipomyia* species previously reported from Neuroptera, *eques* (Johannsen), *okadai* (Tokunaga), and *mcateei* Wirth, belong to the subgenus *Neoforcipomyia* Tokunaga.

When I reviewed the species of biting midges ectoparasitic on insects (1956), all of the known species of *Pterobosca* were recorded from Odonata. Tokunaga and Murachi (1959) reported the first *Pterobosca* species parasitic on lacewings from the Palau and Caroline Islands in the Pacific. They expanded Saunders' (1956) classification of the subgenera of *Forcipomyia* to include *Pterobosca*, a decision with which I concur. Unfortunately, the name of their lacewing parasite, *Forcipomyia* (*Pterobosca*) *chrysopae*, is preoccupied in *Forcipomyia* by *chrysopae* Mayer 1934, which in turn is a synonym of the Holarctic *F. eques* (Johannsen). I therefore propose *F.* (*P.*) *chrysopipennis* **new name**, for *chrysopae* Tokunaga, not Mayer.

Tokunaga and Murachi (1959) gave a revised diagnosis of the subgenus *Pterobosca* and presented a key to the 16 known species. More recently the two following species have been described:

Forcipomyia (*Pterobosca*) *asahinai* Tokunaga, 1962, Pacific Insects 4: 188 (Ryukyu Islands; ex *Orthetrum sabina* Drury).

Forcipomyia (*Pterobosca*) *ogatai* Tokunaga, 1961, Bull. Osaka Mus. Nat. Hist. no. 13, p. 3 (New Caledonia; host unknown).

I am pleased to name the new Jamaican species in honor of its collector, Dr. Thomas H. Farr, in appreciation of his continued interest in the study of ectoparasitic midges.

Forcipomyia (Pterobosca) farri, new species
(Figs. 1–5).

Female.—Length of wing 0.75 mm.

Head brown. Eyes bare, contiguous for a considerable distance on upper portion. Antenna (fig. 2) brownish; lengths of flagellomeres in proportion of 15-10-10-10-12-14-16-20-22-23-28-28-38; antennal ratio (combined lengths of the distal 6 divided by that of the preceding 7) 1.8; proximal flagellomeres disciform, lengths gradually increasing through 9 which is as long as broad; 10-12 each about half again as long as broad; 13-14 slightly longer, 10-14 each dis-

Fig. 1. *Forcipomyia* (*Pterobosca*) *farri* n. sp.; photograph of female wing.

tinctly tapering distally; 15 long and tapering to round terminal papilla. Palpal segments (fig. 3) in proportion of 8-10-23-14-15, third segment 1.2 times as long as broad, with a small, deep sensory pit opening by a smaller pore; segments 3-5 dark brown. Mandible slender distally, only about half as broad as usual in the genus; with 10, very heavily sclerotized, minute teeth.

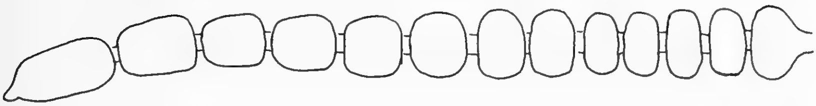
Thorax appearing dark brown in slide mounted specimens. Legs brownish, tarsi whitish; hind basitarsus 3.4 times as long as second tarsomere; fifth tarsomere (fig. 4) nearly twice as long as fourth, slightly longer than broad; claws absent; empodium with dense, long, capitate hairs distally, forming a compact distal pad. Wing (fig. 1) with costa extending to 0.58 of wing length; radial cells slitlike, apparently obliterated; vein M1 ending in wing margin considerably in front of wing tip; macrotrichia very long, but not very dense; discal portion of wing devoid of macrotrichia in lines paralleling the veins and in proximal half of cell M4. Halter deeply infuscated.

Abdomen pale brown, with very sparse hairs and dense spiculation; terga dark brown and reduced to well separated sclerites each about twice as broad as long, each more or less divided into a pair of hemisternites. Spermathecae (fig. 5) two, slightly ovoid, tapering slightly to a short sclerotized neck; unequal, very small, measuring 0.039 mm. by 0.032 mm. and 0.032 mm. by 0.025 mm.

Male.—Unknown.

Distribution.—Jamaica.

Types.—Holotype female, St. Thomas, Morant Bay, 14 mi. east of Kingston, Jamaica, 5 Jan. 1964, T. H. Farr, ex wing of *Chrysopa* (Type No. 67422, USNM). Paratypes, 3 females, same data as type except one with date 2 Feb. 1964. One paratype will be deposited in the



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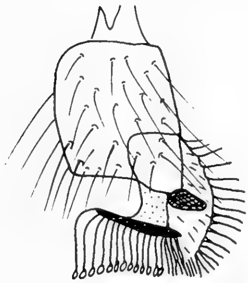

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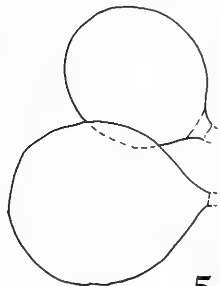

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Figs. 2–5. *Forcipomyia* (*Pterobosca*) *farri* n. sp., female. 1. antennal flagellum; 2. maxillary palpus; 4. fifth tarsomere showing detail of empodium, lateral view; 5. spermathecae.

Museum of the Institute of Jamaica and one in the British Museum (Natural History) in London.

Discussion.—*F. farri* runs in Tokunaga and Murachi's (1959) key to *mollipes* (Macfie) from Africa, and *lairdi* (Wirth) from the Solomon Islands, both of which also lack the tarsal claws and have two spermathecae and a definite palpal pit. *F. mollipes* and *lairdi* both differ from *farri* in having the apex of the mandible much broader, spermathecae subequal, and all of flagellomeres 4 to 9 greatly compressed. *F. lairdi* differs also in having an indistinct palpal pit, and flagellomeres 10 to 14 slightly longer than broad.

Johannsen (1951) did not name a damaged *Pterobosca* specimen from a Puerto Rican dragonfly, which appears to be closely allied to *mollipes* and *farri*. Through the courtesy of Dr. L. L. Pechuman, this specimen was borrowed from the Cornell University collection and reexamined. The antennae are very similar to those of *mollipes*; the mandibles are damaged and palpi are in a poor position to observe the sensory pit; the claws are absent, but the empodium differs from that of *mollipes* and of *farri* in consisting of a pad of fringed hairs much as Macfie (1932) figured for *adhesipes* (Macfie); the spermathecae are larger (0.072 mm. by 0.056 mm.) and narrower. The only other known American species besides *farri* which lacks tarsal claws is the widespread Neotropical *incubans* (Macfie), but it has only one spermatheca. The unnamed Puerto Rican species is apparently new, but it should not be named and described until more adequate material has been collected.

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THE NORTH AMERICAN SPECIES OF PEDIOBIUS WALKER
(Hymenoptera: Eulophidae)

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The chief purpose of this paper is to provide names for three North American species of *Pediobius* Walker that have remained unnamed for many years in the U. S. National Museum collection. It seems desirable, however, to publish at the same time a key to the 23 species that are now assigned to this genus in North America. I also take this opportunity to designate lectotypes for those species that are still represented by a series of cotypes and to include here the available information about the types of all the Nearctic species. In 1963 Peck published a thorough catalog of North American Chalcidoidea (Canad. Ent. Sup. 30, 1092 p.). In this catalog there are complete literature citations for all the described Nearctic species of *Pediobus*, along with all the known distribution and host information. Those data need not be repeated here, although I have included a brief statement about the biological relationships of each species.

This genus has been known for almost a century, in a very large amount of literature, under the name *Pleurotropis* Foerster, 1856. In 1953, however, Ferrière showed that *Pediobius* Walker, 1846, was the correct name for it (Ist. Ent. R. Univ. Bologna Bol. 19: 400). In 1958 I transferred all the Nearctic species from *Pleurotropis* to *Pediobius* (U. S. Dept. Agr. Monog. 2, Sup. 1, p. 68). The North American species of this genus were first revised in 1912, when Crawford published a key to the 9 species that were then assigned to it (U. S. Natl. Mus. Proc. 43: 177–179). In 1915 Waterston (Bul. Ent. Res. 5: 343–346) defined and characterized this genus, and his views are still accepted by all workers in Chalcidoidea. Waterston also described and illustrated many of the best specific characters. He was working with the Ethiopian fauna, but the specific characters he used have been found by subsequent workers to be useful for species throughout the world.

Key to Nearctic Species, Females

1. Legs beyond coxae yellowish tan 2
   All femora and tibiae mostly or entirely black or metallic 3
2. Hind coxae strongly sculptured; apex of scutellum smooth .... **testaceipes** (Crawford)
   Hind coxae smooth; apex of scutellum sculptured .... **crocidophorae**, new species
3. Gaster narrow and elongate, more than 1½ times as long as head and thorax combined; first gastral tergum short, entirely smooth; first funicular segment twice as long as pedicel and ⅘ as long as second and third funicular segments combined .... **longus** (Girault)

Gaster relatively shorter and broader, as long as or shorter than head and thorax combined 4
4. Scutellum smooth medially or at apex; scutellum may be almost entirely smooth, or smooth area may be quite small, figs. 4, 6, 7, 8 5
Scutellum completely sculptured 10
5. Scutellum smooth at apex, sculptured elsewhere, fig. 4 6
Scutellum almost entirely smooth, fig. 7; or smooth medially with sculpturing laterally and at apex, figs. 6, 8 7
6. Vertex smooth; median carinae of propodeum diverging apically .... **lonchaeae**, new species
Vertex shagreened; median carinae of propodeum parallel .... **williamsoni** (Girault)
7. Nearly entire scutellum, including apex, smooth, fig. 7; only a few longitudinal striae present in a narrow area at each lateral margin (in some specimens there appears to be only one longitudinal stria at each lateral margin) .... **longfellowi** (Girault)
Only median area, in basal half of scutellum, smooth, figs. 6, 8; broad sculptured areas laterally and apically 8
8. Median smooth area of scutellum narrow, less than 1/10 the scutellar width, fig. 6 .... **nawai** (Ashmead)
Smooth area covering at least 1/4 the scutellar width, fig. 8 9
9. Vertex metallic green .... **tarsalis** (Ashmead)
Vertex black with brassy or coppery sheen .... **aphidiphagus** (Ashmead)
10. All hind tarsal segments black or dark brown 11
Basal 3 hind tarsal segments tan, yellow, or white; apical segment usually dark brown or black, occasionally also light in color 12
11. First funicular segment 1½ times as long as second, fig. 3; petiole almost twice as broad as long; median propodeal carina single at base, separating into two diverging branches halfway to apex .. **nigritarsis** (Thomson)
First and second funicular segments equal in length, fig. 2; petiole as long as broad; median propodeal carinae double throughout .... **metallicus** (Nees)
12. Area on frons immediately below transverse groove smooth 13
Frons below transverse groove shagreened or minutely alveolate 14
13. Eyes anteriorly emarginate, frons narrow, fig. 1 .... **splendens** (Cook and Davis)
Anterior eye margins almost straight, frons wider, fig. 5 .... **phyllotretae** (Riley)
14. Praescutum and basal third of scutellum with a vague, but discernible, longitudinal median groove; first gastral tergum short; thorax bright metallic green or brassy 15
Not having that combination of characters; longitudinal groove not discernible on praescutum 16
15. Petiole broader than long; thorax bright metallic green; first gastral tergum weakly sculptured apically or entirely smooth .. **utahensis** (Crawford)
Petiole as long as broad; thorax brassy; first gastral tergum strongly sculptured apically .... **perdubius** (Girault)
16. Mesonotal foveae smooth or almost so 17
Mesonotal foveae sculptured much as the rest of the mesonotum 19

17. Entire frons between transverse groove and anterior ocellus smooth .... **bucculatricis** (Gahan)
Frons below anterior ocellus partly or completely sculptured 18
18. Axilla smooth anteriorly, finely shagreened posteriorly .... **lithocolletidis** (Ashmead)
Axilla uniformly covered with alveolate sculpture .... **albipes** (Provancher)
19. Praescutum shining black, non-metallic 20
Praescutum metallic green or blue-green, either brilliant or dark in hue, but distinctly metallic 21
20. Gaster short, first tergum making up most of dorsal length of gaster .... **niger** (Ashmead)
Gaster elongate, first tergum comprising less than half the dorsal length of gaster .... **chloropidis**, new species
21. Gaster elongate, first tergum making up less than half the dorsal length of gaster; praescutum bright metallic green or blue-green .... **rugosithorax** (Crawford)
Gaster short, first tergum comprising most of dorsal length of gaster; praescutum dark metallic green or blue-green 22
22. First gastral tergum almost smooth, with only faint sculpture posteriorly; scutellum metallic blue-green; anterior margin of petiole elevated on dorsal meson as a triangular lobe .... **wilderi** (Howard)
Posterior half of first gastral tergum strongly sculptured; scutellum black with brassy luster; anterior margin of petiole elevated on dorsal meson as a broadly rounded lobe .... **sexdentatus** (Girault)

Pediobius singularis (Howard) was published in the combination *Chrysocharis singularis* in 1882 as a *nomen nudum* (Amer. Nat. 16: 61). In 1891 Howard validated the name by illustrating the pupa (Insect Life 4: 194). This pupa as figured certainly is a member of the genus *Pediobius*, as now defined. No authentic specimens of this species can now be found in the U. S. National Museum collection, or elsewhere. The species cannot be placed from the illustration of the pupa alone. *P. singularis* should be left unplaced.

Pediobius epilachnae (Rohwer), a Philippine egg parasite of the coccinellid beetle *Epilachna*, has been introduced into eastern North America for biological control. It is not known to have been established. It will run out in the above key with *lithocolletidis* and *albipes*, but it differs from both of them in that the mesonotal foveae are narrow, deep, and elongate, rather than being broad and shallow.

Pediobius testaceipes (Crawford)

Pleurotropis testaceipes Crawford, 1914, Ins. Ins. Mens., 2: 37. ♀. Described from one specimen: Type ♀, USNM 18216, labeled, "Hunter No. 3415, Batesburg, S. C., Issued VII.11.'13, E.V.81, Leaf miner on undet. plant, Coll. 7/5/13, Pup. 7/9/13?, Issued 7/11/13, Pleurotropis testaceipes Type Cwfd."

This species is presumably a primary parasite of an undetermined leafminer; no additional specimens have been found since it was described.

Pediobius crocidophorae, new species

Female.—Length 1.2–1.4 mm. Head, thorax (except for scutellum), and propodeum black with faint greenish or brassy luster; scutellum and basal half of first gastral tergum metallic blue-green; petiole and posterior ¾ of gaster black; antennae yellow; coxae tan, with brassy luster; legs beyond coxae yellow; wings hyaline, veins pale tan.

Frons below transverse groove sculptured, area above groove almost smooth, very faintly sculptured, this sculpture becoming more intense on vertex; ocellocular line and length of lateral ocellus equal and each twice as great as the distance from lateral ocellus to occipital ridge; dorsal width of compound eye ½ interocular width at anterior ocellus. Relative lengths of parts of antenna—scape, 30; pedicel, 10; first funicular segment, 10; second, 9; third, 8; club, 16.

Pronotum with 6 dorsal bristles; mesonotum, including foveae, with scaly sculpture. Forewing with marginal vein 10 times as long as stigmal, postmarginal and stigmal veins subequal in length. Scutellum convex and entire surface sculptured; parallel, longitudinal rugae present at base, the addition of transverse rugae in the middle and apical areas producing semirectangular reticulate figures. Propodeum smooth, a pair of widely spaced, parallel median carinae present; sublateral carinae straight, slightly convergent posteriorly.

Petiole as wide as long. Gaster slightly longer than thorax and propodeum; first gastral tergum comprising half the dorsal length of gaster, its anterior half smooth, posterior half shagreened; posterior 6 gastral terga shagreened.

Male.—Length 0.9–1.1 mm. Frons bright metallic green, rest of head brassy; thorax (except scutellum) greenish or brassy; scutellum, coxae, and basal ⅔ of first gastral tergum metallic blue-green; antenna pale tan with faint metallic green luster; legs beyond coxae pale yellow or white, apices of femora usually washed with metallic green.

Antenna with only 3 funicular segments; relative lengths of parts of antenna—scape, 24; pedicel, 9; first funicular segment, 10; second, 10; third, 10; club, 18. Structure and sculpture as in female, except that petiole is slightly longer than wide and gaster slightly shorter than thorax and propodeum (posterior terga may be telescoped beneath first tergum, making gaster half its normal length).

Type locality.—Clemson, S. C.

Type.—USNM No. 67489.

Described from 43 female and 11 male specimens: Type ♀, allotype ♂, and 33 ♀, 8 ♂ paratypes, Clemson, S. C., Aug. 2, 1933, reared from pupa of *Crocidophora pustuliferalis* Led., by W. C. Nettles; 2 ♂, same data, but July 28, 1933; 9 ♀, Louisiana [no locality specified], 1928, reared from *Crocidophora pustuliferalis*, C. O. Hopkins. All specimens deposited in the USNM collection.

Biological relationships.—The above data would indicate that this species is a primary parasite of *Crocidophora pustuliferalis* Led., a pyraustid moth that webs together the leaves of bamboo. Actually, *Pediobius crocidophorae* quite possibly is a secondary parasite, through the braconid *Macrocentrus crocidophorae* Muesebeck.

Pediobius longus (Girault)

Pleurotropis longus Girault, 1916, Canad. Ent., 48: 342. ♀. Described from one specimen: Type USNM 20326, labeled "Lafayette, Ind., W. J. Phillips collector, Webster No. 6304"; specimen fragmentary.

This species has been reared from canary grass, *Phalaris* sp., that also yielded *Harmolita phalaridis* Phillips and Poos.

Pediobius lonchaeae, new species

Female.—Length 1.1–1.8 mm. Shining jet black, with propodeum and base of first gastral tergum faintly metallic green; vertex sometimes metallic green; antennae and legs, except tarsi, black with faint metallic green sheen visible on flagellum, femora, and tibiae; basal 3 segments of each tarsus white, apical one dark brown; wings hyaline, veins brown.

Frons below transverse groove shagreened, areas immediately above groove, and at eye margins, smooth; ocellar area faintly sculptured; ocellocular line and length of lateral ocellus equal; distance from lateral ocellus to occipital ridge ⅓ length of ocellus. Dorsal width of eye ½ interocular width at anterior ocellus. Relative lengths of parts of antenna—scape, 40; pedicel, 14; first funicular segment, 16; second, 16; third, 12; club, 22.

Pronotum with 8 dorsal bristles; mesonotum, including foveae, with strong, scaly sculpture. Forewing with marginal vein 7 times as long as stigmal, postmarginal and stigmal veins subequal in length. Scutellum flattened, smooth at apex, elsewhere with irregular, longitudinal rugae, fig. 4, cross rugulae in apical half forming irregular alveolate or semirectangular figures. Postnotum depressed, and a pair of deep, transverse pits on propodeum just behind postnotum. Propodeum glass-smooth except at posterior margin, where surface is faintly reticulated; median carinae of propodeum divergent from base to apex, lateral carinae straight, parallel.

Petiole broader than long. Gaster ⅗ to ¾ as long as thorax and propodeum; first gastral tergum strongly and densely sculptured on lateral surfaces, median dorsal area with slightly weaker sculpture; first tergum comprising ¾ the dorsal length of gaster, following terga telescoped beneath first, only apical 2 or 3 terga visible.

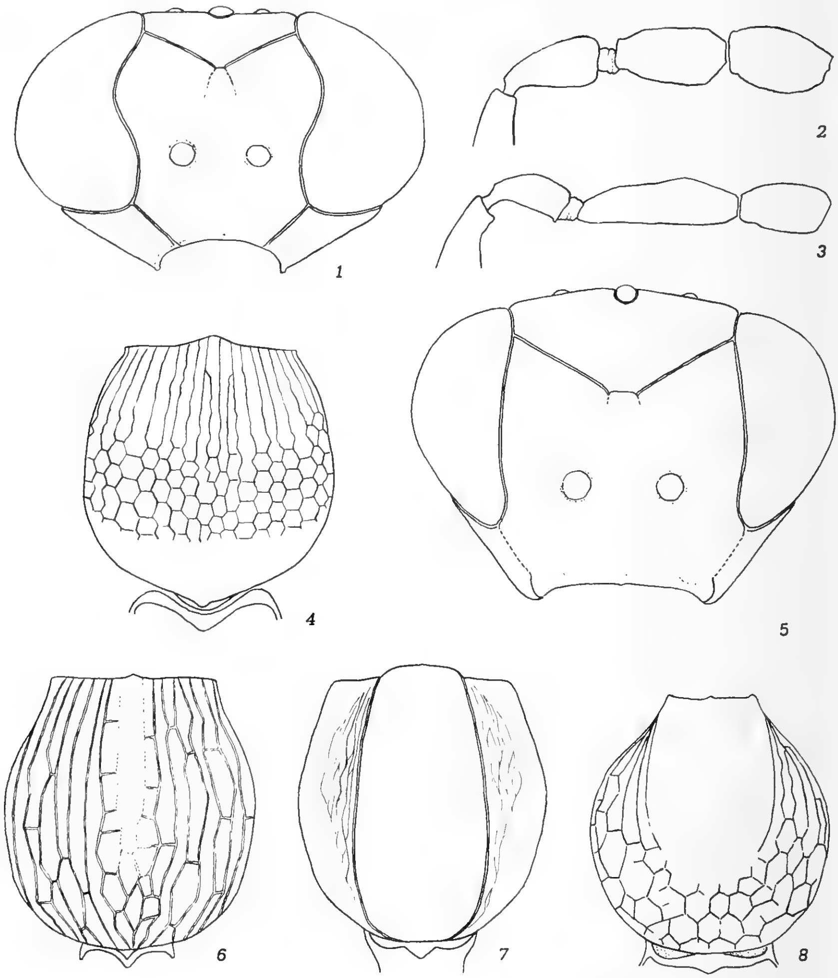
Male.—Length 1.0–1.6 mm. Frons bright metallic green or lavender, vertex green; mesonotum faintly metallic green, propodeum bright green; first gastral tergum green or blue-green; antennae and legs, except tarsi, bright blue-green or lavender, tarsi as in female.

Antenna with 4 funicular segments; relative lengths of parts of antenna—scape, 35; pedicel, 14; first funicular segment, 20; second, 20; third, 18; fourth, 15; club, 20. Structure and sculpture otherwise as in female, except that petiole is slightly longer than broad and gaster is ⅔ as long as thorax and propodeum.

Type locality.—Ithaca, N. Y.

Type.—USNM No. 67490.

Described from 46 ♀ and 27 ♂ specimens: Type ♀, Ithaca, N. Y., no. 589, July 7, 1926, reared from *Lonchaea* sp. in burrows of *Pissodes strobi* (Peck), T. C. Barnes; allotype ♂, same data, but no. 566, June 23, 1926; 12 ♀, 13 ♂ paratypes, same data, but various dates in 1925–1926; 1 ♀, 1 ♂, Mount Alto, Pa., nos. 590, 591, June 24, 1926, T. C.



Pediobius Walker. Fig. 1, *splendens* (Cook and Davis), anterior aspect of the ♀ head; fig. 2, *metallicus* (Nees), pedicel and funiculus of ♀ antenna; fig. 3, *nigritarsis* (Thomson), pedicel and funiculus of ♀ antenna; fig. 4, *lonchaeae*, new species, scutellum; fig. 5, *phyllotretae* (Riley), anterior aspect of the ♀ head; fig. 6, *nawai* (Ashmead), scutellum, drawn from the lectotype; fig. 7, *longfellowi* (Girault), scutellum; fig. 8, *tarsalis* (Ashmead), scutellum.

Barnes; 1 ♀, Essex Co., N. J., no. 561, June 3, 1926, T. C. Barnes; 1 ♀, Franklin Co., Mass., No. 563, June 24, 1926, T. C. Barnes; 1 ♂, Bridgewater, Mass., no. 588, May 1926, T. C. Barnes; 6 ♀, Boston (Roslyndale), Mass., May–June 1928, from white pine shoots, R. L. Taylor; 1 ♀, Pelham, Mass., with white pine weevil, July 22, 1959, J. C.

Downey; 1 ♀, Orford, N. H., no. 567, June 1926, T. C. Barnes; 2 ♀, 1 ♂, Durham, N. H., from weeviled white pine leader, April 7–8, 1954, J. G. Conklin; 1 ♀, Greene, Maine, no. 574, June 1926, T. C. Barnes; Virginia [no localities specified], from *Pissodes strobi* material, July 1963, D. M. Harmon; 1 ♂, Pottageville, Ont., no. 049-1719, Mar. 25, 1950, ex *Pissodes strobi*, F.I.S. 1949; 2 ♂, 5 ♀, Petawawa, Ont., various dates in May and June, 1938 and 1940, ex *Lonchaea* sp. on *Pissodes strobi*, D. E. Gray; 1 ♀, Petawawa, Ont., *Pissodes strobi*, Jan. 27-31, 1940, C. H. Zavitz; 1 ♂, Madoc, Ont., no. 4371A, Jan. 27, 1942 (incubator rearing), *P. strobi*, F.I.S. 1942; 1 ♀, White, Ont., no. 052-1202, *Pissodes strobi*, Aug. 5, 1952, F.I.S. 1952; 2 ♀, Chalk River, Ont., ex *Lonchaea* on *P. strobi*, Jan. 19–20, 1939 (incubator rearing), F.I.S. 1938. Nine ♀ and 4 ♂ paratypes deposited in the Canadian Entomology Research Institute, Ottawa, Ontario; the other specimens are in the USNM collection.

Biological relationships.—This is a primary parasite of *Lonchaea* sp. (probably *L. corticis* Taylor), a fly that invades the burrows made by *Pissodes strobi* (Peck) in the terminal growth of white pine.

Pediobius williamsoni (Girault)

Mestocharis williamsoni Girault, 1911, N. Y. Ent. Soc. Jour., 19: 179. ♀, ♂. Lectotype ♀, Ill. Nat. Hist. Survey, Urbana, Ill.; designated by Frison, 1927, Ill. Nat. Hist. Survey Bul., 16: 222.

This species was reared from conopids of the genus *Physocephala* parasitic on bees of the genera *Anthophora*, *Bombus*, and *Psithyrus*.

Pediobius longfellowi (Girault)

Epipleurotropis longfellowi Girault, 1917, Descr. Hym. Chalc. Var. cum Obs., no. 3, p. 7. ♀. Described from one specimen: Type, USNM 21400, labeled "Parasite of Lithocolletis, Quaintance No. 11031, North East, Pa., VI-4-16, Reared by D. Isley"; specimen fragmentary.

This species has been reared from lepidopterous leafminers of the genus *Lithocolletis*.

Pediobius nawai (Ashmead)

Derostenus nawai Ashmead, 1904, N. Y. Ent. Soc. Jour., 12: 160. ♀, ♂. Described from 1 ♀, 3 ♂ specimens, but the female has been lost: Lectotype ♂, USNM 7200, labeled, "Y. Nawa, Gifu, Japan, Oct. 1902, Derostenus nawaii Ash." Present designation of lectotype.

This is a Palearctic hyperparasite of the gypsy moth and other Lepidoptera, inadvertently introduced into New England along with *Apanteles melanoscelus* (Ratzeburg) before 1920. It is now well established in New England, but has not yet been taken elsewhere in North America.

Pediobius tarsalis (Ashmead)

Asecodes albitarsis Ashmead, 1888, Canad. Ent., 20: 103. ♀. Type lost. Preoccupied in this genus by *Entedon albitarsis* Ashmead, 1888, *ibid.*, p. 102, according to Crawford, 1912, first reviser.

Holcopelte tarsalis Ashmead, 1894, Amer. Ent. Soc. Trans., 21: 341. ♀, ♂. Lectotype ♀, USNM 41376, labeled "Hyper. ex cocoon on sphingid, Accession No. 5402 A. D. Hopk's W. Va., Holcopelte tarsalis Ashm. Type." Present designation of lectotype.

Pleurotropis ashmeadi Crawford, 1912, U. S. Natl. Mus. Proc., 43: 177. New name for *albitarsis* Ashmead. Syn. under *tarsalis* Ashmead by Gahan, 1927, U. S. Natl. Mus. Proc., 71 (4): 26.

This is a common secondary parasite of Lepidoptera. Specimens in the USNM collection emerged from cocoons or pupal cases of primary parasites of the genera *Apanteles*, *Eulophus*, *Dibrachys*, *Hyposoter*, and *Phorocera*; numerous other primary parasites of various Lepidoptera are recorded in the literature as hosts of *tarsalis*.

Pediobius aphidiphagus (Ashmead)

Entedon aphidiphagus Ashmead, 1887, Amer. Ent. Soc. Trans., 14: 201. ♀. Lectotype ♀, USNM 59133, labeled, "Jacksonville, Fla., Entedon aphidiphagus Ashm." Present designation of lectotype.

Asecodes quercicola Ashmead, 1888, Kans. Agr. Expt. Sta. Bul. 3, p. viii. ♀, ♂. Lectotype ♀, USNM 13147, labeled, "Jun., Riley Co. Ks., Marlatt, 841, Oak apple, June 18, '87, Asecodes quercicola Type Ashm." Present designation of lectotype. Species syn. by Gahan, 1951, Canad. Ent., 83: 170.

This species originally was described, in error, as a parasite of aphids. Actually, it emerges from cynipid galls on *Quercus* that have been invaded by tineid larvae, and these are the true hosts.

Pediobius nigritarsis (Thomson)

Pleurotropis nigritarsis Thomson, 1878, Hym. Scand., v. 5, p. 251. ♀, ♂.

Pleurotropis benefica Gahan, 1921, Ent. Soc. Washington Proc., 23: 117. ♀, ♂. Type ♀, USNM 24166, also ♂ allotype, and ♀, ♂ paratypes. Species syn. by von Rosen, 1956, K. Lantbruksh. Ann., 23: 19.

This is a Palearctic parasite of *Cephus* spp., principally *C. pygmaeus* (L.). It probably was introduced into North America along with its host.

Pediobius metallicus (Nees)

Eulophus metallicus Nees, 1834, Hym. Ichn. Affin. Monog., v. 2., p. 176. ♀, ♂. Type probably lost; redescription by Gahan, 1933, U. S. Dept. Agr. Misc. Pub. 174, pp. 133–137 followed here.

Entedon epigonus Walker, 1839, Monog. Chalc., v. 1, p. 112. ♀, ♂. Species syn. by Walker, 1848, List Hym. Ins. Brit. Mus., v. 2, p. 136.

Semiotellus nigripes Lindeman, 1887, Soc. Imp. Nat. Mosc. Bul., ser. 2, 1: 179, 185, 192. Species syn. by Forbes, 1892, Ins. Life, 5: 72.

This is a Palearctic parasite of the Hessian fly, successfully introduced into the Midwest and Maryland from England in 1891–1894.

Subsequently, it has spread naturally to most areas in North America where wheat is grown.

Pediobius splendens (Cook and Davis)

Derostenus splendens Cook and Davis, 1891, Mich. Agr. Expt. Sta. Bul. 73, p. 13. ♀, ♂. Lectotype ♀, USNM 41377, labeled, "Ag. Coll. Mich. 285, Type, Derostenus splendens Cook." Specimen fragmentary. Present designation of lectotype.

This is a secondary parasite of lepidopterous larvae, emerging from the pupal cases of the primary parasite *Eulophus*.

Pediobius phyllotretae (Riley)

Pleurotropis phyllotretae Riley, 1885, U. S. Dept. Agr. Ann. Rpt. 1884, p. 307. ♀, ♂. Lectotype ♀, USNM 2795, labeled, "Par. on Haltica, head mounted, Pleurotropis phyllotretae L. O. H." Fragments of the head and antennae are on a slide. Present designation of lectotype.

Presumably this is a primary parasite of the larvae of the leafmining flea beetle *Phyllotreta*.

Pediobius utahensis (Crawford)

Pleurotropis utahensis Crawford, 1913, U. S. Natl. Mus. Proc., 45: 316. ♀, ♂. Holotype ♀, USNM 15555, labeled, "Salt Lake, Utah, C. N. Ainslie Collector, Reared from mined corn leaf, Webster No. 8819, antenna mounted, Pleurotropis utahensis Type Cwfd." Also allotype ♂, and ♀, ♂ paratypes in USNM collection.

This species is a primary parasite of *Cephus cinctus* Norton, developing both in native grasses and in cultivated grains. It originally was described as a parasite of a dipterous leafminer, but that evidently was an error.

Pediobius perdubius (Girault)

Amestocharis perdubius Girault, 1917, Descr. Stell. Nov., p. 8. ♀. Lectotype ♀, USNM 20243, labeled, "Holliday, Utah 1915, C. W. Creel collector, Webster No. 9371, Pleurotropis perdubius Girault ♀ type." Present designation of lectotype.

This species originally was thought to be a parasite of *Harmolita*, but that may be incorrect. Many thousands of lots of *Harmolita* material have been reared since this species was described, but no additional specimens of it have been obtained.

Pediobius bucculatricis (Gahan)

Pleurotropis bucculatricis Gahan, 1927, Psyche, 34: 171. ♀, ♂. Type ♀, USNM 40398; also allotype ♂, and ♀, ♂ paratypes.

This species is a parasite of lepidopterous, coleopterous, and dipterous leafminers.

Pediobius lithocolletidis (Ashmead)

Entedon lithocolletidis Ashmead, 1888, Kans. Agr. Expt. Sta. Bul. 3, p. viii. ♀, ♂. Lectotype ♀, USNM 13148, labeled, "Sept., Riley Co. Ks., Marlatt, 717, Litho. on H. g. serratus, Sept. 7, '87, Entedon lithocolletidis Type Ashm." Present designation of lectotype.

This is a parasite of lepidopterous, coleopterous, and dipterous leafminers.

Pediobius albipes (Provancher)

Holcopelte albipes Provancher, 1887, Addit. Corr. Faune Ent. Canada, Hym. p. 210. "♂" = ♀. Lectotype ♀ designated by Gahan and Rohwer, 1917, Canad. Ent., 49: 429; deposited in Provancher Collection, Laval Univ., Quebec, P. Q.

Entedon albitarsis Ashmead, 1888, Canad. Ent., 20: 102. ♀, ♂. Lectotype, USNM 62563, labeled, "Arlington, Va., Entedon albitarsis Ashm." Specimen, probably a ♀, consisting only of thorax, 1 forewing, and 3 legs. Present designation of lectotype. Species syn. by Burks, 1964, Canad. Ent., 95: 1259.

This species is a secondary parasite of lepidopterous larvae.

Pediobius niger (Ashmead)

Closterocerus niger Ashmead, 1896, Amer. Ent. Soc. Trans., 23: 232. "♂" = ♀. Lectotype ♀, USNM 28070, labeled, "Algonquin, Ill., 7.25.94, 3979, Type, Closterocerus niger ♂ Ashm." Present designation of lectotype.

This species has been reared from *Acleris* sp., a tortricid leafroller on maple.

Pediobius chloropidis, new species

Female.—Length 1.3–1.5 mm. Head and body jet black, vertex and propodeum with faint metallic green luster, base of first gastral tergum iridescent blue-green; antennae black with metallic green sheen; legs, except tarsi, dark metallic green; basal 3 tarsal segments white, apical one dark brown; wings hyaline, veins dark brown.

Frons below transverse groove shagreened, above groove with faint, scaly sculpture; vertex between lateral ocelli more strongly sculptured, surface smooth in ocellocular area; ocellocular line 1⅓ times length of lateral ocellus, the latter equal to distance from ocellus to occipital ridge. Dorsal width of an eye ⅖ as great as interocular width at anterior ocellus. Relative lengths of parts of antenna —scape, 28; pedicel, 14; first funicular segment, 9; second, 9; third, 8; club, 19.

Pronotum with 6 dorsal bristles; mesonotum, including foveae, with shallowly impressed, striate sculpture, these striae, although irregular, tending to form longitudinal patterns. Forewing with marginal vein 8 times as long as stigmal, postmarginal slightly longer than stigmal. Scutellum flattened, entire surface sculptured, this sculpture in basal ⅔ of scutellum consisting of parallel, longitudinal striae, cross-striae in apical third producing semiquadrate figures. Propodeum glass-smooth in basal ⅘, apical ⅕ minutely shagreened; median carinae slightly divergent posteriorly and relatively widely separated; area between carinae roughened; sublateral carinae arcuate, divergent posteriorly.

Petiole broader than long. Gaster as long as or slightly longer than thorax and propodeum; first gastral tergum comprising less than half the dorsal length of gaster; posterior half of dorsal surface of first tergum lightly sculptured, exposed surfaces of following terga completely covered with more intense sculpture.

Male.—Unknown.

Type locality.—Natrium, W. Va.

Type.—USNM No. 67488.

Described from 6 female specimens: Type and 2 paratypes, Natrium, W. Va., May 4, 1961, reared from *Pseudogaurax* sp., developing in eggs of *Thyridopteryx ephemeraeformis* (Haw.), H. M. Kulman; 3 paratypes, Brooklyn, N. Y., 1936, reared from *Pseudogaurax anchora* (Loew), Louis Roth. All specimens deposited in the USNM collection.

Biological relationships.—This species is a primary parasite of *Pseudogaurax*, a chloropid fly that develops as an egg-predator on the bagworm.

Pediobius rugosithorax (Crawford)

Pleurotropis rugosithorax Crawford, 1912, U. S. Natl. Mus. Proc., 43: 179. ♀, ♂. Lectotype ♀, USNM 14786, labeled, "Reared from Agromyza pupa, July 8, '11, Salt Lake, Utah, C. N. Ainslie collector, Webster no. 6639, antenna mounted, Pleurotropis rugosithorax Cwfd. ♀ Type." Present designation of lectotype.

Pleurotropis kansensis Girault, 1918, Ent. News, 29: 128. ♀. Described from one specimen: Type ♀, USNM 20694, labeled, "Onaga, Kans., Crevecoeur, 305, Pleurotropis kansensis ♀ type Gir." **New synonymy**.

This is a parasite of dipterous leafminers.

Pediobius wilderi (Howard)

Mestocharis wilderi Howard, 1892, Ent. Soc. Washington Proc., 2: 298. ♀, ♂. Lectotype ♀, USNM 2687, labeled, "Sea Cliff, N. Y., May, from Argiope riparia cocoon, Chrysocharis or Mestocharis wilderi ♀ type How." Present designation of lectotype.

This is a secondary parasite in the egg sacs of spiders, emerging from the cocoons of ichneumonid primary parasites.

Pediobius sexdentatus (Girault)

Pseudacrias sexdentatus Girault, 1916, Soc. Ent., 31: 36. ♀. Lectotype ♀, USNM 19992, labeled, "Pseudacrias sexdentatus Gir. ♀ type." Specimen fragmentary and bearing no other labels. Present designation of lectotype.

This is a very common primary or secondary parasite of small Lepidoptera larvae belonging to several families.

ARTHROPODS FROM NESTS OF THE HOUSE SPARROW[1]

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Introduction.—Bird nests are small and relatively closed communities containing a great diversity of arthropod fauna. Some of these arthropods, the nidicoles, have adapted to life in bird nests and are not found in other habitats. A great many forms live primarily in other situations (e.g. within insect nests, animal cadavers, decomposing plants, bark, fungus gardens) that provide conditions similar to those found in bird nests. The nests of birds are also the natural sources of a great variety of arthropods infesting stored foodstuffs, clothing, wood, preserved zoological and botanical specimens, and other materials used by man. Avian ectoparasites feeding on domestic fowl and incriminated in vertebrate disease cycles find harborage here.

This paper describes the arthropod fauna of a Purple Martin house occupied by House Sparrows. During the summer, and especially after migration of martins in the fall, sparrows moved into the martin house during the winter months. Therefore both birds should be considered as determinants of arthropods found in these nests.

Methods.—The martin house was affixed to a post 10 ft above the ground in a farmyard near Madison, Wisconsin. The structure consisted of two stories with eight apartment cells in each story. It was disassembled on October 26, 1962 and the nests were removed and retained in plastic bags at 45°F until examination. After litter was removed from the house, the mites, pseudoscorpions, and small insects adhering to the walls and floors were swept into a container. Arthropods were extracted with a Berlese funnel. Heat from a 60-w tungsten bulb forced them from the litter into a pint Mason jar containing alcohol.

Composition of the Nest.—The litter consisted of cubes of dried straw which had been molded by the walls of each apartment cell. The bottom of each cube was a dense mass of tightly-packed granular material bound together by matted straw. This floor debris contained bird feathers, dried feces, fragments of insect bodies, and snail shells. Although the fibrous materials on top of the nests were dry, the matted grass and finely-divided debris in the floor of each cell was moist. The nests were sheltered from rain but some water probably entered through cracks in the frame.

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Table 1. Arthropods collected from the sparrow nests.

Order	Family	Species	Numbers and instar
Chelonethida	Cheliferidae	*Chelifer cancroides* (L.)	15 A[c]
Aranae	Theridiidae	*Theridion tepidariorum* (Koch)	2 A
		Steatoda borealis (Hentz)	1 A
Acarina	Blattisocidae	*Proctolaelaps hypudaei* (Oudemans)	
	Cheyletidae	*Cheyletus eruditus* (Schrank)	
	Epidermoptidae	*Dermatophagoides* sp.	
	Laelaptidae	*Haemolaelaps casalis* (Berlese)	3,500 A and I
	Oribatulidae	*Zygoribatula* sp.	
	Tyroglyphidae	*Acarus siro* L.	
	Uropodidae	*Leiodinychus krameri* (Canestrini)	
Collembola	Poduridae	*Xenylla grisea* Axelson[b]	1 A
Psocoptera	Liposcelidae	*Liposcelis bostrychophilus* Badonnel	8 A
Lepidoptera	Pyralidae	*Pyralis farinalis* (L.)[ab]	1 I
	Tineidae	*Acedes fuscipunctella* (Haworth)	21 I
Coleoptera	Coccinellidae	*Adalia bipunctata* (L.)[ab]	2 A
	Cucujidae	*Ahasverus advena* (Waltl.)[ab]	1 A
		Laemophloeus (*Cryptolestes*) sp.[ab]	1 A
		Oryzaephilus surinamensis (L.)[b]	2 A
	Dermestidae	*Anthrenus scrophulariae* (L.)[b]	2 A, 2 I
		Attagenus sp.	15 I
		Dermestes lardarius L.	2 A
	Histeridae	*Carcinops pumilio* Erickson[a]	17 A
		Dendrophilus xavieri Marseul[ab]	50 A, 7 I
		Gnathoncus nanus Scriba[b]	2 A
	Scarabaeidae	*Aphodius granarius* (L.)[b]	1 A
		Trox aequalis Say[ab]	1 A
		Trox scaber (L.)	15 A
	Tenebrionidae	*Alphitobius diaperinus* (Panzer)[ab]	1 A
		Cynaeus angustus (LeConte)[ab]	11 A
		Tenebrio molitor L.	142 A, 120 I
Hymenoptera	Braconidae	*Chremylus elaphus* Haliday[ab]	3 A
Diptera	Ephydridae	*Paracoenia bisetosa* (Coquillett)[ab]	1 A
	Calliphoridae	*Protocalliphora* sp.	1 I
	Muscidae	*Fannia* sp.	1 I
	Scenopinidae	undetermined	22 I
Siphonaptera	Ceratophyllidae	*Ceratophyllus idius* Jordan and Rothschild	690 A

[a] genera not previously reported from nests of the House Sparrow, *Passer domesticus* (L.)
[b] genera not previously reported from nests of the Purple Martin, *Progne subis* (L.)
[c] the capital letters A and I represent adults and immatures, respectively.

Arthropod Species Represented.—Ten species of arachnids and 26 of insects were represented in the nest fauna (Table 1). Mites were the most numerous and most widely distributed group. Many were found on the horizontal and vertical dividers of the martin house as well as within nest litter. All 3,500 mite specimens were not examined. A sample of about 200 mites contained seven species.

Mites from bird nests apparently have not been studied as intensively as insects. *Cheyletus eruditus* has been reported from bird nests in England (Woodroffe, 1953). *Dermatophagoides scheremetewskyi*

Bogdanow was reported from a sparrow nest in Durham, North Carolina (Baker et al., 1956). Species of *Haemolaelaps* are commonly associated with birds including the House Sparrow (Strandtmann, 1949).

Ecological Relationships.—The arthropod fauna of this study included: 1) bird ectoparasites; 2) scavengers of dried plant and animal materials including mycetophagous forms; and 3) predators and parasites of these arthropods.

The bird ectoparasites may or may not be considered as nidicoles. Although they are not directly dependent on the nest for nourishment (flea larvae excepted), their significance in nest ecology must be based on their degree of association with the nest as well as on their basic food requirements. Bird fleas (*Ceratophyllus* spp.) for example spend more time in the nest than on the host and therefore serve as an important food source for spiders, histerids, staphylinids, and other predators. They also contribute to the formation of nest litter and may be involved in the phoretic transport of mites and the introduction of organisms pathogenic to other nest inhabitants.

Bird ectoparasites collected in this study included the flea *Ceratophyllus idius* and the fly larva *Protocalliphora.* The bird lice *Menacanthus annulatus* Giebel and *Bruelia subtilis* (Nitzsch) were removed from sparrows living in these nests but were not found within the nests proper.

Most of the fauna from the sparrow house were scavengers. At least two species of mites are included in this group. The grain mite, *Acarus siro*, is a common and injurious species attacking stored cereal products in North America. *Leiodinychus krameri* is reported from damp, moldy grain and is probably mycetophagous (Hughes, 1948).

Most of the scavengers reported here also occur in stored products. The booklice, moths, and the cucujid, dermestid, and tenebrionid beetles feed on dried plant and animal products. The food range of this group is very broad and includes fungi (*Pyralis*, *Ahasverus*, *Laemophloeus*, *Alphitobius*, *Attagenus*, and *Anthrenus*), dried plant materials (*Liposcelis*), and dried animal materials (*Tinea*, *Attagenus*, *Anthrenus*, and *Dermestes*) (Linsley, 1944). When the larder beetle, *Dermestes lardarius*, is numerous it may attack and kill nestling birds (Rothschild and Clay, 1952).

Some other scavengers are more common in detritus than in food products. *Dendrophilus* includes species which are found in the nests of Hymenoptera, rodents, and birds but may occur in stored foods. *Fannia* breeds in decomposing organic matter including cadavers, excrement, fermenting foods, and refuse in the nests of birds and Hymenoptera (James, 1947). *Trox* includes beetles found in dried animal cadavers and bird and mammal nests. *Aphodius granarius* is found on fungi and in dung (Dillon and Dillon, 1961).

The remaining arthropods are entomophagous. *Gnathoncus* is a common nidicole in bird nests in Great Britain where it feeds voraciously on fleas in all stages of development (Rothschild and Clay, 1952). *Carcinops pumilio*, *Cheyletus eruditus*, and scenopinid larvae are common predators found in stored grain and bird nests. The two-spotted lady beetle, *Adalia bipunctata*, is a well known predator of ornamental and agricultural pests. *Chremylus elaphus* has been recorded as a parasite of *Pyralis farinalis* and *Acedes fuscipunctella* (Muesebeck *et al.* 1951). The spider, *Steatoda borealis* was reported from nests of the Catbird (*Dumetella carolinensis* (L.)) (McAtee, 1927).

Chelifer cancroides is never found in habitats far removed from man; this pseudoscorpion is widespread and abundant in chicken houses, barns, dwellings, beehives, and nests of starlings and sparrows (Hoff, 1944). Rothschild and Clay (1952) say that this species is carried to new habitats by attaching itself to various insects, especially flies, and birds. It feeds on mites.

Summary.—Thirty-six species of arthropods were removed from the nests of House Sparrows occupying a Purple Martin house. Arthropod fauna included bird ectoparasites, scavengers, and entomophagous forms.

Mites were the most widely distributed and numerous group, at least seven species being represented by 3,500 specimens. Fleas and yellow mealworm larvae and adults were the most numerous insects.

A tenebrionid beetle found in this study, *Cynaeus angustus* (LeConte), is reported from bird nests for the first time. Fifteen insect genera are reported for the first time from either sparrow or martin nests or both.

Acknowledgments.—Grateful acknowledgment is made to the following specialists for determination of arthropods collected in this study: R. E. Crabill, Aranae; E. W. Lindquist, Acarina; D. L. Wray, Collembola; E. L. Mockford, Psocoptera; K. C. Emerson, Mallophaga; H. W. Capps, Lepidoptera; E. A. Chapin, Coccinellidae; T. J. Spilman, Cucujidae and Tenebrionidae; J. M. Kingsolver, Dermestidae; R. L. Wenzel, Histeridae; O. L. Cartwright, Scarabaeidae; R. D. Shenefelt, Braconidae; C. W. Sabrosky, Calliphoridae; G. Steyskal, Muscidae; W. W. Wirth, Scenopinidae and Ephydridae; and P. Johnson, Siphonaptera. The pseudoscorpion was identified by the author.

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TWO SPONTANEOUS MUTANTS OF CULEX TARSALIS
(Diptera: Culicidae)

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Studies of the inheritance of resistance to insecticides in *Culex tarsalis* Coquillett have been hampered by the lack of genetic markers in this species. Plapp and his colleagues (1961) described the inheritance of resistance to DDT and malathion in *C. tarsalis*; the former was inherited as a recessive and the latter as a dominant. Matsumura and Brown (1961) also found malathion resistance to be inherited as a dominant or semi-dominant in this species. Sex-linkage was neither sought nor found by these workers. No other genetic studies of *C. tarsalis* have been reported.

Breland (1961) has shown that the diploid number of chromosomes in *C. tarsalis* is six, as in other mosquitoes which have been studied. Sex appears to be determined by a single gene or a short region of the sex chromosome as reported by Gilchrist and Haldane (1947) for *Culex pipiens* Linn. Sex is thus a marker for one of the three linkage groups. The present work describes a marker for a second linkage group as well as a factor linked with sex.

Materials and Methods.—The colony used in this study was established with material from Bakersfield, California in 1956. Rearing is by conventional techniques and is carried out at about 25°C. The two mutants appeared spontaneously after several years' culture. It is not know whether the mutants were present at the time the colony was established.

Results.—White-eye (*w*) results in a lack of pigmentation of the eyes of adults, pupae, larvae, and embryos. Repeated replicate crosses indicate that *w* is fully penetrant and recessive. Linkage with sex was tested for by crossing males heterozygotic for *w* with white-eyed females (Table 1). The results indicate that *w* is inherited independently of sex.

Wild-type pupae and late fourth-instar larvae of *C. tarsalis* vary in color from brownish to violet to green. Yellow-larva (*y*) results in a light pigmentation which is characteristically a deep orange in female larvae and pupae and a lighter brownish color in males. There is some difficulty in distinguishing mutant and wild-type pupae which are male but there is no difficulty in distinguishing females. Repeated replicate crosses indicate that this factor is recessive. Heterozygote males were crossed with females homozygous for the recessive to test for sex-linkage (Table 2). The males in these tests had *y* in coupling with the factor for maleness, *M*. It will be noted that

Table 1. Backcrosses of white-eye in *Culex tarsalis.*

Parents	Progenies	Number of offspring				Total
		white-eye		black-eye		
		♂	♀	♂	♀	
$\frac{w}{+}\frac{M}{m} \times \frac{w}{w}\frac{m}{m}$	25	750	762	762	790	3064
$\frac{w}{w}\frac{M}{m} \times \frac{w}{+}\frac{m}{m}$	12	448	441	489	492	1870
Total		1198	1203	1251	1282	4934

y tended to be inherited in association with *M.* The reciprocal backcross, in which the female was heterozygotic, resulted in a lack of association between *y* and *M.* There is some variability in the data because of the difficulty of classifying males correctly but the crossover rate between *M* and *y* was about 6% regardless of whether or not males were included. The results indicate a strong linkage between yellow-larva and sex.

Mutant phenotypes similar to these are known in *Culex pipiens*; white-eye was described by Gilchrist and Haldane (1947) and yellow-larva was described by Ghelelovitch (1950), Laven (1957), and Spielman (1957). A strain of *C. pipiens* homozygous for these factors was reciprocally crossed with the strain of *C. tarsalis* homozygous for *y* and *w.* Several thousand adults were used in each cross. Mating was poor owing to flight impairment of the white-eyed strain of *C. pipiens.* Although many thousands of eggs were laid, much less than 1% of them were fertile. Three hybrids of the cross *C. pipiens* female × *C. tarsalis* male hatched and all had black eyes. Two of these matured and were morphologically intermediate between the two species. The hybrid late-instar larvae and pupae were yellow. One female and one male adult emerged but the female adults did not produce eggs. Previous results with this cross (unpublished) suggest that the hybrid adults are sterile.

Discussion.—White-eye appears to be an excellent marker of one of the autosomes of *C. tarsalis.* It is fully penetrant and appears to have no associated deleterious characteristics. The linkage group of this factor is not designated at present since we hope to be able to determine its analog in *Culex pipiens* and use the same linkage designations for both species. In time we wish to extend these designations to other members of the subgenus *Culex.*

White-eye appears not to be linked with sex in *Culex tarsalis.* Fragmentary data not shown here indicate that it is also not linked with yellow-larva, which is sex-linked.

Table 2. Backcrosses of yellow-larva in *Culex tarsalis*.

Parents	Progenies	Number of offspring: yellow-larva ♂	yellow-larva ♀	violet-larva ♂	violet-larva ♀	Total
$\frac{y}{+}\frac{M}{m} \times \frac{y}{y}\frac{m}{m}$	19	771	51	40	699	1561*
$\frac{y}{y}\frac{M}{m} \times \frac{+}{y}\frac{m}{m}$	21	364	308	299	314	1285

*Crossover ratio = .058

Since white-eye is sex-linked in *C. pipiens* it is to be expected that the factor is not allelic in the two species. Hybrids, as expected, had wild-type eyes.

Yellow-larva in *C. tarsalis* is a poor marker owing to its poor expression in males. The figures presented are approximate but they indicate close linkage with sex; the crossover ratio is about 6%.

In *C. pipiens*, yellow-larva is fully penetrant and is in linkage-group 2. It sometimes behaves as a recessive (Ghelelovitch, 1950; Spielman, 1957) but may also behave as a semi-dominant (Laven, 1957; and unpublished observations of the writers). It appears that each factor present at this locus results in the production of pigment of a given color. Individuals with two *y* alleles would produce only yellow pigment. Individuals with one *y* and one wild-type allele would produce a yellow pigment and a dark pigment. In some larvae the yellow pigment can be detected in heterozygotes as reported by Laven (1957). In other larvae, owing to a slightly different "wild-type" allele or, possibly to modifiers, heterozygotes can not be distinguished by their color.

The yellow color of hybrids of *C. tarsalis* and *C. pipiens* would seem to indicate that *y* is allelic in these species. Linkage data, however, indicate that the factors are probably in different linkage groups in the two species. A part of the yellow color could be due to the semi-dominance of *y* from *C. pipiens*. If *y* were also semi-dominant in *C. tarsalis*, as may be the case, it might be expected that hybrid larvae would have a rather strong yellowish cast. We believe this is the correct explanation for the yellow color of hybrids.

Summary.—Two mutants of *Culex tarsalis* are described for the first time. White-eye (*w*) is fully penetrant, recessive, and autosomal. Yellow-larva (*y*) is sex-linked, and recessive or possibly semi-dominant; it is poorly expressed in males. The white-eye of *C. tarsalis* is not allelic with that of *C. pipiens*. Crosses between *C. tarsalis* and *C. pipiens*, both homozygous for the yellow phenotype, produce hy-

brid larvae which are yellow; this result is ascribed to semi-dominance of the two factors rather than their being allelic.

Acknowledgments.—The writers wish to express their gratitude to Mr. Melvin M. Boreham for technical assistance, and to Dr. G. A. H. McClelland for his helpful criticism.

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A NEW SPECIES OF ATHERIGONA RONDANI CAUSING DAMAGE TO WHEAT PLANTS IN WEST PAKISTAN
(DIPTERA: MUSCIDAE)

GEORGE C. STEYSKAL, *Entomology Research Division, A.R.S., U. S. Department of Agriculture, Washington, D.C.*

In material collected and submitted for determination by K. M. Naqvi, of the Agricultural Research Institute, Government of West Pakistan, were the specimens described here as a new species. I am happy to dedicate the species to its collector, who is engaged in a study of its biology and seeking a means of controlling its "considerable damage to wheat."

Atherigona naqvii, new species
(Figs. 1–5)

Male. Length of wing, 2.7–3.25 mm.

The following parts blackish: ocellar triangle, back of head (except near oral margin), third antennal segment (except extreme base laterally and somewhat more mesally); palpus at base; sclerotized parts of proboscis; thorax (except humeri and approximately apical third of scutellum); apical third of f_1 (except knee); tarsus_1 (except last two segments), and a pair of round spots just apicad of midlength of abdominal terga 3 and 4. A pair of faint brown spots on tergum 2 and brown median longitudinal line on terga 2 and 3 usually present. Apical half of t_1 usually more or less infuscated. Remainder of body and legs tawny. Wings wholly hyaline; veins light brown; halter and squama, including margin and very short fringe, whitish. Basal segments of arista sometimes brownish, apical part of arista black.

Whole insect distinctly pruinose, only prosternum and haustellum nearly shining; mesonotum appearing grayish, with narrow brown *dc* lines and often with rather narrow brown line between mesal 2 rows of *acr* hairs.

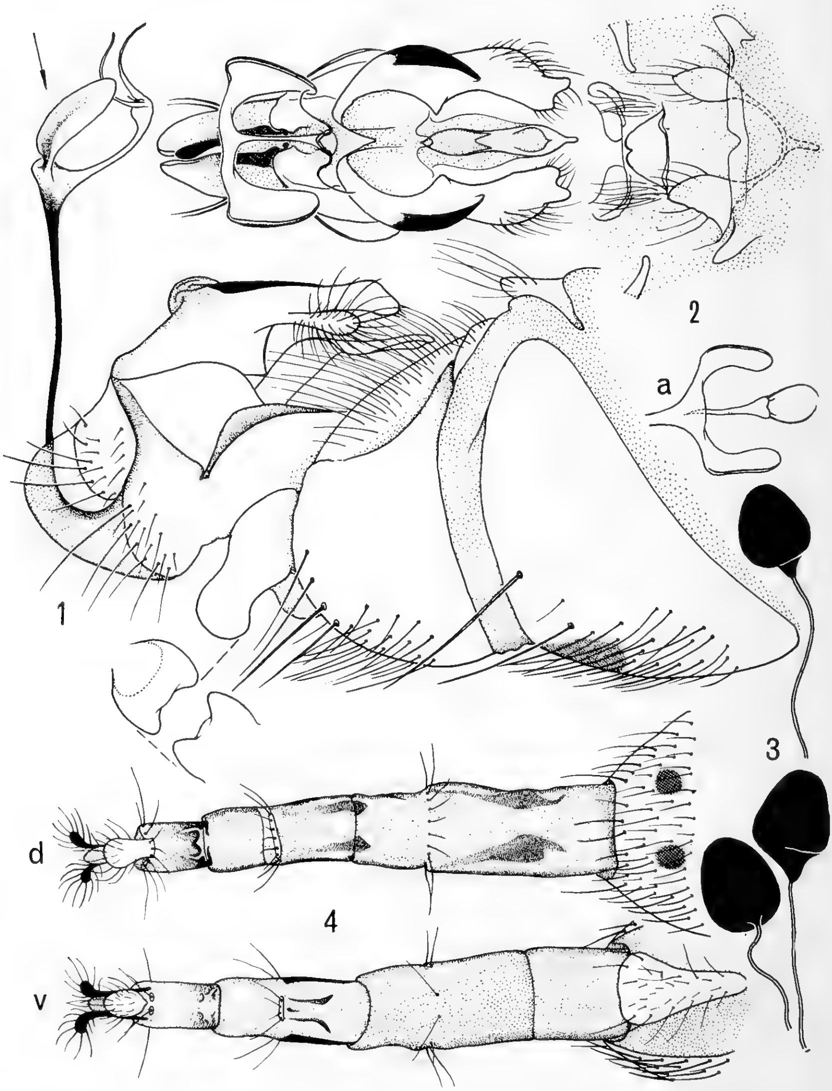
Bristles and hairs black, including those near anus; only apical palpal hairs and those situated ventrally about the copulatory apparatus yellowish.

Head as in figure 5; front at narrowest part (opposite ocellar triangle) 0.28–0.30 of total width of head, medifrons half as wide as front; face deeply, roundingly concave.

Thorax with rather sparse notal hairs; 2 strong posterior *dc*; 4 rows of presutural *acr* hairs, of which the mesal 2 rows diverge markedly toward rear and sometimes have a few hairs between them; 6 rows of postsutural *acr* hairs, including a pair of well-developed *prsc*; largest *pa* a little longer than apical *sc*; subbasal *sc* nearly as long as apicals and preceded by a smaller basal pair about ⅓ their length; *stpl* triangle nearly equilateral, posterior side a little the shortest, ventral bristle weakest and posterior one strongest and longest; 5–6 small hairs also on sternopleuron, of which 1 or 2 are within the triangle; *ppl* 2, long; 1 small poststigmatal.

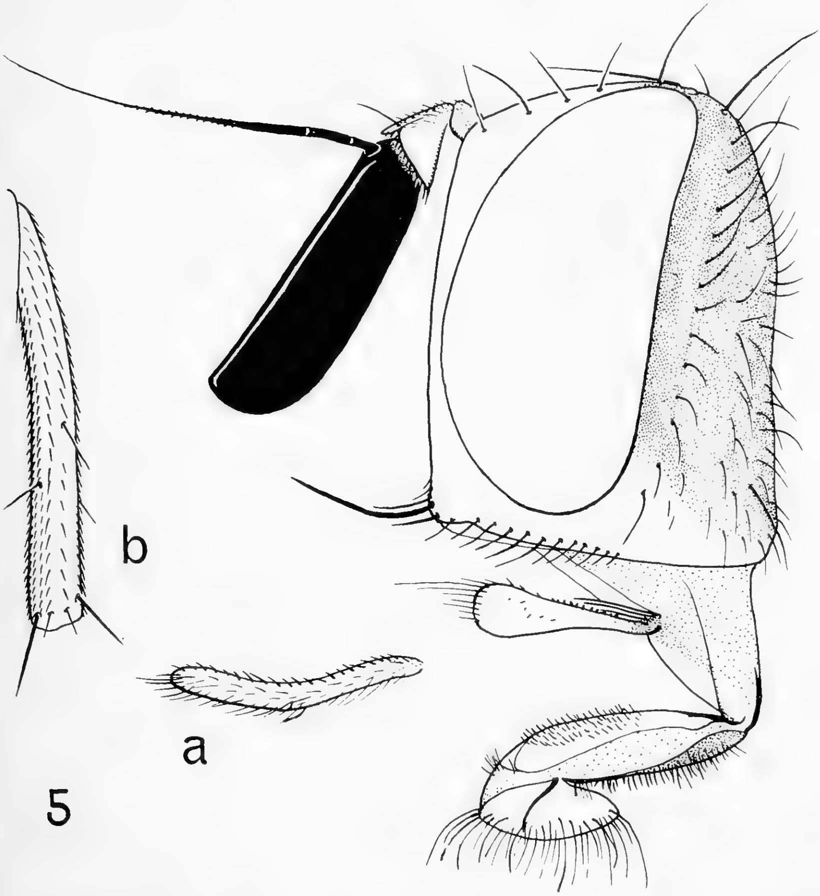
Legs of ordinary shape; f_1 with 2 outstanding preapical *pv*; t_2 with small median *p*; t_3 with *av*, *ad*, and *pd* as in figure 5b.

Wings with *ta* at 0.43 of length of discal cell and opposite end of auxiliary vein; 3rd and 4th veins distinctly converging, last section of 3rd vein with long gentle arcuation, of 4th vein straight.



Atherigona naqvii, new species. Fig. 1, lateral view of male postabdomen; fig. 2, ventral view of copulatory apparatus from direction of arrow in left upper corner, a—trifoliate process of another specimen at different magnification; fig. 3, spermathecae; fig. 4, female postabdomen, d—dorsal, v—ventral view.

Abdomen with lateral marginal bristles of terga 3 and 4 conspicuously longer than others; postabdomen as in figs. 1 and 2; dorsal (hypopygial) process weakly bituberculate, sometimes with median tubercle in dorsal view nearly as long as laterals; trifoliate process as figured (figs. 1, 2, 2a), stem black, only streaks



Atherigona naqvii, new species. Fig. 5, lateral view of head of male; a—palpus of female; b—hind left tibia of male.

on lateral lobes blackish, median lobe yellowish, slender, with 2 long curved filaments, mesad of which are 2 small hairs; ventral receptacular area (right end of fig. 2) with characteristic processes and apodeme.

Female. Similar to male. Length of wing, 3.18–3.53 mm. Palpus (fig. 5a) slender, yellowish, infuscated at base, with short black hairs, the dorsal row of which are spinuliform. Legs with f_1 blackish, except at base; t_1 blackish, except for short distance at base; all tarsi slender, blackish. Wings with *ta* at 0.35–0.37 of length of discal cell and distinctly basad of end of auxiliary vein. Abdomen with all hairs black, dorsal blackish spots rather more pronounced than in male, often with more or less distinct pair on terga 2 and 5 (fig. 4d) and with median line in nearly whole length of preabdomen. Postabdomen (ovipositor) as in fig. 4, with little well-developed sclerotization; spermathecae (fig. 3) 3, black, obturbinate, with infundibuliform base; spermatic ducts very slender, one considerably longer that the other closely associated 2.

Holotype (male), allotype, and 10 ♂ and 8 ♀ paratypes, Tando Jam (12 km. east of Hyderabad), West Pakistan, ex larvae damaging wheat (K. M. Naqvi), no. 67962 in USNM.

Atherigona naqvii is a member of the typical section of its genus and apparently close to *A. bituberculata* Malloch, but differs therefrom in that its palpus is nearly all yellowish and male postabdominal details are of different shape and color—the trifoliate process largely pale with slender median lobe bearing 2 long filaments and the receptaculum of different structure.

DISCOVERY OF FOSSILS OF HERMETIA ILLUCENS (LINNAEUS) IN MEXICO

(Diptera: Stratiomyidae)[1]

During the course of recent archaeological excavations in the State of Tamaulipas, Mexico, MacNeish (1964, Science 143 (3606: 531–537) and Manglesdorf *et al.* (1964, Science 143 (3606): 538–545) found coprolites containing fossilized dipterous larvae in several caves located in that area.

Through the kindness of Mr. David Marsh of McGill University, specimens of the fossil larvae were examined and determined to be an early instar of *Hermetia illucens* (Linnaeus). The larvae were taken from coprolites that were in turn removed from different cultural levels within the caves. By using the carbon-14 dating technique the oldest specimens were determined to be 4,300 years old and the youngest 260 years old. Since the time differential between the oldest and youngest forms amounts to only some 4,000 years, there is, understandably, no appreciable morphological differences between them and modern day forms. Precisely what instar or instars are represented is impossible to determine because of the dry, compressed condition of the specimens and the lack of distinguishing characters in the early instars of this species. (McFadden 1962, unpublished thesis, Univ. of Alberta).

A representative sample of the specimens was mounted on slides by Mr. Marsh and as far as can be determined are still a part of his personal collection.—Max W. McFadden, *Entomology Research Division, A.R.S., USDA, Mexico City, Mexico.*

SOME HEMIPTERA NEW TO THE UNITED STATES
(NOTONECTIDAE, SALDIDAE)

During a collecting trip to Arizona in 1964, the author collected several species of Hemiptera not previously recorded from the United States.

Martarega mexicana Truxal

Ten males, ten females and two nymphs from Oak Creek Canyon, Arizona, C.L. 308, Oct. 7, 1964. These specimens were taken in a small area of quiet water in Oak Creek. A. L. Menke reports (private correspondence) taking this species several years earlier in Arizona, and his record will be published elsewhere. This genus has not been previously reported from the United States.

Saldula dewsi (Hodgden)

Fourteen males, nine females from Oak Creek Canyon, Arizona, C. L. 308, Oct. 7, 1964; five males, four females and one nymph from Aravaipa Canyon, Arizona, C. L. 315, Oct. 8, 1964. This pretty saldid was taken almost exclusively on damp steeply sloping rock surfaces just above the water's edge. It is common in similar habitats in Mexico.

Saldula sulcicollis (Champion)

Fifteen males, twelve females, and three nymphs along a shady spring-fed streamlet, Aravaipa Canyon, Arizona, C.L. 315, Oct. 8, 1964. The specimens were collected amongst the vegetation on barely damp ground, sometimes quite removed from the water. The author took this species in Oaxaca and Chiapas, Mexico, and Champion (1898, Biol. Cent. Am., Rynch. Vol. II, 340) lists it from Omilteme, Guerrero, Mexico. This extends the northernmost known occurrence of this insect by about 1000 miles.

The finding of these three species far north of their known range gives rise to the conjecture that they exist throughout the Sierra Madre Occidental of Mexico in suitable habitats. The paucity of published records indicates that little collecting of aquatic and semi-aquatic Hemiptera has been done in this region. —JOHN T. POLHEMUS, *3115 S. York, Englewood, Colorado.*

SOCIETY MEETINGS

738th Regular Meeting—December 9, 1965

The 738th meeting of the Society was called to order by the President, Dr. Paul A. Woke, on December 9, 1965, at 8:00 p.m. in the Agricultural Auditorium, Symons Halls, University of Maryland. Twenty-five members and eleven guests were in attendance. Minutes of the previous meeting were approved as read.

The following names of candidates for membership were read for the second time and received into the Society: Robert E. Stevens, R. Joseph Kowal, Tokuwo

Kono and William H. Bennett. The following new candidate for membership was presented: Mr. Gary J. Smith.

The annual reports of the Society officers were presented and a motion was made, seconded and passed that they be accepted. Summaries of these reports will appear in a forthcoming issue of the Proceedings. President Woke personally thanked the officers and committee chairmen for their help during the year and expressed special appreciation for the fine job done by Treasurer Carl C. Blickenstaff, Corresponding Secretary Donald M. Anderson and Editor Jon Herring.

Following the annual reports, the floor was opened for nominations for Society officers for the coming year. A motion was made, seconded and passed that the slate of nominess presented by the Nominating Committee be elected by acclamation. The officers for 1966 are: President, Miss Louise M. Russell; President-elect, Mr. Louis G. Davis; Recording Secretary, Dr. W. Donald Duckworth; Corresponding Secretary, Dr. Donald M. Anderson; Treasurer, Dr. Authur K. Burditt, Jr.; Editor, Dr. J. L. Herring; Custodian, Mr. Robert Smiley; Program Committee Chairman, Mr. Victor Adler; Membership Committee Chairman, Cdr. William B. Hull; Delegate to the Washington Academy of Sciences, Dr. H. H. Shepard.

President Woke announced that the Executive Committee had chosen E. N. Cory and F. W. Poos for consideration by the Society for honorary membership in recognition of their long and faithful service to the Society. A motion was made, seconded and passed that the nominees be elected to honorary membership.

Dr. Gurney noted the deaths of Dr. George Wolcott and Dr. Charles Seivers.

Dr. Gurney also noted briefly the remarkable "long-necked" larvae of a nemopterid neuropteron, apparently *Necrophilus arenarius* Roux, collected during his 1965 visit in Egypt. He showed photographs taken in and near the cave where he observed them, not far from the pyramids of Giza, where he was conducted by Dr. Aly Aly El Moursey of the University of Cairo.

F. W. Poos noted that the billbug, *Sphenophorus venatus vestitus* Chttn. was becoming a serious pest of Zoyzia grass in the area. Serious damage is caused by the larvae feeding on the roots of the grass.

K. O'Neill noted that at last year's December meeting someone had reported collecting the western flower thrips in Maryland and she would appreciate any information concerning further occurrence of this species in the area.

The speaker for the evening, Dr. Myron L. Kolbarsht, gave an interesting talk entitled "Can Blow Flies Taste Amino Acids and Proteins?"

Following the introduction of visitors, the gavel was passed to the new President, Miss Louise M. Russell, who adjourned the meeting at 9:20 p.m. Following the meeting refreshments were provided by the faculty and wives of the Entomology Department, University of Maryland.

Respectfully submitted,
W. Donald Duckworth
Recording Secretary

BOOK REVIEWS

A Catalog of the Diptera of North America North of Mexico. Agriculture Handbook No. 276,* Agricultural Research Service, United States Department of Agriculture. 1696 pages, issued August 1965. Prepared cooperatively by specialists in the various groups of Diptera under the direction of Alan Stone, Curtis W. Sabrosky, Willis W. Wirth, Richard H. Foote and Jack R. Coulson of the Entomology Research Division, Agricultural Research Service, United States Department of Agriculture, Washington, D.C. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price $5.50.

The first attempt to inventory the Diptera of North America was the publication in 1858 by Baron Carl Robert Osten Sacken of his "Catalogue of the described Diptera of North America." This contained he says "about 1800 species." A second edition was published in 1878.

In 1905 John Merton Aldrich published his "Catalogue of the Diptera of North America." This covered North America in the widest sense, south to and including Panama, the West Indies and Trinidad, but a count limited to the area of the present catalog (U.S., Canada and Bermuda) for direct comparison shows 952 genera and 5,432 species recognized by Aldrich as of January 1, 1904.

In sharp contrast to Aldrich's Catalog the present catalog recognizes 16,130 valid species distributed in 1,971 valid genera and 105 families. In addition 374 nontypical genera, 236 nontypical subspecies and 146 varieties are recognized. There are nearly 1,100 generic synonyms and over 3,200 specific synonyms, not counting 1,000 emendations, errors and misidentifications. In all the catalog contains over 25,000 entries. It represents a doubling of genera and a tripling of species since its predecessor by Aldrich. It is believed that all pertinent names proposed from 1758 through 1962 are included as well as some 1963 names. On pages 1113–1116 is a list of 6 unplaced species and 146 unidentified nomina nuda.

In the "Introduction" it is stated: "In scope, this catalog is a compromise between a check list on one extreme and a complete work, listing all occurrences of every name in the literature, on the other. The former would be of limited value because of its brevity and the latter too costly, cumbersome, and perhaps noncritical. The most important functions of a catalog are to list all published names with a reference to the original publication of each, to distinguish between valid and synonymous names, to present as sound a classification as possible and to give an indication of the species. A catalog should also serve as a guide to important revisional works, keys and significant accessory information." All of these things, in the opinion of this reviewer, this catalog does.

On pages 3–6 is a list presenting the arrangement of the families which has been adopted, each family with the number of valid genera and valid species in North America north of Mexico. Instead of the traditional two suborders of the past, three suborders are here recognized—the Nematocera, Brachycera and Cyclorrhapha. On page 5 is a list of the abbreviations used in the catalog itself and in the bibliography. On pages 11–13 is a list of the 62 new names which are proposed. On pages 13–14 (under "Acknowledgments") is a list of the 47 cooperating taxonomists specializing in the various families and the portion each prepared.

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* This series number appears only on the front cover.

One of the most useful features of the catalog is the bibliography which contains nearly 4,800 titles. This careful and painstaking section was prepared by Jack R. Coulson, Curtis W. Sabrosky and Irmgard Muller. Throughout the text of the catalog the references are given by author, date and page, which leads quickly to the original paper in the bibliography. Here the full title is given with the reference in abbreviated form. The names of journals are abbreviated according to the system used by the U.S. Department of Agriculture Library. For other publications, abbreviations using the same general system have been devised. At the end of the bibliography is a list of the abbreviations used therein, showing the full name of the journal, place and date of publication, name changes, series, and other information that may be helpful in locating the publication in libraries.

The index, very sensibly, includes all categories of names used in the catalog. Valid specific, subspecific and varietal names are in lower case Roman, valid generic and subgeneric names are in boldface, all names above generic level are in roman capitals and all names that are synonyms are in roman italics.

Due to the large amount of essential data included, the principal authors decided to omit such items as the hosts of parasitic species (which would have entailed a large amount of additional bibliographical, nomenclatural and zoological research), references to papers of not strictly taxonomic nature (although a selection of the more important papers of a general nature has been cited at the head of each family), those describing additional life history stages, local faunal lists, etc.

Somewhat smaller type would have reduced the size and weight and undoubtedly increased the durability of this rather lightly bound nearly 5-pound volume but the format is excellent and the type throughout is certainly clear and easy to read. The inclusion of the family name at the top of each alternate page is most useful. This work, it is to be hoped, will provide an impetus for further much needed catalogs relating to other groups and other regions. It is also to be hoped that it will provide a sound basis for extension of effort into those fields which have been perforce excluded.

Those responsible for planning and carrying out the very considerable task of preparing this comprehensive synoptic catalog have done great service to North American dipterology, present and future, in providing a necessary prerequisite to all other kinds of research. MORTIMER D. LEONARD, *Collaborator, Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D. C.*

Butterflies and Moths. Edited by Norman Riley; Text by Alfred Werner and Josef Bijok. 126 pp. 40 col. pl. 1 col. text. fig. New York, 1965, The Viking Press. $10.95.

The past few years have seen a growing trend toward the production of "picture books" in all fields of science. Among the insects, it is the Lepidoptera, and particularly the butterflies, which have received the most attention. One of the most attractive of these books on the Lepidoptera is *Butterflies and Moths*. This book was first published in Germany in 1955 as *Fliegende Kleinodien*, and an English edition was prepared shortly afterward. The revised edition, with text and plate additions, was published early this year.

The forty colored plates in this book are probably the best ever produced for a "popular" book. They were printed in Germany by the eight color offset process and are surprisingly faithful in color to the actual insects. One hundred and thirty-seven species, mostly tropical, are represented giving the general reader a good sampling of the more characteristic families of Lepidoptera. The photos used in the plates have been extensively retouched, and mostly very well. In several places, however, the artist was unfamiliar with the proper location of wing veins and has placed them incorrectly. This retouching is particularly apparent in the figure of *Trogonoptera brookiana* (Pl. 13, there called *Ornithoptera brookiana*) which was apparently made from a damaged specimen. The greatest flaw in the plates is the incorrect identification of at least two of the species pictured. *Papilio gundlachianus* (Pl. 21) is called *P. columbus* and *Gloriana ornata* (Pl. 8) is pictured under the name *Phyllodes* sp. Certain other usage in the nomenclature appears to me archaic, but that is a matter of personal opinion.

The text is divided into two sections, *viz.* a section of general information by Alfred Werner, and a section on developmental stages by Josef Bijok. This text is, for the most part, very clear and concise and the few vague points are probably due to faulty translation. Werner's general discussion of the Lepidoptera is well handled and non-technical enough to be read by the general reader but still not so oversimplified as to be uninteresting to the entomologist. Several interesting anecdotes by A. R. Wallace, H. W. Bates, Lucius Beebe and others enliven the text.

Josef Bijok has done an admirable job of presenting the major information of Lepidopteran development in only four pages. Within this short space he covers the egg, larva, pupa and adult, as well as giving a good discussion of the anatomy of the imago.

On the whole this is a nicely produced book which will be of great use to the amateur and of interest to the professional as well. In it the beginner can find the important facts to guide him more deeply into the field, and the professional will be interested in owning this book as a work of entomological art. It is only regrettable that the identification of the figured specimens was not checked more closely.—ROBERT E. SHELL, *1437 Aspen Street, N. W., Roanoke, Virginia.*

Recognition of Structural Pests and Their Damage, by Harvey L. Sweetman, 1965. Wm. C. Brown Co., Dubuque, Iowa. XI + 371 p. May be obtained from Trade Magazines, Inc., 1900 Euclid Avenue, Cleveland, Ohio 44115. $7.75 in USA; $8.25 outside USA.

Biologists, entomologists, and pest control operators are frequently confronted with a tissue-wrapped, squashed specimen or a piece of gnawed or shot holed timber and expected to quickly identify the culprit and explain in succinct and dulcet tones how to control the obnoxious pest. Dr. Sweetman has undertaken to provide the means to identify such pests that "occur in any structure of man or associated with the immediate environs of such structures." Agricultural pests, forest pests and their ilk are not included unless they have gained notoriety by a ubiquitous habit and have had the temerity to invade our structures. The profusely illustrated keys for the most part are aimed at the non specialist and in addition at the "novice, householder or inexperienced person or a commercial pest control operator or his serviceman." Dr. Sweetman has accomplished his purpose, but he is somewhat inconsistent in his approach. He provides keys to 14 species of *Anopheles*, 54 species of *Aedes* (omitting *communis*, *sierrensis*), 5 species of *Culiceta*, 8 species of *Culex*, 3 species of *Mansonia*, and 11 species of *Psorophora*, which would be helpful to a conscientious mosquito control operator, but provides only keys to 5 species of *Lyctids* and 4 species of *Bostrichids* which might not satisfy an inquisitive pest control operator. The ants are treated lavishly to the point of requiring a detailed knowledge of the *Formicidae* in order to use portions of the key.

It would be unlikely that a text covering so wide a field would escape its share of errors. Suffice to say there are a moderate number of typographical and taxonomic errors. Fortunately, they do not detract significantly from the value of the text. Dr. Sweetman has done a superb job of organizing, revising, and compiling keys to the majority of structural pests. What is far more important, he has illustrated these keys. How often has a perspiring young entomologist delved through verbose or conversely too concise keys, wishing for an illustration to point up a particularly perplexing character? It is hoped that more authors will follow Dr. Sweetman's example and provide illustrations for their keys. An illustration may be the key to unlock the mystery of a couplet. Dr. Sweetman has provided such keys.—EUGENE J. GERBERG, *Insect Control & Research, Inc., Baltimore, Maryland 21228.*

CARL JOHN DRAKE[1]
1885–1965

From each generation of entomologists, some have been destined to be leaders in one phase or another of their science, but only a few have acquired outstanding stature and international recognition in at least three phases of entomology. Carl Drake was such a leader, gifted as a developer of young people and administrator in an outstanding department, successful director of large-scale pest control programs, life-long enthusiast and prolific writer on the systematics of Hemiptera, especially of the Tingidae (lacebugs).

Carl John Drake was born at Eagleville, Ohio, July 28, 1885, and he died at Washington, D. C., October 2, 1965. His father, William L. Drake, was of English stock; his mother, Alice A. (Shippy) Drake, was Irish. Carl was the oldest of 4 boys and 2 girls. When he died, only one brother, 16 years his junior, Marion O. Drake of Tiffin, Ohio, survived from the immediate family. The family farm was at Eagleville, Wood County, not far from Toledo, and here Carl began grade school, but the family moved to nearby Seneca County and he

[1] Opening photograph, August 20, 1965, courtesy of Frank W. Mead, Florida Division of Plant Industry. We are also grateful to the following individuals for information concerning Dr. Drake's career and early life: Floyd Andre and Oscar E. Tauber, Ames, Iowa; Marion O. Drake, Tiffin, Ohio; Richard C. Froeschner, Washington, D. C.; F. C. Hottes, Grand Junction, Colo.; Charles H. Richardson, Santa Barbara, Calif.

finished grade school there. He was tall and of strong physique, accustomed to hard work. In the last year of his life he told an associate how as a youth he got jobs on neighboring farms at just a few dollars per week, and how he sometimes was paid one dollar weekly more than other boys because he worked that much harder.

At an early age Carl planned to be a teacher, and for several years attended night classes at Heidelberg Academy, in Tiffin, near home, and for 4 years he taught grade school while studying at night. Later, he studied full-time at Heidelberg and played actively on the football and basketball teams. From Heidelberg Academy, Carl went to Baldwin-Wallace College, Berea, Ohio, was graduated with Bachelor of Science and Bachelor of Pedagogy degrees in 1912, and he did some instructing there during the summers of 1912–15. Again, he played basketball, and years later he proudly displayed a photograph of the team and ascribed to quick reflexes his success in athletics. A college roommate was Raymond Moley, later a member of the Franklin Roosevelt administration and a featured columnist of Newsweek.

Carl was a graduate student at Ohio State University during 1913–17, including three summers, and in that period he served successively as graduate assistant, assistant, and instructor in the Department of Zoology & Entomology. The first mention of a serious interest in biology which we have found recorded is his work at the Lake Laboratory, Cedar Point, Ohio, in August 1913. There he worked on the food of frogs. His first scientific note, "An occurrence of *Atypus milberti* Walck. in Ohio," dealing with a spider species which was unusual that far north, taken from a stomach of *Rana pipiens* at Cedar Point, appeared in 1914. A significant paper appeared in 1914 in which he summarized his observations on the food of frogs; years later he would refer with pride to this early work. During those formative years Carl Drake was under the tutelage of the master teacher and pioneer hemipterist, Professor Herbert Osborn, who encouraged him to select an insect group for specialization and stick with it, so it is not surprising that he began the serious study of Hemiptera. His first papers on the systematics of Hemiptera were co-authored with Osborn; their 36-page report on lacebugs of Ohio appeared in 1916, and the first paper on Hemiptera by Drake alone was on a new tingid from Tennessee, also published in 1916. Apparently the association with Herbert Osborn was very important in influencing Drake's growing specialization in Hemiptera systematics. At about the time his work at Ohio State was maturing, his interest in Tingidae received a big boost when he acquired the private collection of Hemiptera made by Frank M. McElfresh, once a graduate student at the University of Illinois, who was forced by ill health to abandon his studies and who died at an early age. When describing a Haitian tingid from the McElfresh collection in 1918, Drake wrote

"I have named the species in honor of the late Frank M. McElfresh, a great student, collector and worker in this group of insects. Although Mr. McElfresh had excellent knowledge of this group of insects and was preparing to monograph the Tingidae of North America he left no notes or manuscripts and had published no papers on the Tingids."

Drake completed formal training at Ohio State in 1917, but did not receive the Ph.D. degree until 1921. His thesis, as a unit, was never published, and we assume that parts of it were incorporated in various publications. From Ohio he went to Syracuse University where he taught as a specialist in entomology in the School of Forestry, 1917–22, advancing from instructor to professor. Although he continued research work on Hemiptera, did comprehensive ecological and systematic work on Hemiptera of the Cranberry Lake Region of New York during that period, and also pursued tingid systematics, he became fascinated by bark beetles, learned to recognize the most important species of Scolytidae, and in 1921 described a new species of ambrosia beetle, the only new species he described outside of Hemiptera. Two summers during these years were spent in the Southeast, that of 1918 employed by the Florida Agricultural Experiment Station, in 1921 at the Experiment Station of Mississippi State College. One result of the 1918 work was his 53-page paper published in 1920 on the southern stink bug, *Nezara viridula* (L.). In July 1921, while collecting Hemiptera on cypress trees in Mississippi, he found specimens of an unusual, distinctively streaked, narrow-winged katydid; this proved to be a striking new genus, described by Caudell as *Inscudderia taxodii*, later found peculiar to cypress elsewhere in the Southeast.

Dr. Drake's most important career work, unless it be the sum total of his systematic research, was that done at Iowa State College, Ames, Iowa, since renamed Iowa State University. From his arrival in 1922 until his retirement from administration in 1946 when he concentrated his efforts on systematics, he was Head of the Department of Zoology & Entomology, Entomologist of the Experiment Station, and State Entomologist. He followed Dr. E. D. Ball as Department head, and arrived at a time when the department was ripe for expansion and improvement. He was a forceful leader of broad vision under whose direction a new entomological laboratory was built and equipped, funds were obtained to aid graduate students by scholarships, and notable growth in the library occurred. One of Drake's secrets in training successful students in entomology was his insistence that they first of all acquire a strong foundation in general zoology, botany, physical sciences and mathematics. In addition to entomology his department was very strong in parasitology, protozoology, physiology

Photo about 1935, during Dr. Drake's teaching years, courtesy of Iowa State University.

and wildlife management, and pioneered in insect toxicology and physiology. To obtain qualified teachers and find openings for graduates of the department, he developed very wide contacts and made special trips to Woods Hole and other centers.

In Dr. Drake's later years he showed much satisfaction with the successes achieved by graduates of the department he formerly headed, and by those attracted to Ames for advanced degrees, and he would recall his experiences in appraising the qualities and training needs of various individual students. While teaching actively he took a personal interest in students, even helping some financially, and he particularly encouraged able students to work toward advanced degrees. Doubtless because of his accomplishments, he was Chairman of a committee of the American Association of Economic Entomologists which studied training requirements of professional entomologists, and in 1931 he reported on replies obtained from a questionnaire sent to some 50 leading specialists and teachers. Perhaps as an outgrowth of this activity, in 1936 he published an article giving his opinions regarding the broad base, the well planned schedule of courses, habits of library browsing, the development of fundamental interests, and other aspects of an entomologist's background. He emphasized that the training of research entomologists should include the actual doing of research. From graduate students he expected an excellent performance and many hours of work. He required a high standard of writing, was patient at least with first mistakes, and hoped that after a thesis was published the man would continue to be productive. His own enthusiasm, hard work and productivity must have inspired many students.

Since Dr. Drake's death, nearly all entomologists with whom we have discussed his impact on the science have stressed the large number of biologists in outstanding positions throughout the United States, and some abroad, who went on from Ames. As a small sample of such former students, and others, mostly entomologists and wildlife workers, coming under Drake's influence, we would list the following (in alphabetical order): Floyd Andre, Thomas S. Baskett, José C. M. Carvalho, Robert Coatney, George C. Decker, Paul L. Errington, Christian Farstad, Bentley B. Fulton, James Grayson, H. M. Harris, Ephraim Hixson, E. F. Knipling, Randell Latta, Dale Lindsey, Clay Lyle, Harlow Mills, Kenneth E. Penrod, Lloyd Rozeboom, Thomas G. Scott, Silas S. Sharp, James A. Slater, George Sprugel, H. D. Tate, Oscar E. Tauber, and B. V. Travis.

In Iowa under Dr. Drake's leadership there was an expansion of entomological research in the Experiment Station and activities by the State Entomologist. Losses from grasshoppers, chinch bugs and other agricultural pests greatly increased during the drought years of the 1930's, and he demonstrated vigorous organizational ability in directing large scale control programs which involved numerous bait-ing–mixing stations, tank-car lots of poison, and bran and sawdust in freight-car lots. Undoubtedly, his early experience on the farm gave him a practical point of view and increased his effectiveness. He pioneered in Iowa with the newer insecticides and in applications from airplanes. During World War II, when some insecticides were in short supply, he ingeniously helped develop the use of certain toxic materials as substitutes, and after the War he and Dr. Oscar Tauber were the first entomologists in Iowa to conduct small field tests of DDT.

For about two months, in November 1938–January 1939, Dr. Drake and Professor Charles H. Richardson were in Argentina, studying grasshopper problems there and demonstrating methods of bait preparation and application. The trip was by invitation of the Sociedad Rural, an association of large Argentine farm owners and operators, which recognized the accomplishments in Iowa and in 1937 had published in Spanish an article by Drake on the Iowa experiences in grasshopper control. In conjunction with the Argentine trip, several other South American countries were visited, and some collecting, at least of Orthoptera and Hemiptera, was done.

Dr. Drake was a member of the National Plant Board in 1935–42, and as its Chairman in 1941–42 he took a special interest in its activities and the legal basis for its work. In 1942 he published a 52-page report summarizing the various laws, regulations and rulings pertaining to the Plant Board. He was Chairman of the Central States Plant Board in 1945–46.

After his retirement from administration in 1946, Dr. Drake remained in Ames except for trips, busy with the taxonomy of Hemiptera, chiefly Tingidae, until January 1957, when he moved to Washington, D. C., at the same time presenting his collection of Hemiptera to the Smithsonian Institution. At the U. S. National Museum, a unit of the Smithsonian Institution, he became a Research Associate, unsalaried, but with the assistance of a Smithsonian technician and with support from a National Science Foundation Grant, the latter used mainly for artist service and other technical assistance. Here he remained very active, usually working nearly seven days a week, until 3 weeks before his death. A revision of the genus *Corythuca* was under way at the time of his death, and it may be completed by Dr. R. C. Froeschner, a close friend and associate at the National Museum.

Carl Drake died October 2, 1965 in the Washington Hospital Center, from complications following a serious diabetic and circulatory condition that was discovered when he collapsed at his residential hotel about 3 weeks earlier. Burial was in Ohio in accordance with wishes given to his youngest brother about 3 years before. For several years his health had declined, but it was not his nature to have medical check-ups or even a regular consulting physician, and his life probably was shortened as a consequence. Most of his life he enjoyed good health, though as a young man he suffered complications from mumps, and in early 1939 he returned from Argentina with a serious epigastric hernia which was corrected by surgery. (The operation removed his navel, and he often said this made him the original Adam). His enthusiasm for further work seldom waned. Three days before his death he told visitors of plans for a supplement to the tingid catalog and other systematic work.

Taxonomy was the phase of entomology closest to Carl Drake's heart, and it was his chief activity after retirement. During his prime years at Ames he occasionally hunted and fished, played a good game of bridge, was a member of the Ames Golf and Country Club where he sometimes played golf, but these activities remained of secondary interest. He always found time for Hemiptera systematics, an hour or two here and there, and most evenings and week-ends. By and large, he simply worked all of his waking hours. Although a member of many professional societies, and an active leader in several of them, they did not crowd out his beloved taxonomic research.

Dr. Drake remained a bachelor, and the lack of family responsibilities probably explains in large measure how he found time to accomplish so much, and why his devotion to entomology, especially systematics, became so strong. He felt very close to his mother, and provided for much of her care for many years. Apparently he naturally liked people, as evidenced by his friendly relations with students and associates. He enjoyed giving presents to friends, for instance dolls to the children of his associates, and seemed to delight in making them happy. Although he was not a man of narrow personality, it probably is unfortunate that he remained unmarried; a family of his own doubtlessly would have broadened his social growth, improved his personal neatness, and made his retirement years less lonely. As it was, his circle of close friends was rather limited during his last years, and for much of his life he was pretty much of a "loner." Working under him was not always easy because he changed plans frequently as new ideas developed.

Hemiptera specialists the world over will be glad to learn that a full bibliography of Dr. Drake's publications and a list of the species he described has been prepared by Mrs. Florence A. Ruhoff, who served as his assistant during the Smithsonian years.[2] Publication of this valuable record is expected, and we are indebted to Mrs. Ruhoff for certain facts derived from her compilation. His publications on all phases of entomology, including 3 now in press, total 518. At least 105 papers concern applied entomology, and some 253 are with co-authors, who varied greatly in the degree of participation. Some co-authors merely collected specimens, and Drake was glad to extend co-authorship in recognition of their contribution and to encourage further work; at other times the portion contributed by a second author was a very important share of the total effort. Among the co-authors the following especially may be mentioned: Herbert Osborn, with whom Drake began systematic research; H. M. Harris, former student and staff member at Ames, who collaborated with him extensively on Gerridae, Nabidae and other non-tingid families; F. C. Hottes, a former student who co-authored numerous papers, dealing especially with Gerridae and Saldidae; Edson J. Hambleton, who collected Tingidae consistently during his many years abroad, particularly in South America; George C. Decker, a former student and colleague, with whom he worked on numerous projects in applied entomology; Margaret E. Poor (Mrs. Hurd), who was associated with him at Ames at least 10 years and with whom he prepared about 20 papers on Tingidae; Norman T. Davis of the University of Connecticut, who contributed very importantly to joint papers which correlated morphology and systematics; Florence A. Ruhoff, who assisted him at the Smithsonian, collaborating in the important comprehensive work of his 9 years in Washington. More than 60 papers each contain more than 12 pages.

In his taxonomic work Drake was basically a describer of new species, which of course were to be found in large numbers both in the United States and abroad. Since coming to Washington more of

[2] Mrs. Ruhoff is now in the Division of Mollusks, U. S. National Museum, and is not continuing work with Hemiptera.

his papers were of a comprehensive character than before, doubtlessly reflecting the freedom from nonsystematic responsibilities, the assistance available to him, and the incentives derived from daily associations at the National Museum and from the participation in long-term projects supported by NSF. However, he published few keys and for unknown reasons he never depended on them. The final years at Ames, beginning a little prior to his retirement, had been marked by some deterioration in the pleasantness of his personal associations, so the move to Washington was the start of a period when undivided attention could be given to the Hemiptera, amid basically congenial surroundings.

The supreme publication of Drake's career, appearing only 7 months before his death, was "Lacebugs of the World: A Catalog," compiled by himself and Mrs. Ruhoff, complete with a wide range of introductory information about the family Tingidae and illustrated by 56 plates of beautiful and very useful drawings. In recent years he had enjoyed the services of several highly accomplished illustrators who made habitus drawings of a large number of tingids. More basic morphology and concern for zoogeographic aspects were brought into his work than had been true during earlier years, giving breadth to several of the larger papers. He was anxious to present biological information, when available, about tingids living in specialized ecological niches, such as the myrmecophiles and gall-producing species.

At the U. S. National Museum, Dr. Drake's superb collection of Hemiptera and associated library are very valuable acquisitions. In the Tingidae, 1,482 species from a total of 1,820 species recognized as valid for the world were contained in the Drake Collection when the catalog was written. Among other families of Hemiptera, the aquatic and semi-aquatic Heteroptera for the Americas are very well represented. He described 1,480 new species, the great majority in the Tingidae. Whenever possible he augmented his collection by purchase; especially valuable specimens already assembled were the collections of Henry Hacker of Australia, Edwyn C. Reed of Chile, and various lots from Nicolas A. Kormilev of South America and more recently New York.

Dr. Drake enjoyed collecting Hemiptera and did so when time permitted; in fact, most of his travels during his main active years included some collecting or visits to museums. However, because of specialized collecting, large amounts of general material did not accrue from his field work. He liked to take a graduate student or other associate and go on an extended collecting trip; in this manner he made several collecting trips in the western states and one each to Canada and Mexico with F. C. Hottes. He made many collecting trips, including a long one to California, with Floyd Andre, and a long one to the Southwest with Earl Pritchard. Dr. Andre has recalled the pleasure he himself experienced as a student while in San Francisco with Dr. Drake because of their going on a special collecting trip one day with Harry G. Barber and Edward P. Van Duzee. Drake made at least one trip to visit European museums, and he was a great admirer of the facilities available at the British Museum for studying insects on a world-wide basis. He had looked forward to a Russian visit, wished to wait until his catalog was published, and unfortunately delayed too long.

Although Dr. Drake was generous and spent freely for things especially desired, he was basically frugal, accustomed to plain living, a habit probably stemming from the absolute need for thrift during his early years. From the standpoint of saving, he had the advantages of no family to support and excellent positions as his professional career developed. He invested his savings wisely, beginning to do so before the tremendous economic growth in the United States which followed World War II, and as a consequence accumulated what, for an entomologist, was virtually a small fortune. His will had not been settled when this biography was written, but enough was known of its stipulations to realize that he wished for the principal portion of his estate to support, on a continuing basis, systematic research with Hemiptera–Heteroptera. In part due to his strong feeling of national loyalty, he designated the U. S. National Museum as the center for this research.

So closed the life and career of one essentially dedicated to entomology for half a century, whose energies were channeled into making the world's rich insect fauna better known, who played a leading part in training numerous young people for industrious lives and professional careers, and who, as his own long life neared completion, placed the physical products of his labors where they will further serve scientific achievement.

Ashley B. Gurney, *Chairman*,
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THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

ORGANIZED MARCH 12, 1884

OFFICERS FOR 1966

MEETINGS.—Regular meetings of the Society are held in Room 43 of the U.S. National Museum on the firs Thursday of each month from October to June, inclusive, at 8 P.M. Minutes of meetings are published regularl in the *Proceedings.*

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CULEX (THAIOMYIA) DISPECTUS, A NEW SUBGENUS AND SPECIES FROM THAILAND (DIPTERA: CULICIDAE)[1]

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From 1961 to 1966 the U.S. Army Medical Component, South East Asia Treaty Organization conducted extensive mosquito collecting activities throughout the Kingdom of Thailand in connection with interdisciplinary studies of mosquito-borne diseases in the country. These collections, currently being studied at the Smithsonian Institution, have revealed that Thailand is endowed with a particularly rich mosquito fauna, sharing many species with India and Indochina in its northern and central monsoon areas, and having a large Malayan element in the more southern provinces. Included among the SEATO collections is an excellent series of a unique species of the genus *Culex* which represents a new subgenus. The description of this taxon was prepared after examination of 29 ♀ ♀, 27 ♂ ♂, and 56 larvae, 23 of which are individual rearings with associated larval and pupal skins.

In the following description, terminology and chaetotaxy of the immature stages conforms to that of Belkin (1962).

Subgenus **Thaiomyia**, subgenus novum

This new subgenus appears to have its closest affinity to the subgenus *Culiciomyia* Theobald, 1907, but distinctive differences exist in the adult male and larval stage. The female cannot be distinguished from the subgenus *Culiciomyia*. In the male, the terminalia are similar to those found in *Culiciomyia*, however, the third segment of the palpus is without the distinctive lanceolate scales on the ventral surface which are so characteristic of the subgenus *Culiciomyia*. It is in the larval stage, however, that the subgenus *Thaiomyia* exhibits unique characteristics which unquestionably exclude it from other subgenera within the genus *Culex*. Foremost is the total absence of the pecten. Also, the ventral brush consists of ten individual tufts of setae, the basal one located between the grid and the saddle.

The type species for this new subgenus is hereby designated *Culex* (*Thaiomyia*) *dispectus*, sp. nov.

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[2] Immediate publication secured by full payment of page charges—Editor.

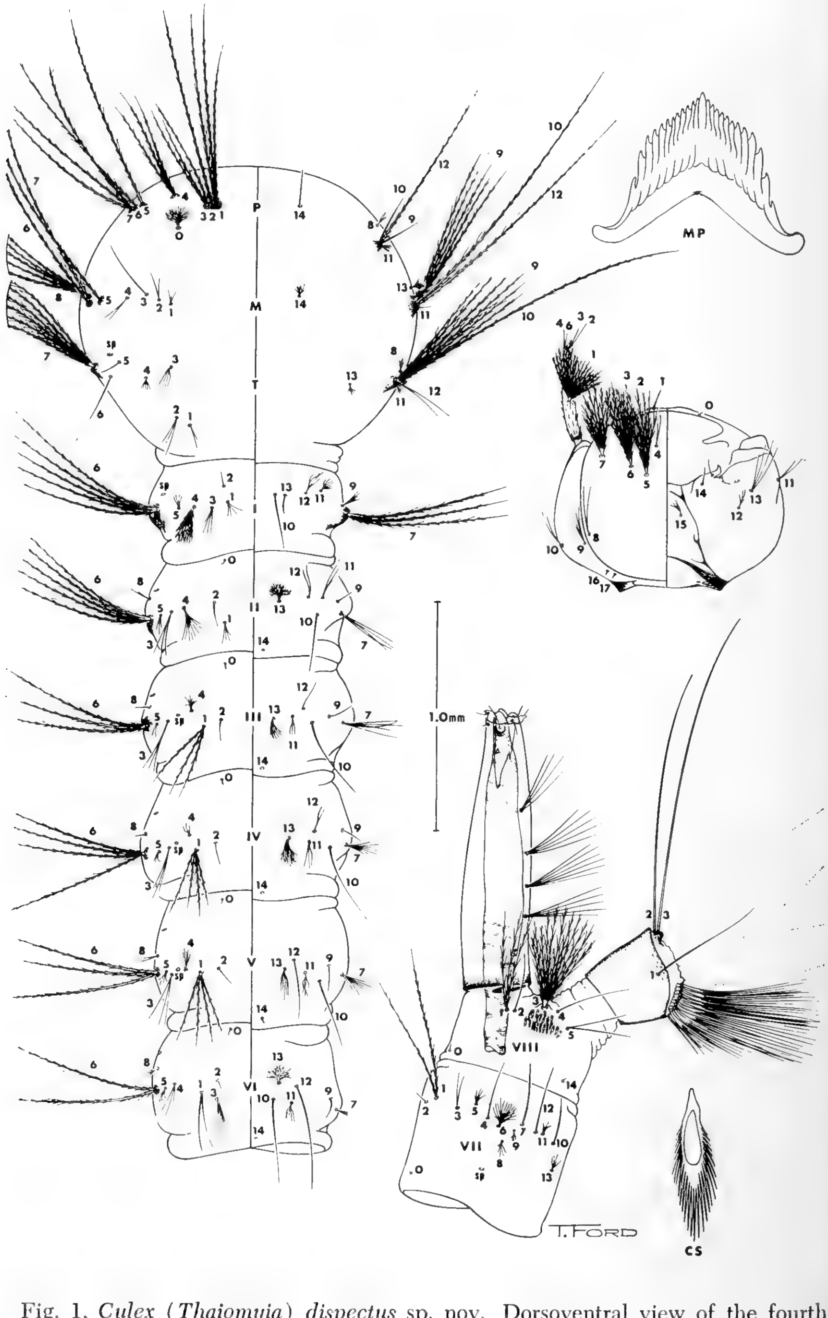

Fig. 1, *Culex* (*Thaiomyia*) *dispectus* sp. nov. Dorsoventral view of the fourth stage larva. MP, mental plate; CS, comb scale.

Culex (Thaiomyia) dispectus, species novum
(Figures 1 and 2)

Female. In general a moderately sized species with overall dark brown appearance and without striking characteristics. Proboscis and palpus uniformly dark scaled. Decumbent scales of the vertex sparse, narrow and light brown medially, gradually becoming lighter and broader towards the orbital line; erect scales forked, dark brown. Integument of scutum uniformly light brown, with faintly darker stripes in the dorsocentral areas; covered with a uniform pattern of rather sparse, bronze-brown scales. Achrostichal bristles absent, except for a very few small dark bristles at the extreme anterior; anterior dorsocentral, posterior dorsocentral, supraalar, and prescutellar bristles prominent and well developed. Integument of the scutellum similar to that of the scutum; scales very sparse, but similar in color to those of the scutum; bristles normal for the genus. Pleural integument uniformly creamy white, but with faintly darker patches at the postspiracular plate and the lower sternopleuron; distinct scale patches or scattered scales absent. Upper sternopleuron with four large and one small bristle; posterior sternopleuron with a linear series of approximately 10 bristles; lower mesepimeron with one large and one small bristle. Dorsal wing scales uniformly bronze-brown; scales of the costa, subcosta, and R_1 reflecting a blue-green metallic color when struck by light at an oblique angle, however, in direct light these scales appear to be the same color as the other dorsal wing scales. Hind femur dark, but with a narrow line of lighter scales on the anteroventral margin; hind tibia and tarsus uniformly dark brown; fore- and mid-legs marked as the hind legs, however, the fore- and mid-femora do not possess the light stripe on the anterior margin. Abdominal terga totally dark brown, without indications of light scales; sterna covered with a uniform pattern of light brown scales.

Male. Similar in general appearance to the female except as noted below. Proboscis with a tuft of dark setae inserted on the ventral side of the labium at approximately the middle. Length of the palpus exceeding the proboscis by approximately the fourth and fifth segments; segment III without distinctive lanceolate scales on the ventral surface. Antenna normal for the genus, slightly shorter than the length of the proboscis. Abdominal terga basically dark brown, but beginning with terga IV, a basal white spot is present; this spot does not extend to the lateral margins of the terga and is triangular in shape. Terminalia as illustrated in figure 2.

Larva. Chaetotaxy and conformation as illustrated in figure 1. Head rather darkly pigmented; antenna lighter than the head capsule, the basal ring concolorous with the shaft. Hair 1-C filamentous, its length almost equal to ¾ the distance between the preclypeal hairs; hair 4-C simple, single or double; hair 5-C 12 branched, pectinate; hair 6-C with approximately 9 branches, pectinate; hairs 16, 17-C represented by minute spicules. Thoracic and abdominal integument glabrous. Comb consisting of approximately 20 to 30 fan shaped scales arranged in a broad, somewhat triangular patch. Siphonal index ranging from 3 : 1 to 4 : 1, rather broad basally and tapering to a truncate apex; four pairs of subventral tufts inserted in a line, their length greater than the width of the siphon at the point of insertion; individual siphonal tufts three- to six-branched. Pecten absent. Anal saddle completely ringing the tenth segment;

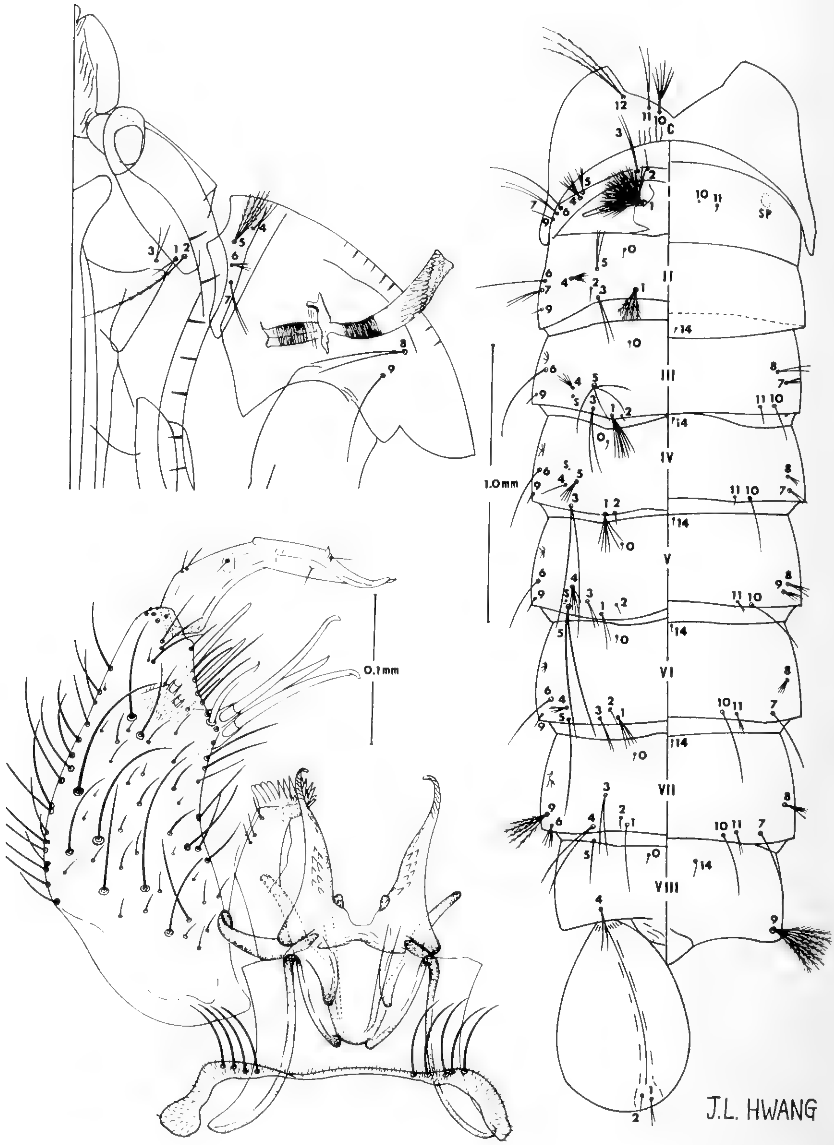

Fig. 2, *Culex* (*Thaiomyia*) *dispectus* sp. nov. Dorsoventral view of the pupa and dorsal view of the male terminalia.

ventral brush consisting of ten individual tufts of setae, the basal tuft usually inserted between the grid and the saddle.

Pupa. Chaetotaxy and conformation as illustrated in figure 2.

Types. Holotype ♂ with associated larval and pupal skins and terminalia slide mounted with the following data: Doi Sam Sao, Tak Province, Thailand, 2 VIII 65, Somboon Maneechai, collector, deposited in the U.S. National Museum, No. 68931. Paratypes: 3 ♂ ♂ and 3 ♀ ♀ with associated larval and pupal skins having the same data as the holotype, to be deposited in the British Museum, and the U.S. National Museum.

Distribution. In addition to the type locality, specimens have been collected from: Khao Salak Phra, Tak Province; Kraburi, Ranong Province; and Doi Sutep, Chiang Mai Province.

Biology. Larvae have been collected on four occasions from open bamboo internodes or bamboo stumps in a primary rain forest environment. The collection from Chiang Mai was from an artificial container. Collections from Tak Province were made at an altitude of over 1,500 feet. Larvae collected in association with *C. dispectus* sp. nov. included: *Armigeres flavus* (Leicester), *Armigeres subalbatus* (Coquillett), *Orthopodomyia* sp., *Uranotaenia* sp., and *Culex* (*Lophoceraomyia*) sp. Collections were made during August, and September.

Acknowledgments

Individuals who collected this previously undescribed species include: Mr. Somboon Maneechai, Mr. Sahem Esah, and SFC Edward L. Peyton. Special thanks are due to the members of the Department of Medical Entomology, SEATO Medical Research Laboratory who processed the material. Dr. Alan Stone and Major John E. Scanlon, MSC, USA have been extremely helpful with their advice and encouragement. Illustrations were prepared by Miss Thelma L. Ford and Miss Jung Lea Hwang.

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REPRODUCTIVE BEHAVIOR IN THE DAMSELFLIES ENALLAGMA ASPERSUM (HAGEN) AND ENALLAGMA EXSULANS (HAGEN)

(Odonata: Coenagriidae)

George H. Bick *and* Lothar E. Hornuff[1, 2]

These notes, part of a general study[3] of reproductive behavior in the suborder Zygoptera, add *Enallagma aspersum* (Hagen) and *E. exsulans* (Hagen) to our (1963) *E. civile* study, affording a broader basis for characterizing behavior in this cosmopolitan genus.

All work was done in the field, at two habitats in St. Joseph County, Indiana, during June, July, August, 1965. We studied *aspersum* at a 135′ by 144′, 1′–3′ deep, bog pond supporting abundant emergent vegetation, primarily *Sparganium androcladum* and *Sagittaria latifolia*; *exsulans* at Juday Creek, a small tributary of the St. Joseph River. Methods and terminology are essentially as in our *civile* study.

Enallagma aspersum (Hagen)

Prior to pairing, males were most abundant about 10 feet from water along the juncture between tall dense terrestrial vegetation such as ragweed (*Ambrosia trifida*), and the much shorter aquatic *Eleocharis* sp. Here unpaired males seldom perched but almost constantly cruised along the weedy border, giving no indication that they were maintaining territory.

Although counts were not made because of density of *aspersum* as well as vegetation, we observed a striking population movement near noon each day. From 1200 to 1300 hours, females were absent and unpaired males abundant along the aquatic-terrestrial vegetation interface. Apparently females arrived synchronously, because between 1330 and 1430 hours abundant pairs rather than males were evident. Soon after 1430 most individuals were absent from the interface, abundant in tandem over water.

We never noted an unpaired female at water or initial seizure, but males seized females emerging from underwater oviposition without courtship or display by either member. Sperm transfer, observed seven times, was always in tandem on terrestrial vegetation. The five timed episodes (Table 1) averaged 17.8 seconds, with copulation quickly following at the same spot or very close by.

Among 30 copulations, 25 were on terrestrial vegetation 15–40 feet from the pond. Six of 10 timed episodes were uninterrupted; each of four was interrupted once for not more than 1 minute. Excluding interruptions, copulation averaged 13.5 minutes (Table 1). The male

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Table 1. Duration of reproductive activity in *Enallagma aspersum*. Some events were incompletely (inc.) timed, others were not timed (—).

Sperm transfer (seconds)	Copulation (minutes)	Post-copula tandem exclusive of oviposition (minutes)	Submerged oviposition (minutes)
17	inc.	—	—
17	inc.	—	—
21	inc.	—	—
22	inc.	—	—
12	16	—	—
	19	13	13
	10	20	21
	12	15	—
	16	—	—
	12	—	—
	14	—	—
	12	—	—
	14	—	—
	10	—	—
		inc.	25
		inc.	22
Range:			
12–22	10–19	13–20	13–25
Mean:			
17.8	13.5	16.0	20.2

pumped his abdomen infrequently, and primarily during the first minute of contact. He simultaneously contacted the female's abdomen with the femoral-tibial juncture of his metathoracic legs in the same rapid motion we (1965a) describe for *Argia apicalis*, and here designate as kicking. The female's legs usually straddled her abdomen and touched the substrate.

After copulation, most pairs moved directly to water in one long flight, then delayed oviposition for an average of 16 minutes, while they shifted frequently and the female probed many perches, probably too briefly for significant egg laying. Because the shifts were small and some pairs remained perched for long intervals, this exploration period was less well-defined than in *apicalis* (Bick and Bick, 1965a).

Jacobs (1955) states that *aspersum* females sometimes submerged. In our population, females of the four pairs timed continuously throughout oviposition and many others incompletely timed, always oviposited submerged and unaccompanied. We never saw a tandem female probe more than momentarily above the surface at any one stem.

Unlike some other Zygoptera, *aspersum* females did not begin oviposition above water and then back down the stem beneath the surface. Instead, when the female reached a suitable stem, she immediately turned and descended head first pulling the passive male with her. The male always separated before his abdomen was completely under water and then perched nearby. The one female we were able to see after submergence descended 15 inches directly to the bottom before beginning to oviposit at the base of the plant.

Apparently as an adaptation for survival during late summer drought, females oviposited only at the bases of plants growing in deep water. They used *Eleocharis*, *Sagittaria*, and *Sparganium*, the last more frequently probably only because it was present in somewhat deeper water. The entire egg complement must have been inserted in the same stem since each female surfaced within 3 inches of the one on which she descended. Submerged oviposition averaged 20.2 minutes (Table 1); Jacobs (1955) records 5–25, Morgan (1930) 25.

While under water, the female's thorax and abdomen, particularly segments 8 and 9, changed markedly from bright blue, as in the male, to drab gray. Four females, whose records were complete (Table 1), were blue before submerging, gray immediately after surfacing. One of these became blue again after 75 minutes in a cage. Thirty-two additional females in copula or in tandem before submerging were blue; 10 other females were gray just after surfacing. Females of *Argia apicalis* (Bick and Bick, 1965b) occurred in more than one color phase during the same day, however, unlike the situation in *aspersum*, we could not associate the changes with reproduction or submergence.

Whereas an unpaired male seldom perched, one who had separated from a submerged female perched almost constantly. Each mate of the four females, continuously timed during oviposition, remained near the female throughout her submergence for 13, 21, 22, or 25 minutes. We hypothesize that the male could not see the female since we could not, and that some stimulus other than seeing her must have caused him to remain in her vicinity. These males, like *civile* (Bick and Bick, 1963), wing warned and flew toward intruders, thereby maintaining their stems free of strange males even though these guarding activities often allowed invaders to perch on adjacent stems. Since unpaired males seldom perched over water, the perched mate may have been a signal of the presence of a submerged female to passing males resulting in their grouping nearby. In spite of this grouping, the mate, rather than an intruder, seized the female when she emerged.

After oviposition, females did not climb up the submerged stem, but bobbed suddenly to the surface. One female was quickly seized by her mate as she floated on the surface, two reached vegetation and when they were a few inches above the surface were captured by their mates, and the fourth female escaped.

We were able to follow three females during a second tandem and did not see a second sperm transfer, or copulation, or oviposition in the same day. Each was uncooperative, demonstrating the same biting and zigzag flight which occurred under similar circumstances in *civile* (Bick and Bick, 1963). These three females known to be in a second

Table 2. Duration of reproductive activity in *Enallagma exsulans*. Some events were incompletely (inc.) timed, others were not timed (—).

Sperm transfer (seconds)	Copulation (minutes)	Post-copula tandem exclusive of oviposition (minutes)	Oviposition (minutes): Tandem: ♀ only submerged	Tandem: ♀ & ♂ submerged	Unaccompanied: ♀ submerged, ♂ standing by	Unaccompanied: ♀ submerged, ♂ gone	Total
28	119	10	4	6	11	0	21
27	62	1	5	2	10	0	17
—	—	inc.	6	9	0	0	15
—	inc.	28	0	0	22	9	31
24	67	inc.	—	—	—	—	—
30	55	inc.	—	—	—	—	—
17	—	—	—	—	—	—	—
Range:							
17–30	55–119	1–28					15–31
Mean:							
25.2	75.8	13.0					21.0

tandem, and two additional ones flying the zigzag pattern, had the gray color characteristic of females just surfacing after underwater oviposition. Evidently, biting and zigzag flight, as well as gray color, can be used as evidence of an attempted second mating during the day and as a prediction of an early separation without copulation or oviposition.

Enallagma exsulans (Hagen)

All observations were at a 63-foot length of Juday Creek where the stream was 18 feet wide, 4–11 inches deep, and flowed at 53 feet per minute. Dense overhanging dogwoods (*Cornus* sp.) were on one side, willows (*Salix nigra*) on the other. In the creek were two small beds of *Veronica anagalis-aquatica*, and a small stand of *Sparganium* sp.

We never noted an unpaired female at water or initial seizure, but males seized females emerging from underwater oviposition without courtship or display by either member. Two pairs were observed and timed continuously for all reproductive events, five continuously for at least one major event (Table 2).

As in *aspersum* and *civile* (Bick and Bick, 1965c), sperm transfer in *exsulans* was always in tandem. In addition, we observed the event occurring in tandem in *E. ebrium* (three pairs), and *E. basidens* (one); and Jurzitza (1966, personal communication) saw it at the same stage in *E. cyathigerum*. Clearly, intra male transfer of sperm in *Enallagma*, and perhaps in the entire suborder (Bick and Bick, 1965c), occurs after the male has grasped the female and is holding her firmly in the tandem position. Sperm transfer in *exsulans* averaged 25.2 seconds (Table 2), and occurred between 1120 and 1535 hours as pairs perched 1–2 feet high on *Sparganium*.

Copulation, quickly following each sperm transfer, was punctuated by 2–11 interruptions lasting 1–26 minutes. During the interruptions, some pairs remained at the same perch, others often shifted. One pair shifted 10 times, once for 50 feet during the 26-minute interruption.

Contact, excluding interruptions, averaged 75.8 minutes and always exceeded 55 (Table 2). Except for *Ischnura elegans*, these durations are very long when compared with other coenagriids: *Pyrrhosoma nymphula*—15 minutes, *Coenagrion pulchellum*—10–15, *Ischnura elegans*—180–340 (Corbet, 1963); *Argia apicalis*—16 (Bick and Bick, 1965a), *E. civile*—19 (Bick and Bick, 1963), *E. aspersum*—13. Because in *exsulans* the sexes disengaged readily at the start of each interruption, difficulty in separating apparently did not cause the prolonged copulatory time. Morphological differences between *exsulans* and the other two *Enallagma* species seem insufficient to explain the great time variation. Interpretation of the variation in copulation times is difficult and suggests a need for additional information on basic processes of reproduction in damselflies to answer such questions as: are the long periods actually required for the transfer, what mechanism might make a long copulation necessary, what advantage results from such behavior. Corbet (1963) suggests that disturbance and temperature may influence copulatory duration. However, unpaired males seldom disturbed either *aspersum* or *exsulans* in copula, and the great time difference between these could not be correlated with the minor temperature differences at the two habitats.

Copulation was always over water as pairs perched 8 inches to 6 feet high on *Sparganium* or dogwood. While in copula, the female's legs either straddled her abdomen, occasionally contacting the substrate, or pressed tightly against her thorax, but these positions varied in any one sequence. Pumping of the male abdomen, always slight and infrequent, occurred only once during the 55-minute period. The male kicked the female abdomen with the femoral-tibial juncture of his metathoracic legs when copulatory contact was firmly established, as well as when it was being initiated and terminated, indicating a more general function than achieving and breaking contact.

We observed three pairs completing copulation and starting oviposition. Copulation always terminated at or very near one small *Veronica* bed which was the only ovipositing site, yet only one pair began egg laying immediately. The others delayed for 10 and 28 minutes while they perched in tandem, briefly probed, and shifted about the oviposition site. The shifts were small, making exploration less apparent than in *apicalis* (Bick and Bick, 1965a).

Eriksen (1960) reports submerged oviposition for *exsulans*. At Juday Creek, *Calopteryx maculatum* oviposited in *Veronica* at the surface, yet *exsulans* using a nearby bed of the same material, always descended. Physically, *exsulans*, as well as *maculatum* should have been able to oviposit above the surface, but since *exsulans* never did, submerged oviposition seemed obligatory. At Juday Creek, *exsulans* oviposited only in *Veronica*, elsewhere (Eriksen, 1960) in *Potamogeton filiformis*. Obviously, oviposition is not limited to *Veronica*, but apparently to submerged aquatics, and *Veronica* was the only one available to our population.

While ovipositing beneath the surface in the very shallow, clear water, the female twisted and turned assuming many positions, but never progressed in the repetitious downward manner described by Eriksen (1960). This behavior difference was probably due to depth and contrasting growth form of the two plant species. Each female remained in an area, not exceeding 16 square inches, during her entire submergence.

There were three distinct variations in oviposition. In variation one (first and second pairs, Table 2), females submerged while still in tandem, then the males submerged. After 2 and 6 minutes, the males broke tandem, surfaced, and perched near the females who continued to oviposit alone. Because, in both pairs, the mate was not marked, we could not differentiate his activity from the five or six males hovering just above the female. In variation two (third pair, Table 2), the pair remained in tandem throughout submerged oviposition and surfaced together. In variation three (fourth pair, Table 2), the male did not submerge, but separated immediately and perched 5–18 inches away for 22 minutes without showing aggressive behavior because other males were absent. Thus, females always oviposited under water, accompanied or not for various lengths of time. Females submerged for 15–31 minutes, males for only 2–9.

After oviposition various events, other than a second successful reproduction, took place among the four pairs. The first emerging female was immediately captured in flight; after 3 minutes in tandem without copulation, the pair separated and the female left water. The second female left the creek immediately after surfacing, as five males circled the oviposition site. The third pair emerged in tandem, separated after 6 minutes without copulation, and both sexes flew off. The fourth female emerged in the absence of all males and left unpursued.

Discussion

The question arises, are certain aspects of reproductive behavior sufficiently distinct among the species within a genus to supplement morphological differentiation. In *Enallagma*, at least from a comparison of *aspersum*, *civile*, and *exsulans*, the behavior which we studied does not seem to offer reliable criteria for separation of species.

The three species were similar in many behavioral aspects. Prior to mating, a male did not maintain a sizeable area free of competing males. Courtship or display was entirely absent, yet species and sex recognition were excellent. Sperm transfer, always in tandem, immediately preceded each copulation, and details for both events were essentially similar in the three species. Copulation preceded each oviposition. During egg laying, the female usually submerged for at least part of the period but the male seldom descended. A male who had separated from a female ovipositing under water remained nearby and maintained a stem during most of the female's submergence. Even though seized after oviposition, a female seldom successfully mated a second time during the day.

On the other hand, *exsulans* differed significantly from *civile* and *aspersum* in duration of copulation, and all three at first seemed to differ in major aspects of oviposition. Females of *civile* most often oviposited first in tandem above the surface and then unaccompanied beneath the surface; *aspersum* only submerged and unaccompanied; *exsulans* only beneath the surface, sometimes in tandem, sometimes not. However, most of these oviposition habits varied within the same population and among different populations of the same species. At the Oklahoma pond, *civile* females used three kinds of vegetation, sometimes submerging, sometimes not, depending on water level. At the Indiana pond, the same species used yet another kind of vegetation and descended in a different fashion. At one small spot along Juday Creek, *exsulans* exhibited three variations in submerged activity which were unrelated to any environmental change. In our *aspersum* population, ovipositing females always submerged; whereas in the one that Jacobs (1955) studied this was not routine. It seems that each of these *Enallagma* species is very plastic in use of oviposition materials and in oviposition behavior and that this permits occupation of a wide variety of habitats. Such plasticity is an odonate feature, and Corbet (1963) suggests that it contributes significantly to the success of the group.

Because the reproductive behavior which we studied was essentially similar in the three species, and because variation occurred within and among populations and even in the same individual of a species, we believe that the behavior studied herein does not furnish a reliable basis for differentiating the three species.

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NEW DISTRIBUTION RECORDS OF BITING DIPTERA FROM WISCONSIN

During the course of an arthropod-borne virus isolation program conducted by the Entomology and Veterinary Science Departments, new distribution records for three species of bloodsucking Nematocera were obtained. These records extend the known distributions of *Aedes grossbecki* Dyar and Knab and *Psorophora varipes* (Coquillett) northward and of *Leptoconops catawbae* (Boesel) westward. Each species was collected in Dane County, Wisconsin in 1964.

Aedes grossbecki was represented by one female taken in a light trap on May 26 in the University of Wisconsin Arboretum, Madison. This species occurs throughout the eastern states but is usually rare wherever it occurs (Carpenter and LaCasse, 1955, Mosquitoes of North America). Nearest previous records were from Illinois (Ross, 1947, Bull. Ill. Nat. Hist. Surv. 24:1–96) and Missouri (Anonymous, 1951, Mosquito records from the Missouri River Basin States. Surv. Sect., CDC, USPHS. 93 p. mimeo.).

One female of *Psorophora varipes* was collected by Philip D. Shenefelt on August 4 in a lowland hardwood forest near Mazomanie, Wisconsin while attempting to feed upon the collector. Other records from the Midwest include Illinois (Ross, 1947), Indiana (Christensen and Harmston, 1944, Jour. Econ. Ent. 37: 110–111; Hart, 1944, Amer. Midl. Nat. 31:414–416), Missouri (Adams and Gordon, 1943, Ent. News 54:232–235; Dyar, 1922, Proc. U.S. Nat. Mus. 62:1–119), and Iowa (Rowe, 1942, PhD Thesis, Iowa State Univ.). Neither species was included in the lists of Wisconsin mosquitoes compiled by Dickinson (1944, Milwaukee Publ. Mus. Bull. 8:269–365), Allen (1950, M.S. Thesis, Wisc. Univ.), Ryckman (1952, Amer. Midl. Nat. 47:469–470), or Patel (1959, PhD Thesis, Wisc. Univ.).

Two females of *Leptoconops catawbae* were collected on May 15 in the same lowland forest described for *P. varipes*. These insects were biting the first-named author when collected. This species has not been found previously in Wisconsin although there were faunal studies of *Culicoides* by Jones (1955, PhD Thesis, Wisc. Univ.) and Lupton (1960, M.S. Thesis, Wisc. Univ.). *Leptoconops catawbae* was recorded from Ohio, Michigan, Ontario, and Quebec (Stone, Sabrosky, Wirth, Foote, and Coulson, 1965, USDA, Agric. Handbook No. 276).

The authors express their appreciation to Dr. Alan Stone and Dr. Willis W. Wirth of the U.S. National Museum for their determinations of the mosquitoes and midge, respectively.

PATRICK H. THOMPSON *and* GENE R. DEFOLIART, *University of Wisconsin, Madison.*

A NEW ROSTROZETES MITE FROM BRITISH GUIANA
(Acari: Oribatei: Haplozetidae)

Harold G. Higgins, *Salt Lake City, Utah*[1, 2]

In 1965 Dr. Ludwig Beck published his excellent paper on the genus *Rostrozetes* in which he reviewed the known forms and described several new species from South America. A new species of this interesting genus was found in a collection of mites from British Guiana taken by Dr. Donald De Leon. A description of this new South American species follows:

Rostrozetes dimorphochaites, n. sp.
(Figs. 1, 2, 3)

Diagnosis: Lamellar hairs serrate; a sclerotized ridge mediad to the pteromorphs; dorsal hysterosomal setae of two types, six very large, medial, setose setae and seven pairs of fine, simple, marginal setae; setae p_2 located on a tubercule.

Description: Propodosoma roughly triangular in outline; rostrum blunt, rounded medially with lateral points; rostral hairs simple, inserted in depression formed by rostral projection; lamellar hairs serrate, longer than rostral hairs, located in a small depression on sides of propodosoma, extended to tip of rostrum; a faint, sclerotized line crossing rostrum at level of lamellar hairs; lamellae located along sides of propodosoma; interlamellar hairs weak, simple, with small insertions, located anterior to notch in undulated dorsosejugal suture; pseudostigmata cup-shaped, located at lateral margin of propodosoma near dorsosejugal suture the rim raised slightly above body; sensillus with long, smooth petiole and setose head which appears somewhat serrate from the side.

Hysterosoma longer than wide; pteromorphs large, curved downward, extending forward to pseudostigmata; a sclerotized ridge mediad of pteromorphs; dorsal setae of two types: medial six very large setose, as shown in Figure 3; seven pairs of simple, marginal setae; setae p_2 inserted on a tubercule; entire dorsum heavily pitted as shown in Figure 1.

Camerostome egg-shaped; ventral sclerotizations and setae as shown in Figure 2; genital opening longer than wide with slightly flattened sides, each cover with five visible, simple setae; anal aperture nearly as long as wide with flattened sides, each anal cover with two setae; fissure *iad* located near anal opening above level of an_2; entire ventral surface heavily pitted as shown in Figure 2.

Legs stout, monodactylus.

Size: Length 270 μ; width, 180 μ.

Type Locality: A single specimen was collected from *Simaba cedron* near the 24 mile Post, Bartica-Potaro Road, British Guiana on 27 October 1963 by Donald De Leon (Coll. No. 2570).

Discussion: Rostrozetes dimorphochaites n. sp. can be separated

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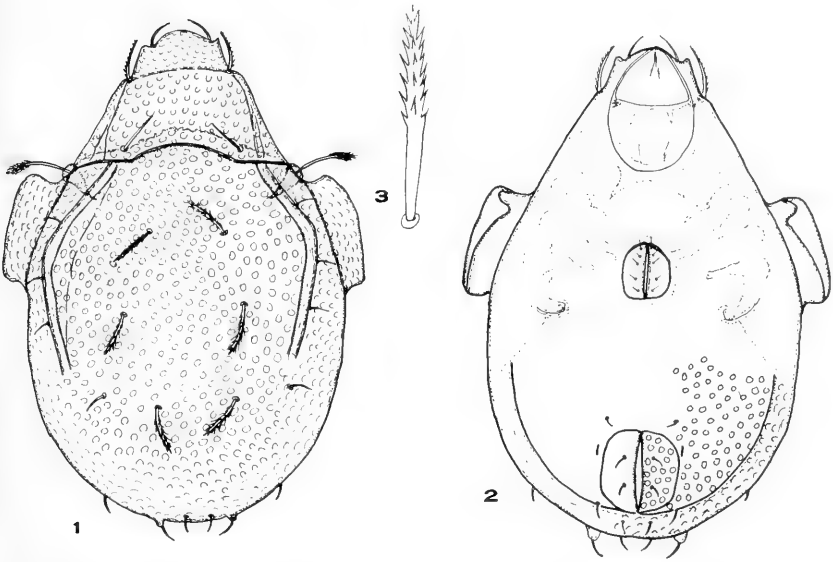
[2] Immediate publication secured by full payment of page charges—Editor.



Rostrozetes dimorphochaites, n. sp. Fig. 1, Dorsal view, legs omitted; fig. 2, Ventral view, legs omitted; fig. 3, Enlarged medial seta.

from all known species of this genus by the serrate lamellar hairs, the distinct, sclerotized ridge mediad to the pteromorphae, the three pairs of large, setose setae on the hysterosoma, and the presence of the tubercules on the posterior end of the hysterosoma. The name *dimorphochaites* refers to the two distinct types of setae on the dorsum.

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NEW AND LITTLE KNOWN DOLICHOPODIDAE FROM THE PACIFIC NORTHWEST AND INTERMOUNTAIN AREAS
(DIPTERA)

FRED C. HARMSTON[1] *and* LAVERNE S. MILLER[2]

The following descriptions of new Dolichopodidae are based upon specimens collected by the writers and those received from the following persons: Dr. Charles P. Alexander, University of Massachusetts; Mr. Kenneth Goeden, Oregon State Department of Agriculture; and Mr. Roy J. Myklebust, Washington State Department of Health.

Campsicnemus alaskensis, n. sp.

Male. Length, 1.8 mm.; of wing, 2.6 mm. Face yellowish pollinose, narrow at the middle where the eyes are narrowly separated, broader on lower portion. Front metallic, outer portions violet, somewhat dulled with gray pollen. Palpi pollinose, brown. First and second segments of antennae yellow, strongly contrasting with the black third segment which is pubescent, triangular, slightly longer than wide. Arista dorsal, inserted at base of third segment, twice the length of antenna. Lower postocular cilia white, a few of the upper cilia black.

Thorax and abdomen black, dulled with grayish pollen. Hypopygial appendages embedded. Fore coxae yellow, the anterior surface with pale hairs and bristles; middle and hind coxae black, the former with pale hairs on anterior surface. Femora and tibiae yellow, of plain structure. Tarsi yellow, infuscated from tip of the first segments. Halteres and calypters yellow, the latter with black cilia.

Wings grayish hyaline, of rather uniform width, without a spot on last portion of fourth vein.

Described from 1 male collected by Dr. C. P. Alexander, at Clam Beach, Sterling Highway, Alaska, August 3, 1954. Holotype male to be deposited in the California Academy of Sciences, San Francisco, California.

Campsicnemus oregonensis, n. sp.

Male. Length, 2 mm.; of wing, 2.3 mm. Face narrow, the eyes nearly contiguous at middle, velvety-brown. Front brilliant metallic, blue-violet. Palpi black. Antennae black; third segment as broad as long, pubescent, rounded at tip. Arista dorsal, inserted at base of third segment. Lower postocular cilia white, the upper cilia black.

Thorax metallic, black; scutellum with violet reflections, with one pair of bristles and four evenly spaced hairs on the margin; pleurae grayish, pollinose. Abdomen black with greenish-bronze reflections, lightly dusted with grayish pollen. Hypopygium embedded, the appendages clothed on posterior surface with delicate pale cilia.

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Fore coxae yellow on anterior surface, bright silvery pollinose when viewed from the front, the outer and basal portions dark; anterior surface with delicate pale hairs and several black bristles at tip. Middle and hind coxae black. Femora yellow, the fore pair brownish-black on basal half, especially on upper surface. Middle femora with long sharp bristles on lower surface. Middle tibiae decidedly flattened on apical half; inner surface bearing two rows of evenly spaced blunt brisles on basal half, those in the posterior row nearly twice the length of those in the other row; outer surface noticeably thickened near the middle, the apical half concave and glabrous which gives a flattened appearance, the tip enlarged and with a deep notch above the point of attachment of basitarsus; outer surface with two large bristles inserted at middle at the thickest part of tibia and bearing a compact cluster of four to five short black bristles between the bases of the large bristles. Tarsi black from about the middle of the first segments; fore and hind tarsi of plain structure. Middle basitarsi moderately bent, terminating in a strong black thorn, fringed along outer edges with black hairs, those on posterodorsal edge almost one-half the length of basitarsus. Halteres and calypters yellow, the latter with black cilia.

Wings grayish hyaline, last portion of fourth vein with a faint brownish spot near basal third.

Female. Similar to the male in general coloration of body and legs; face much wider, the portion immediately below the antennae and that below the suture brownish pollinose, the middle portion grayish.

Described from 5 males and 1 female collected by the junior author at Barview State Park, Oregon, March 12, 1963. Holotype male and allotype female to be deposited in the California Academy of Sciences; paratype males in the U.S. National Museum, Oregon State Board of Health, and collection of the senior author.

Campsicnemus alexanderi, n. sp.

Male. Length, 2.2 mm.; of wing, 2.5 mm. Face yellowish pollinose. Front lightly dusted with yellow pollen, the violet ground color evident. Antennae black; third segment pubescent, elongate-triangular, approximately twice as long as wide; arista dorsal, inserted at basal corner. Postocular cilia white, the upper cilia black. Palpi black.

Dorsum of thorax metallic black, with greenish-bronze reflections, dusted with yellow pollen; scutellum with a single pair of large marginal bristles and a row of four evenly spaced hairs on posterior margin. Abdomen concolorous with thorax. Hypopygium dusted with gray pollen; appendages embedded.

Fore coxae yellow, infuscated at base on outer side, the anterior surface with delicate white hairs and with black bristles at tip and along the outer side near apex; middle and hind coxae black. Femora yellow, the basal third of all pairs black on lower surface. Anterior femora with a few long delicate pale hairs on basal half of lower edge; middle femora bearing a row of sharp black bristles along the posterior margin of lower edge which are about as long as the diameter of femora, and a row of similar, but shorter, bristles along the bottom edge of femora. Tibiae yellow; middle tibiae with a row of evenly spaced, long, stout, blunt bristles along entire posteroventral surface which are longer than the diameter of tibiae, and a row of shorter sharp bristles along the outer edge. Tarsi brownish, of plain structure. Halteres and calypters yellow, the latter with black cilia.

Wings grayish hyaline, without a spot on the last portion of fourth vein.

Described from 3 males collected by Dr. C. P. Alexander, at Mile Post 49, Taylor Highway, W. Fork Dennisan River, Alaska, August 13, 1954. Holotype male to be deposited in the California Academy of Sciences; paratypes in the U.S. National Museum and the collection of the senior author.

Campsicnemus coloradensis, n. sp.

Male. Length, 2 mm.; of wing, 2.5 mm. Face black, narrow on middle portion where the eyes are narrowly separated. Front black, metallic. Palpi black. Postocular cilia wholly black. Antennae black; third segment broader than long, apex rounded, pubescent. Arista dorsal.

Dorsum of thorax black, with bronze-green reflections; scutellum with a pair of large bristles and six evenly spaced hairs on the posterior margin. Pleurae concolorous with dorsum. Abdomen and hypopygium black, the latter embedded.

Coxae, femora, tibiae, and tarsi black. Anterior surface of fore and middle coxae with black hairs and bristles. Middle femora with two rows of divergent bristles on lower surface which are nearly as long as the diameter of femur. Middle tibiae slightly bowed, flattened; inner surface with two rows of blunt bristles on basal half which merge into a row of about four longer pointed bristles, the apical fourth nearly bare on inner surface. Outer surface of middle tibiae densely clothed with long bristles many of which are as long as the hind basitarsus. Middle basitarsi about three-fourths the length of second segment, bowed, ending in a stout, black, horn-like projection, the posterior surface with black hairs that are about one-half the length of segment. Second to fifth segments of middle tarsi and the fore and hind tarsi of plain structure. Halteres black; calypters dark brown with black cilia.

Wings dark grayish, hyaline; posterior cross-vein and the small depression on distal portion of fourth vein slightly infuscated.

Female. Face wider than in the male. Middle legs of plain structure. Coloration of body, legs, and wings as in male.

Described from 1 male and 2 females collected by the senior author at Ward, Colorado, June 21, 1962. Holotype male and allotype female to be deposited in the California Academy of Sciences; paratype female in collection of the senior author.

Syntormon myklebusti, n. sp.

Male. Length, 2.8 mm. Face narrow, silvery pollinose. Front blue, metallic. Palpi black. Antennae black; third segment about as long as the first segment of fore tarsi, the basal two-fifths wide, from which point the segment is abruptly narrowed on both upper and lower edges with the apical three-fifths parallel-sided and ending in a blunt point.

Arista almost apical, yet inserted slightly above the tip of segment. Lower postocular cilia pale, the upper cilia black.

Dorsum of thorax bronzy-green, lightly dusted with white pollen; pleurae densely whitish pollinose. Abdomen dark green. Hypopygium black, bearing a pair of small brownish, spoon-like lamellae, their outer surfaces clothed with brownish hairs.

Fore coxae brownish; middle and hind pairs black. Femora and tibiae yellow, the hind tibiae brownish at apex. Middle tibiae with a row of three long, slender, black bristles at the middle on lower edge. Fore tarsi dark from tip of second segment; first segment enlarged at tip below. Middle tarsi of plain structure. Hind basitarsi swollen, bearing a comb of dense, stiff, yellow bristles at tip on inner edge which overlies a small projection bearing a short black bristle at tip; second segment about as long as third, bearing a densely haired prolongation on lower portion which extends beyond the point of attachment of third segment. Halteres and calypters brownish-yellow, the latter with narrow black margin and dark brown cilia.

Wings gray, hyaline.

Female. Face nearly three times as wide as in male, yellowish-gray pollinose. Front blue, metallic. Third segment of antennae short, rounded at tip, the arista dorsal. Coxae, femora, and tibiae yellow. Tarsi dark from the tip of second segments. Metepimeron and venter of abdomen yellow.

Described from 1 male and 2 females collected at Ilwaco, Washington, July 19, 1960, by Mr. R. J. Myklebust in whose honor the species is named. Holotype male and allotype female to be deposited in the California Academy of Sciences; paratype female in the collection of the senior author.

Systenus oregonensis, n. sp.

Male. Length, 2 mm.; of wing, 2.5 mm. Face and front whitish, the former narrow and barely separating the eyes on lower portion. Antennae brown; third segment tending toward black, triangular, about the length of third segment of fore tarsi, the tip blunt, densely pubescent. Arista apical about twice the length of third segment. Palpi yellow, the upper surface with black hairs and with a prominent black bristle at tip. Lower postocular cilia white, the upper cilia black.

Dorsum of thorax and scutellum brown, sparsely whitish pollinose; upper portions of pleurae dark brown, the lower half yellow. Abdomen black, with black bristles. Hypopygium rounded; lamellae yellow, triangular, about the length of fifth segment of fore tarsi, bearing a few short black hairs on margin.

Coxae yellow, the middle pair with a narrow brown stripe near the middle; fore and middle pairs with black hairs and bristles on anterior surface, the middle and hind pairs with a large black bristle on outer surface. Femora, tibiae, and tarsi yellow, the latter slightly infuscated toward the tips; fore femora with a long, slender, black bristle inserted at basal third on lower edge which is as long as the diameter of femora; middle femora with a single anterior preapical bristle; hind femora with two anterior preapicals, the lower one inserted near lower edge of femora. Halteres with yellow stem, the knob brown; calypters yellow with black cilia.

Wings grayish, hyaline; third and fourth veins strongly divergent on apical portions, their tips separated by a distance equal to the length of posterior cross-vein.

Described from 2 males; the holotype collected by Mr. Kenneth Goeden, sweeping plants in marsh at Wilsonville, Oregon, July 3, 1963; paratype collected at Troutdale, Oregon, June 23, 1963, by the junior author. Holotype to be deposited in the California Academy of Sciences; paratype in the U.S. National Museum.

Systenus utahensis, n. sp.

Male. Length, 2.2 mm.; of wing, 2 mm. Face and front with dense grayish pollen, the former narrow on lower portion. Palpi yellow, the upper surface with sparse black hairs and a prominent black bristle at tip. Antennae yellowish to about the middle of third segment which is brown on apical half; third segment triangular, the tip rounded, about the length of third segment of fore tarsi, pubescent. Arista apical, twice the length of antenna. Lower postocular cilia pale, the upper cilia black.

Thorax and pleurae wholly yellowish, the latter with a small, triangular, black spot immediately below halter. Bristles of thorax strong, black. Abdomen dark brown, venter yellowish, the hairs and bristles black. Hypopygial lamellae yellow, ribbon-like, broad at base, tapering to a sharp point, about the length of the first segment of fore tarsi, the margins fringed with long pale hairs.

Legs, including coxae, yellow; fore and middle coxae with black hairs and bristles on anterior surface; hind coxae with a black bristle on outer surface at middle. Fore femora with a prominent, slender, sharp bristle inserted at basal third on lower edge which is as long as the diameter of femora at point of attachment. Halteres and calypters yellow, the latter with black cilia.

Wings grayish, hyaline; distal portions of third and fourth veins parallel.

Described from 2 males collected in moist cavity of cottonwood tree, Moab, Utah, August 4, 1957, by the senior author. Holotype male to be deposited in the California Academy of Sciences; paratype male in U.S. National Museum.

Parasyntormon caudatum (Van Duzee), n. comb.

Sympycnus caudatus Van Duzee, Canad. Ent., 49:338, 1917.

The structure of fore tarsi, clubbed inner appendages of hypopygium, and presence of a pair of stout, rod-like appendages extending from the venter of fifth abdominal segment in *caudatus* are characteristic of *Parasyntormon* rather than *Sympycnus.*

Sympycnus nodatus Loew

Sympycnus nodatus Loew, Dipt. Amer. Sept. Indig., II: 85, 1861.

Sympycnus (*Calyxochaetus*) *abbreviatus* Van Duzee, Canad. Ent., 49: 341, 1917.

Van Duzee's type specimen of *abbreviatus* was damaged and the true structure of the arista and the middle tarsi was not determined. The presence of the long slender bristle on inner surface of hind tibia at basal third identifies the species as *nodatus.*

Sympycnus rotundus n. name

Sympycnus calcaratus Parent, Ency. Ent., Ser. B., Dipt., 6:43, 1932.

This change in name for Parent's species is necessary in view of *Sympycnus calcaratus* Van Duzee, described in 1930, Pan-Pac. Ent., 7(1):41.

Sympycnus parenti n. name

Sympycnus cilifemoratus Parent, Ency. Ent., Ser. B., Dipt., 6: 42, 1932.

This change in name for Parent's species is necessary in view of *Sympycnus cilifemoratus* Van Duzee (described as *Nothosympycnus*), Proc. U.S. Nat. Mus., 63(21): 12, 1923.

THE CORRECT NAME FOR AN ANTHOCORID PREDATOR OF THE CUBAN LAUREL THRIPS

(HEMIPTERA: ANTHOCORIDAE)

The following synonymy is presented for the benefit of biological control workers concerned with the control of the Cuban laurel thrips, *Gynaikothrips ficorum* (Marchal).

Montandoniola moraguesi (Puton)

Montandoniella moraguesi Puton, 1896, Rev. d'Ent. 15: 232.

Montandoniola moraguesi (Puton), Poppius, 1909, Acta Soc. Sci. Fenn. 37 (9): 30.

Montandoniola thripodes Bergroth, 1916, Proc. U. S. Nat. Mus. 51. (2150): 233. (Holotype from Hong Kong in USNM No. 20153) **NEW SYNONYMY**.

Ectemnus pictipennis Esaki, 1931, Ann. Zool. Jap. 13: 264.

E. pictipennis was made the type of a new genus, *Teisocoris* by Hiura (1959, Bull. Osaka Mus. Nat. Hist. 11: 1). Carayon (1961, South African Animal Life 8: 543) synonymized this genus with *Montandoniola* and its type-species with *moraguezi*. In this same paper, he predicted the above synonymy of *thripodes*, which I have confirmed by examination of the type.

M. moraguesi occurs over much of the same range as *Gynaikothrips*. It is known from France, Italy, Spain, Portugal, Africa, India, the Orient and western Micronesia. It is not known from the New World.

This predator was introduced from the Philippines into the Hawaiian Islands in mid-1964 after the Cuban laurel thrips was discovered at the Honolulu International Airport in January of that year. Dr. C. J. Davis states (*in litt.*) that *Montandoniola* is doing an outstanding job of controlling *ficorum* in Hawaii. Whereas most of the banyan leaves (*Ficus retusa*) dropped off the trees following heavy infestations prior to the introduction of the anthocorid; now most of the leaves recover as a result of effective thrips control by this bug. JON L. HERRING, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C. 20560.*

SOME NEW SYNONYMIES IN TABANIDAE
(DIPTERA)

G. B. FAIRCHILD, *Gorgas Memorial Laboratory, Panama, R. de P.*

Recent study of types in European museums has revealed a number of names applied to supposedly Neotropical specimens but actually referring to Nearctic or Palearctic species. It seems worthwhile to dispose of these names preliminary to a larger treatment of the Neotropical species in preparation.

Travel to European museums, except Berlin, was made possible by a grant from the Bache Fund, National Academy of Sciences.

Tabanus maculipennis Wied., 1828, Auss. Zweifl. Ins., 1:138–139, ♀, aus Brasilien. Im Berliner Museum. Kröber, 1934, Rev. Ent., 4(3):311, listed with a query.

Tabanus imitans var. *excessus* Stone, 1938, U.S. Dept. Agric. Miscell. Publ. No. 305, p. 87, Florida. Philip, 1947, Amer. Midl. Nat., 37(2):308. (**New synonymy**)

Wiedemann's type is in Berlin Museum, and was seen on loan through the courtesy of Dr. H. Schumann. It bears the following labels: "Brasil v. Olf"; printed 54; red Type; green "maculipennis Wied.*". The specimen is unfortunately now headless, but agrees in detail with the original description. The asterisk on the name label on Wiedemann material in Berlin generally indicates that the specimen is a type.

Through the courtesy of Dr. Alan Stone, I was able to compare the type with specimens of the three forms: *T. imitans* Wlk., *imitans* var. *excessus* Stone and *imitans* var. *pechumani* Philip. It agrees best with var. *excessus*, having the large wing spots on cross-veins and small spots at ends of most longitudinal veins. The hind tibial fringe is largely red, the setae on basicosta red with a few black ones at tip. Wiedemann says nothing about the shape of the basal plate of antenna, which suggests *excessus* also, as *imitans* and *pechumani* both have a long dorsal tooth, and Wiedemann usually mentioned a tooth when it was present. His description of frons and callus agrees also with *excessus*. The erroneous locality apparently results from an early exchange of labels, a mischance affecting other material of Wiedemann's both in Berlin and Vienna. For example, the Berlin Cotype of *Stibasoma fulvohirtum* Wied. is labelled "Georgia, Somer", while a specimen labelled "Brasil, Sello", is determined by Wiedemann as *T. impressus* Wied., though actually *T. funipennis* Wied., a Nearctic species.

The synonymy of this species and its forms should stand as follows: *Tabanus maculipennis* Wied. 1828 (= *T. imitans* var. *excessus* Stone 1938); *T. maculipennis* var. *imitans* Wlk. 1848 (= *T. imitans* Wlk. 1848); *T. maculipennis* var. *pechumani* Philip 1960 (= *T. imitans* var. *pechumani* Philip 1960).

Hamatabanus carolinensis (Macquart) 1838, Dipt. Exot., 1(1):145.
Tabanus scitus Walker, 1848, List Dipt. Ins. Brit. Mus., 1:181, ♀, Georgia.
Hamatabanus scitus Philip, 1947, Amer. Midl. Nat., 37(2):290, synonymy.
Tabanus (*Poecilosoma*) *fraterna* Kröber, 1931, Zool. Anz., 94(3–4):82–83, fig. 14, ♀, Berlin, von S. Paulo. Not Macquart 1845.
Tabanus (*Poeciloderas*) *frater* Kröber, 1934, Rev. Ent. 4(3):297. Nom. nov. for *fratern* Kröb. (**New synonymy**).

The female type of *fraterna* in Berlin Mus. bears the following labels: S. Paul Sello; pink Type; Kröber det. label as *Hybopelma fraterna* Kröb. det. Kröber 1929. The specimen lacks antennal flagelli, 2 legs, and one wing is glued on. It agrees closely with a specimen of *carolinenis* from Raleigh, N. C. Kröber's description is adequate, but his figure inaccurate in several respects. The type is an old specimen and appears to have been involved in the same mass mislabelling that affected the previous species.

Diachlorus bivittatus Wiedemann, 1828, Auss. Zweifl. Ins., 1:193, ♀, Brasilien.
Diachlorus badius Kröber, 1928 Arch. Schiffs-Tropen Hyg., Beihefte, 32(2):50, fig. 24, ♀, Georgia. Stone, 1938, U.S. Dept. Agric. Misc. Publ. No. 305, p. 14. Philip, 1947, Amer. Midl. Nat., 37(2):284. (**New synonymy**).

The type in Vienna Nat. Hist. Mus. bears the following labels: handwritten "Georgia"; printed "Coll. Winthem" with "ferrugatus" written in; red "Type"; Kröber det. 1927. The specimen is in my opinion only a badly rubbed and rather pale specimen of *D. bivittatus* Wied., differing from a homotype of the latter only in having pale hind femora. Leg color is very variable in this species, and the head and wing characters agree closely. There is also a series of *D. ferrugatus* ex. Coll. Winthem in Vienna labelled Colombia, as well as specimens from Georgia and Carolina, so this is quite surely another case of early mislabelling, and the species can safely be deleted from the Nearctic fauna.

Tabanus tinctus Walker, 1850, Ins. Saund. 1:29, ♀, St. Thomas? Fairchild, 1956, Smiths. Miscell. Colls., 131(3):30. Palearctic. *T. eggeri* Schin. a synonym.
Tabanus eggeri Schiner, 1868, Reise Novara, Dipt., p.81, nom. nov. for *T. intermedius* Egger 1859, not Walker 1848.
Phyrta speciosa Kröber, 1931, Rev. Ent. 1(4):401, fig. 2, ♀. Type Munchen, von Brasilien. (**New synonymy**).

The type in Munich bears the following labels: pencilled 3; pink Type; Kröber det. 1928; old green bordered label with "14/Brasil/T./speciosus/Pty."; Munich Type label. It is in good condition, and agrees closely with a specimen of *tinctus* in Munich det. by M. Leclercq. The Berlin specimen mentioned at the end of Kröber's description is labelled as follows: Green pencilled "Brasilien" with a query in ink; red Cotype; Kröber det. label with "Phyrta ♀/speciosa Krb./det. Kröber 1928". Specimen is well preserved except for loss of one antenna and style of the other. It agrees with a specimen of *tinctus* in my collection.

Tabanus moerens Fabricius, 1787, Mantissa Insectorum, 2, p.356. Habitat Cajennae.

Chrysops moerens, Surcouf, 1921, Genera Insect., Tabanidae, Fasc. 175, p.153, no locality. Pechuman, 1938, Bull. Brooklyn Ent. Soc. 33(3):136–137. Synonym of *variegata* De G.

A specimen in Copenhagen Museum is labelled type, and consists of only a wing attached to a fragment of thorax on an old short pin. This wing is not that of *C. variegata*, but belongs probably to a Palearctic species, agreeing quite well with a specimen of *C. punctifer* Loew.

Pechuman, in his discussion of the species, also stated that the type consisted of only one wing, then in the Kiel collection. Since the Kiel material is now in Copenhagen, this is no doubt the same specimen. Pechuman himself did not see the type, but sent a representative collection of South American *Chrysops* for comparison by Dr. O. Schroder, among them *C. variegata*. This species is one of the few Neotropical species with a clear spot in the discal cell, and the only species with this character sent (Pechuman in litt.). It is therefore not surprising that Schroder decided that the type wing of *moerens* agreed. Fabricius' description when read with this in mind, offers several points of disagreement with *variegata*, such as, antennae black with base white, head with two white lines and two shiny black vertical spots beneath antennae; abdomen grey, first segment yellowish with black arc, second and third with two black basal marks, the remainder immaculate; legs black, tibiae brick colored. None of these statements apply to *variegata*. The type bears no locality and unless European workers can identify it with certainty from the wing and the description, it had perhaps best be left as a nomen dubium.

Tabanus maculicornis Zetterstedt, 1842, Dipt. Scand., Taban., 1:117. Palearctic.

Tabanus costaricensis Kröber, 1931, Konowia, 10:294, ♀, Costa Rica. (**New synonymy**).

The Type in Vienna Nat. Hist. Mus. bears the following labels: printed "Costa Rica, Brade"; pink Type; Kröber det. label 1929. Comparison with specimens of *maculicornis* Zett. in Vienna Mus. shows no differences, and I conclude that the specimen was mislabelled. Kröber himself noted that his species bore a great resemblance to *maculicornis*, but presumably trusted the locality label.

FURTHER RECORDS OF MISSOURI APHIDS

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Two papers on Missouri aphids have been published previously by the writer, one in 1959 and the other in 1963. These contain records of 169 aphids from 205 food plants, based on collections made through 1961. The present paper records 11 species not previously known from Missouri, and adds 14 food plants (both marked with an asterisk in the text), several of which are of unusual interest. It also includes new host plant records for several species previously reported from the state.

Most collections reported here were made by Dr. W. R. Enns of the Department of Entomology, University of Missouri, and by the Emeritus Head of the Department, Dr. Leonard Haseman (LH in the text). It is personally gratifying to have more records from Dr. Haseman who taught me my first course in entomology at Cornell University in 1909–1910. A few miscellaneous earlier records are also included. I thank Dr. A. N. Tissot (ANT in text) of the University of Florida for making or verifying a number of determinations and Miss Louise M. Russell, Agricultural Research Service, U.S. Department of Agriculture, for suggestions on the preparation of this paper.

LIST OF APHIDS

**Anuraphis longicauda* Baker (1920), House Springs, no date, on plum, H. Gruber.

?*Aphis craccivora* Koch, cowpea aphid. Rosati, 26 July 1962, on *Gaura filipes*, Enns (ANT det. with query, only apterae). Columbia, 14 May 1963, on *Geum vernum*, and 26 May 1963, on bittersweet, LH (ANT det. with query, only apterae). I find no other record of an *Aphis* on *Gaura*.

Aphis gossypii Glover, cotton aphid and melon aphid. Columbia, 11 Sept. and 12 Oct. 1963, on okra, LH. The following records are from the files of Insect Detection and Survey, Plant Pest Control Division, U.S. Dept. Agriculture: Higginsville, 1 July 1914, on muskmelon and watermelon, W. F. Lyon (Chittenden det.). Lebanon, 29 July 1915, on cantaloupe, Stevens (Chittenden det.).

Aphis nerii Fonscolombe, oleander aphid and milkweed aphid. Columbia, 15 Oct. 1962, many immature apterae and one alata on the wild potato vine, *Ipomoea pandurata*, LH (ANT det.). I know of no other record of an aphid on this plant. Columbia, 22 Oct. 1963, on *Hoya carnosa*, Enns. Dr. Enns writes that two small colonies were noticed on leaves of a potted wax plant about to be moved indoors. The only other record, I thought, of an aphid on this plant was called to my attention by Dr. Enns who states that it was reported in TRI-OLOGY (4 (1): 3. 1965), as *lutescens* Monell, as severely infesting the stems and leaves of 1,000 *Hoya carnosa* R. Br. at a nursery in Zellwood, Orange County, Fla. I have however subsequently found that this aphid was previously recorded from this plant at Rehovot, Israel, 11 June 1950 (Bodenheimer and Swirski, 1957).

Aphis rumicis Linnaeus, dock aphid. Portageville (New Madrid County), 27 May 1964, a teneral viviparous female and some alatoid nymphs on "narrow dock," *Rumex* sp., E. C. Houser (ANT det.).

Aphis sedi Kaltenbach, sedum aphid. Columbia, 15 Oct., 5 Nov. (many alate and apterous viviparae, oviparae and apterous males) and indoors 20 Nov. 1962, also 29 May 1963, all on *Sedum telephium*, LH (MDL det., teste ANT).

**Aphis mimula* Oestl. Columbia, 20 June 1963, 24 June 1964, many apterae on carpenter's square, *Scrophularia marilandica*, LH (LMH det.). Known only from orig. descr., Minn. and Neb. 1887 on *Mimulus* spp.

**Aphis* sp. Columbia, 25 July 1964, all nymphs, on nasturtium, LH (ANT det.).

**Aphis sanborni* Patch, Sanborn's currant aphid. Columbia, 22 June and 23 May (abundant), 1963, on wild gooseberry, LH (Russell det.)

Dactynotus helianthicola Olive. Previously (1963: 71) designated as "n. sp. No. 3 Olive."

Dactynotus nigrotuberculatus Olive. Previously (1963: 71) designated as "n. sp. No. 5 Olive."

Dactynotus pseudambrosiae Olive. Previously (1963: 71) designated as "n. sp. No. 7 Olive."

**Dactynotus taraxaci* (Kaltenbach), dark dandelion aphid. Columbia, 12 May 1963, many on flower stems of *Taraxacum officinale*, Enns.

**Georgiaphis ulmi* (Wilson). Columbia, 31 May 1962, in tightly curled leaves of slippery elm, LH.

Hyadaphis pseudobrassicae (Davis), turnip aphid. Columbia, 22 May 1964, on mustard, LH.

Hysteroneura setariae (Thomas), rusty plum aphid. Columbia, 16 Aug. 1963, one alate vivipara and many apterae on tall redtop, *Triodia* (*Tridens*) *flava*, LH (ANT det.). I find no previous record of an aphid on this grass.

?*Lachnus salignus* Gmelin, giant willow aphid. Columbia, 12 May 1962, on *Salix* sp., Enns (ANT det. with query, all immature).

Macrosiphum avenae (Fabricius), English grain aphid. Columbia, 23 May 1964, on flower heads of Kentucky bluegrass, Enns.

Macrosiphum euphorbiae (Thomas), potato aphid. 14 May 1963, a few on *Ampelamus albidus*, first record on this plant, Enns; 11 Sept., 12 Oct. 1963, on okra, LH; 23 May 1963 on lettuce, LH; 9 May 1963 on *Celastrus scandens*, LH; 21, 28 Oct. 1964 on okra, LH; 6 Jan. 1964 on *Solanum pseudocapsicum*, first record from this plant, Enns.

**Macrosiphum tiliae* (Monell). Columbia, 13 May 1964, on *Tilia* sp., LH. Apparently recorded previously only from New York and Illinois.

*?*Melaphis rhois* (Fitch), sumac gall aphid. Lexington, 2 July 1962, a few apterae in a leaf gall on *Rhus glabra*, Enns (ANT det. with query, specimens in poor condition).

?**Myzocallis exultans* Boudreaux & Tissot. Columbia, 11 Oct. 1964, a single alate viviparous female, E. C. Houser (ANT det. with query).

**Myzocallis frisoni* Boudreaux & Tissot. 11 Oct. 1964, many alate viviparous females, oviparae and males on pin oak, E. C. Houser (ANT det.).

**Myzus lythri* (Schrank), Mahaleb cherry aphid. Columbia, 2 June 1963, on Mahaleb cherry, Enns.

Myzus persicae (Sulzer), green peach aphid. "Central Missouri (May 21, 1935). Quite serious on peach during first half of May but as of now about cleaned up." (LH in files of Insect Detection and Survey, Plant Pest Control Division, USDA).

**Pterocomma populifolae* (Fitch), reddish brown poplar aphid. Columbia, 6 May 1962, one alate vivipara accidental on *Salix* sp., Enns (ANT det.).

List of Food Plants

Ampelamus albidus (honeyvine)
Macrosiphum euphorbiae
Brassica sp. (mustard)
Hyadaphis pseudobrassicae
***Celastrus scandens** (bittersweet)
?*Aphis craccivora*
Macrosiphum euphorbiae
Citrullus vulgaris (watermelon)
Aphis gossypii
***Cucumis melo** (muskmelon)
Aphis gossypii
Cucumis melo var. **cantaloupensis** (cantaloupe)
Aphis gossypii
***Gaura filipes**
?*Aphis craccivora*
***Geum vernum** (avens)
?*Aphis craccivora*
***Hibiscus esculentus** (okra)
Aphis gossypii
Macrosiphum euphorbiae
***Hoya carnosa** (wax plant)
Aphis nerii
***Ipomoea pandurata** (wild potato-vine)
Aphis nerii
Lactuca sativa (garden lettuce)
Macrosiphum euphorbiae
Poa pratensis (Kentucky bluegrass)
Macrosiphum avenae
Prunus sp. (plum)
Anuraphis longicauda
Prunus persica (peach)
Myzus persicae
Quercus palustris (pin oak)
?*Myzocallis exultans*
Myzocallis frisoni
Rumex sp. (dock)
Aphis rumicis
***Rhus glabra** (smooth sumac)
Melaphis rhois
Ribes sp. (wild gooseberry)
Aphis sanborni
Salix sp. (willow)
?*Lachnus salignus*
Sedum telephium (liveforever)
Aphis sedi
***Scrophularia marilandica** (carpenter's-square)
Aphis mimula
***Solanum pseudocapsicum** (Jerusalem cherry)
Macrosiphum euphorbiae
***Taraxacum officinale** (dandelion)
Dactynotus taraxaci
***Tilia** sp. (linden or basswood)
Macrosiphum tiliae
***Triodia (Tridens) flava** (tall redtop)
Hysteroneura setariae
Tropaeolum sp. (Nasturtium)
Aphis sp.
***Ulmus rubra** (slippery elm)
Georgiaphis ulmi

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THE GENUS EUMECOSOMYIA HENDEL
(Diptera, Otitidae)

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The genus is here reviewed, with the description of one new species, *Eumecosomyia hambletoni*, from Guatemala, making a total of three known species, all from tropical and subtropical America. One species, *Eumecosomyia nubila* (Wiedemann), is reported for the first time from the United States (southern Texas). *E. nubila* seems to have potentialities as a pest of maize (*Zea mays* L.) and related plants.

Genus **Eumecosomyia** Hendel

1909, Wien. Ent. Ztg. 28: 269 (2 spp., type not designated); 1910, Gen Ins. 106: 38 (type designated as *E. gracilis* Coquillett [= *Ortalis nubila* Wiedemann, see below]).

The genus is a member of the subfamily Ulidiinae and will run in my key to the North American Otitidae (1961, Ann. Ent. Soc. Am. 54: 404) to rubric 42, where it may be distinguished from *Chaetopsis* Loew and *Stenomyia* Loew by the outwardly arcuate, nonangulate, retrorse closure of the anal cell and nonretreating face.

Key to the Species of **Eumecosomyia** Hendel

1 (2). Interantennal space dull black; palpus dark brown; legs yellow, tips of tibiae and fore tarsus somewhat brownish; wing whitish antero-basally, light brownish elsewhere, the color somewhat deeper antero-apically .... **E. nubila** (Wied.)

2 (1). Interantennal space not dull black, concolorous with surrounding areas; legs largely blackish; palpus orange; wings more strongly marked.

3 (4). Wing dark brown, with complete whitish crossband between *ta* and *tp*, broad anteriorly, narrow in discal cell, and somewhat broader again posteriorly; antenna wholly orange, also adjacent face and front; front 0.30 of total width of head; wing 3.4–4.8 mm. long .... **E. lacteivittata** Hendel

4 (3). Wing yellowish at base, whitish in basal 0.4 of marginal and submarginal cells, otherwise dark brown except faint paler area in middle of hind margin; third antennal segment usually infuscated above; front 0.26 of total width of head; wing 2.68–3.13 mm. long .... **E. hambletoni**, new species

E. hambletoni, new species

Male. Length of wing, 2.68 mm. Color of body and legs black with metallic green and bluish reflections, only the following parts reddish to brownish yellow: front, antenna (except brown dorsal half of third segment and base of second and first segments), palpus, cheek, knees (very narrowly), narrow tips of t_1 and t_2 and narrow base of fore basitarsus, all of middle and hind tarsi.

Head with front at narrowest part 0.26 of total width of head, slightly wider anteriorly; 3 inclinate lower *fo* at mesal margin of whitish pruinose parafrontal stripe, which is 0.2 of total width of frons; 1 pair of proclinate medifrontals close above antennae; 1 strong upper *fo* slightly posterad of strong *oc*; 1 strong *vti*; 1 weak *vte*; 1 *pvt* half as long as *vti*; medifrons mat; parafrontal plates and ocellar triangle lightly whitish pruinose; ocelli disposed in narrow triangle, the upper pair as far from vertex as from lower one; face angularly concave, upper half whitish pruinose, lower half shining; antenna 0.75 length of face; arista long, bare, black except short, reddish, scarcely swollen basal part.

Thorax with mesonotum covered with moderate pruinosity (whitish anteriorly, becoming a little yellowish posteriorly); pleura subshining; chaetotaxy: 1 *h*; 2 *ntpl*; 1 *sa*; 1 *pa*; 2 postsutural *dc* (anterior 1 less than half as long as posterior); *acr* consisting of very small setulae in 4 rows anteriorly, 2 rows posteriorly; 2 *sc*; 1 very small *ppl*; 1 upper and 1 lower posterior *mspl*, the latter much the smaller; 1 *stpl*.

Wing with shape, venation, and pattern very similar to those of *E. nubila* (Wiedemann), as shown by Hendel (1910, Gen. Ins. 106; pl. 4, fig. 98; as *E. gracilis*, with pattern rather darker than usual for that species). Squamae, their cilia, and halter whitish.

Abdomen almost polished; covered with rather abundant but short reclinate setae.

All bristles and setulae black.

Female. Length of wing, 2.77–3.13 mm. Similar to male; ovipositor (not sheath) yellowish.

Holotype (male), allotype, and 1 female paratype, Esquintla province, GUATEMALA, November 17, 1964, swept from *Cymbopogon* sp. (Gramineae) (E. J. Hambleton), no. 67817 in U.S. National Museum. The species is named in honor of its collector, Edson J. Hambleton, of Westgate, Maryland, who has added a number of excellently prepared Diptera to the National collections. The species is very similar to *E. lacteivittata* Hendel, from which it differs as in the foregoing key.

E. lacteivittata Hendel

1909, Wien. Ent. Ztg. 28: 270; 1910, Gen. Ins. 106: 40.

The type is from Orizaba (Vera Cruz), Mexico; specimens in the U.S. National Museum collections are also from Mexico (Aguascalientes, Ag.; Mexico and Chapingo, D.F.; and Querétaro, Q.).

E. nubila (Wiedemann)

Ortalis nubila Wiedemann, 1830, Auss. Zweifl. 2: 660.

Epiplatea gracilis Coquillett, 1900, Jour. N. Y. Ent. Soc. 8: 25 (*Epiplatea* is a genus of Richardiidae).

Eumecosomyia gracilis (Coq.) Hendel, 1909, Wien. Ent. Ztg. 28: 269; 1910, Gen. Ins. 106: 40, pl. 4, figs 97, 98; 1911, Wien. Ent. Ztg. 30: 26 (*synonymized*).

E. nubila (Wd.) Hendel, 1911, l.c. (syn. of *gracilis*); Painter, 1955, Jour. Econ. Ent. 48: 41.

The type of *Ortalis nubila* is from "Brasilien"; that of *Epiplatea gracilis* from Allende (Coahuila), Mexico. Hendel in 1909 noted specimens from Cuba (Habana), Hispaniola (Santo Domingo), Brazil (Iguapé), and Paraguay. Material in the U.S. National Museum is from Cuba (Habana; Santiago de las Vegas); Mexico (Allende [type of *gracilis*] and Matamoros, *ex* larva from ears of green corn, Coahuila; Nogales, *ex* green corn ear, and Valle del Yaqui, Sonora); Guatemala (Antigua, corn and teosinte [Painter]; Chimaltenango, on "cornus"; Guatemala City; Puerto Barrios); Nicaragua (San Marcos); Costa Rica (Paso Ancho. San Sebastian, "coix mayaca"); Trinidad (St. Augustine, *ex* maize cob); Venezuela (Antímano; El Valle, in stalks of *Zea mays* L., mining near the crown); Peru (Canete, on corn); Brazil (Nova Teutonia, S.C.; São Paulo, scavenger in *Diatraea* tunnel; also from the United States (Brownsville, *ex* pupae from corn, and San Antonio, 31 Oct. 1905, Texas).

A NEW GOMPHINE DRAGONFLY FROM EASTERN TEXAS
(ODONATA: GOMPHIDAE)

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The pine-woods area just north of Houston, Texas, has been found during the last six years to have a very rich Odonata fauna. Three previously undescribed species have recently been taken there: a *Somatochlora* and an *Enallagma* (both described recently in this journal), and a new *Gomphus* belonging to the subgenus *Hylogomphus* as defined by Needham (1951). The *Enallagma* and *Somatochlora*, as well as *Gomphus maxwelli* Ferguson, appear to be confined to this portion of Texas (including in the latter case an unpublished record from adjacent Louisiana). However, the new *Gomphus* may turn out to range more widely, though in our area it is confined to one small stream.

Gomphus apomyius, n. sp.

Holotype male. *Head.*—Face and occiput yellow, vertex black. Postocellar ridge sinuous, not reaching lateral margins of ocelli. Occipital ridge convex, smooth, with a fringe of black hairs.

Prothorax.—Fore lobe erect, pale. Mid lobe with paired mesal pale spots and obscurely pale lateral extremities. Hind lobe entire, dark.

Pterothorax.—Dark brown, yellow as follows: dorsal stripes expanded downwards and broadly confluent with pale collar, which is itself interrupted narrowly by the mid-dorsal carina; obscure thin antehumeral stripe expanded above into rounded triangular spot which is narrowly separated from the dorsal stripe; mesepimeron except for edges, including a stripe on the humeral suture; metepisternum obscurely pale centrally, grading imperceptibly towards darker stripes covering first and second lateral sutures; metepimeron except for obscurely dark stripe in second lateral suture.

Wings.—Venation black, typical for subgenus. Gaff very slightly shorter than inner side of triangle.

Legs.—Black, fore femur bright yellow and mid femur obscurely yellow internally.

Abdomen.—Dark brown, yellow as follows: sides and mid-dorsal lines on 1, 2, and 3 proximad to the lateral carina; proximal lateral spots and mid-dorsal spots narrowed apically on 4 to 7; margins of terga of 7 to 9, this color expanded on 8 and 9 to reach nearly half way to mid line.

Appendages.—Black. The superior appendages terminating in a slightly rounded, narrowed point, and having a ventral-apical, right-angled low tooth. Inferior appendage terminates in a small dorsal hook. Caudal margin of this appendage rounded in dorsal view.

Genitalia.—Anterior hamules expanded terminally and having a square end, with little development of an apical tooth; edges rolled to form a squared "C" in cross section, with three very small internal apical teeth. Posterior hamules with prominent shoulder and recurved apical hook and three small teeth between shoulder and this hook. Penis of short type, with prominent vesicle, which is of bilobate type (Walker, 1957) but with lateral diverticula and shallow median cleft very reduced.

Allotype Female. Color pattern as in male, except for small pale spots behind lateral ocelli, and greater extent of yellow on abdomen: dorsal spots on 3 to 5 extend the length of the segment as narrow lines. Face with short, thick spines extending laterally from lateral ocelli. Postocellar ridge lower than in male, sinuous and tripartite, with raised shorter central and longer terminal portions. Occipital ridge straight, with fringe of black hair. Vulvar lamina extending half the length of the ninth segment, flattened, with tips divergent.

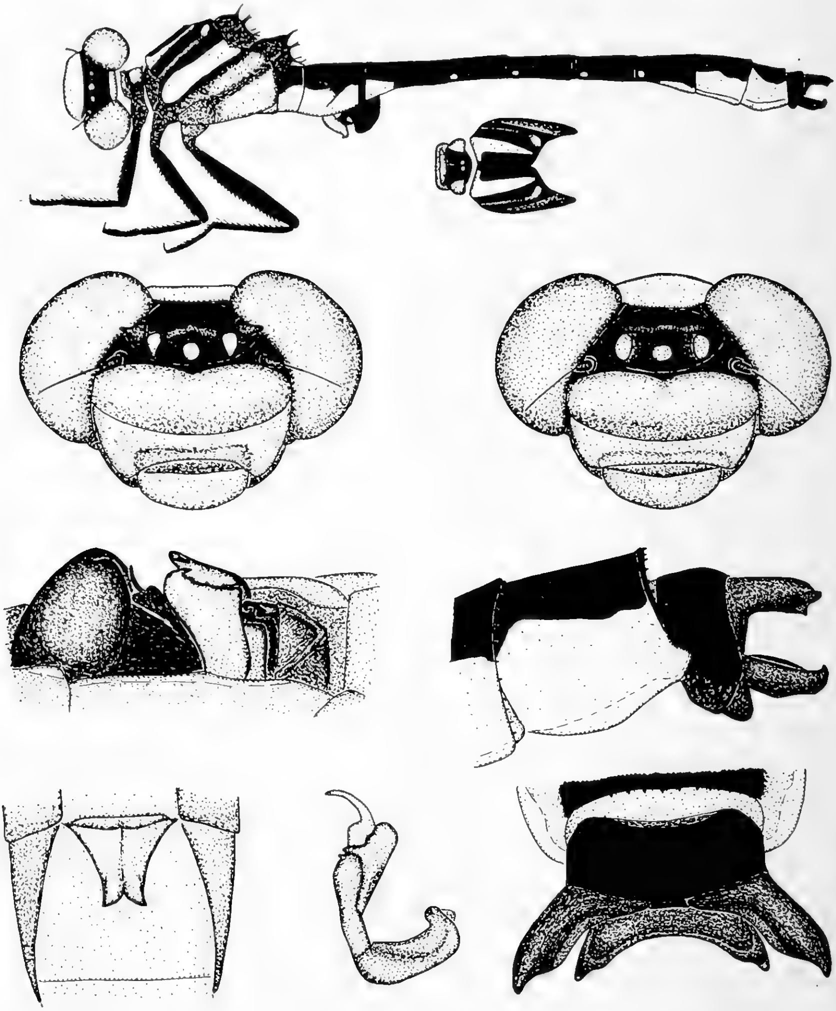
Dimensions.—Holotype male: abdomen 28 mm, hind wing 25 mm. Allotype female: same dimensions.

Variations among type series.—The 20 males show little variation, except that the twelve reared specimens tend to be more vividly colored than the eight more mature males caught in the imaginal state. Eight of the twelve reared specimens have very pale or more distinct spots behind the lateral ocelli, as in the females. Two of the eight more mature males have very pale spots; these spots undoubtedly disappear with maturity. Dimensions range from 26 to 28 mm (abdomen) and from 23 to 25 mm (hind wing).

The four females examined show very little variation and range in size from 27 to 28 mm (abdomen) and from 24 to 25 mm (hind wing).

Material examined.—All specimens were taken at Big Creek, 2 mi. west of Shepherd along state highway 150, San Jacinto Co., Texas. Holotype: collected 7 April 1963. Allotype: reared, emerged 9–11 March 1962. The remaining specimens were either collected along with the holotype or reared, emerging 20 March 1961, 6–16 March 1962, or 20–21 March 1963. A teneral male not included in the type series was collected on 18 March 1962 by Robert Cumming and prepared for cytogenetic examination. Three additional reared specimens from the 1962 lot were given to a fellow worker and have not been available for inclusion in the type series.

The Holotype and Allotype have been deposited in the University



Gomphus apomyius, n. sp. Upper: lateral view of male, showing color pattern with inset showing thoracic dorsum. Second row: faces of female (left) and male (right). Third row: ventro-lateral view of male genitalia of second segment (left), lateral view of male appendages (right). Fourth row: ventral view of female vulvar lamina (left), lateral view of penis (center), and dorsal view of male appendages (right).

of Florida collection, and Paratypes have been deposited in the U.S. National Museum, Academy of Natural Sciences, and University of Michigan collections.

The new species *apomyius* appears to be most closely related to *parvidens* Currie (1917), of which only the male has been fully described. The principal difference between these species is in the form of the superior appendage of the male, which in *parvidens* has a distinctly acuminate termination with a small, acute ventral tooth. The genitalia of the 2nd segment are very similar, differing principally in the more prominent shoulder of the posterior hamule of *apomyius*. The thoracic pale color of *parvidens* is far more restricted, and in spite of the variability of this character within the Gomphidae this difference would appear also to be a valid criterion for separation. Males and females of the new species are structurally abundantly distinct from *abbreviatus* Hagen, *brevis* Hagen and *viridifrons* Hine, as a glance at Currie's (1917) and Needham and Westfall's (1955) illustrations will show.

More problematical is the relationship between the new species and some other *Hylogomphus* which have been taken during the last decade in Florida (Westfall, personal communication), and in North Carolina and New Jersey by the author. The author's specimens were loaned several years ago and have not been available for inspection. However, some brief notes indicate that the new species may prove to be very similar to one which the author took in abundance in New Jersey. These other *Hylogomphus* remain undescribed.

As most of the specimens were reared, little is known of the habits of the mature insects, though their behavior is probably typical for the subgenus. Nymphs were found in abundance in a small, sandy stream flowing through pine woods near Shepherd, Texas. Although the stream is monotonous in character, 46 species of Odonata have been taken within a few miles along the stream, including several other species of *Gomphus* s. lat.: *G.* (*Stylurus*) *laurae* (Williamson), *G.* (*Gomphus*) *lividus* Selys, *G.* (*Gomphus*) *oklahomensis* Pritchard, *G.* (*Gomphurus*) *modestus* Needham, and *G.* (*Arigomphus*) *maxwelli* Ferguson. The nymph of the new species, as well as some of the others mentioned above, will be described in a separate paper devoted to the fauna of this area.

The specific name, meaning, "one who drives away flies," is very appropriate for this small but aggressive dragonfly.

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TWO NEW MITES OF THE GENUS AEROPPIA
(Oppiidae: Oribatei: Acarina)

Harold G. Higgins, *Salt Lake City, Utah*

In 1961 Hammer described the genus *Aeroppia* and two new species from specimens taken in South America. At this time she also included *Dameosoma vacuum* Berlese in this genus. Later in 1962 she mentioned still another form but did not describe it for lack of sufficient material. Recently in a collection of oribatid mites received from Dr. Donald De Leon of Erwin, Tennessee, were two new species of this interesting genus. A short description of these new forms follows.

Aeroppia insularis, n. sp.
(Fig. 4)

Diagnosis: Interlamellar hairs longer than body setae; a distinct sclerotized ridge posterior to rostral hairs; and a broken, sclerotized ridge anterior to the dorsosejugal suture.

Description: Color yellowish; propodosoma wider than long; rostral hairs located dorsally and extends over tip of rostrum by more than half their length; lamellar hairs long, weakly setose, located dorsally; a distinct, sclerotized ridge posterior to the rostral hairs; pseudostigmata circular with a distinct, anterior point; interlamellar hairs weakly setose, about one-fourth longer as well as heavier than body setae, located mediad to pseudostigmata; exobothridial hairs longer and stouter than body setae; a distinct, broken row of sclerotizations anterior to the curved dorsosejugal suture; some faint, sclerotized circles between the pseudostigmata.

Hysterosoma more elongate-oval than other species of this genus; body setae very weakly setose, of about equal diameter throughout their length with a blunt tip and located as shown in figure 4; inflated setae on posterior end of hysterosoma very large and distinct.

Size: 585 $\mu \times 360\ \mu$.

Type Locality: Two specimens (Coll. No. 2653) from *Artocarpus communis* at San Cristobal, Dominican Republic, 9 November 1963 by Donald De Leon.

Discussion: This species appears to be near *A. peruensis* Hammer but is much larger, has much longer and heavier interlamellar hairs, and lacks the "densely punctate" hysterosoma.

Aeroppia clavatum, n. sp.
(Fig. 5)

Diagnosis: Pseudostigmatic organs club-shaped, as long or longer than interlamellar hairs.

Description: Color yellowish; propodosoma about as long as wide; rostral hairs located dorsally and extends over tip of rostrum by about one-half their length; lamellar hairs located dorsally, much larger than other body setae; interlameller hairs with small insertions, as long or longer than pseudostigmatic organs;

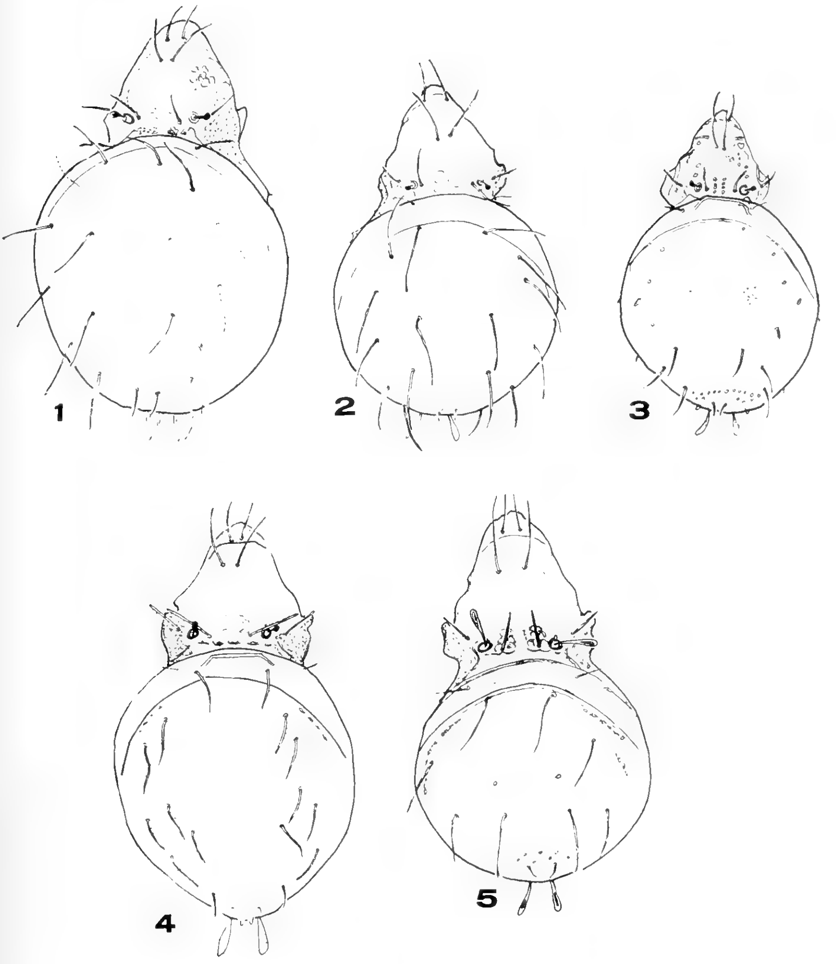

Fig. 1, *Aeroppia columbiana* Hammer (After Hammer, 1961); fig. 2, *A. vacuum* (Berl.) (After Hammer, 1961); fig. 3, *A. peruensis* Hammer (After Hammer, 1961); fig. 4, *A. insularis* n. sp.; fig. 5, *A. clavatum* n. sp.

pseudostigmata with small, sclerotized, anterior points; pseudostigmatic organs club-shaped with rounded heads and small petioles; sclerotizations of irregular circles near base of interlamellar hairs.

Hysterosoma round with body setae as shown in figure 5; small areae porosae along margins and near posterior end of body.

Size: 375 $\mu \times$ 240 μ.

Type Locality: Holotype and one paratype (Coll. No. 2558) from *Duguetia neglecta* at Nature Reserve, near 24 mile post, Bartica-Potaro Road, British Guiana, 24 October 1963 by Donald De Leon.

Additional Specimens: All specimens were collected by Dr. Donald De Leon from the Nature Reserve which is a mile square piece of virgin rain-forest about one mile from the 24 mile post, Bartica-Potaro Road, British Guiana. These specimens with the collector's numbers and the vegetation on which they were found are listed as follows: Three specimens (Coll. No. 2584) from *Licania laxiflora* on 28 October 1963; 2 specimens (Coll. No. 2582) from *Anaxagoria dolichocarpa* on 28 October 1963; 2 specimens (Coll. No. 2599) from *Licania* sp. on 31 October 1963; 1 specimen (Coll. No. 2575) from *Tetragastris hostmanni* on 28 October 1963.

Discussion: The small collection of *A. clavatum* n. sp. shows some variation in the length of body setae and the amount of sclerotizations near tectopedia II. The long, club-shaped pseudostigmatic organs, however, seem to be constant and characteristic of this species.

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ECOLOGICAL NOTES ON SOME SPHAEROCERIDAE REARED FROM SNAILS, AND A DESCRIPTION OF THE PUPARIUM OF COPROMYZA (APTERINA) PEDESTRIS MEIGEN[1]

(Diptera)

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and

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Dead and decaying snails are fed upon by larvae of several families of Diptera, including the Sphaeroceridae. Although the larvae of some Sphaerocerids which feed in putrifying snails are known to develop also on other dead animals, decaying vegetation, etc., other species may have a more restricted diet. The following questions may be

[1] This report is, in part, a by-product of an investigation of mollusc-killing Sciomyzid flies supported by NSF Grant GB-80.

asked. Do the Diptera recorded from dead gastropods feed, in nature, just as commonly in other types of carrion? If not, what are the environmental factors which may have led to the development of such specificity, and what behavioral features of the flies have become adapted to such a source of food?

Schmitz (1917) found species of *Sphaerocera, Borborus* (= *Copromyza*), and *Limosina* (= *Leptocera*) to be attracted to snails that he had killed in boiling water and had deposited as bait in a woodland during summer. Richards (1930) recorded *Leptocera* (*Leptocera*) *fontinalis* Fallén from dead *Helix aspersa* (Müll.)

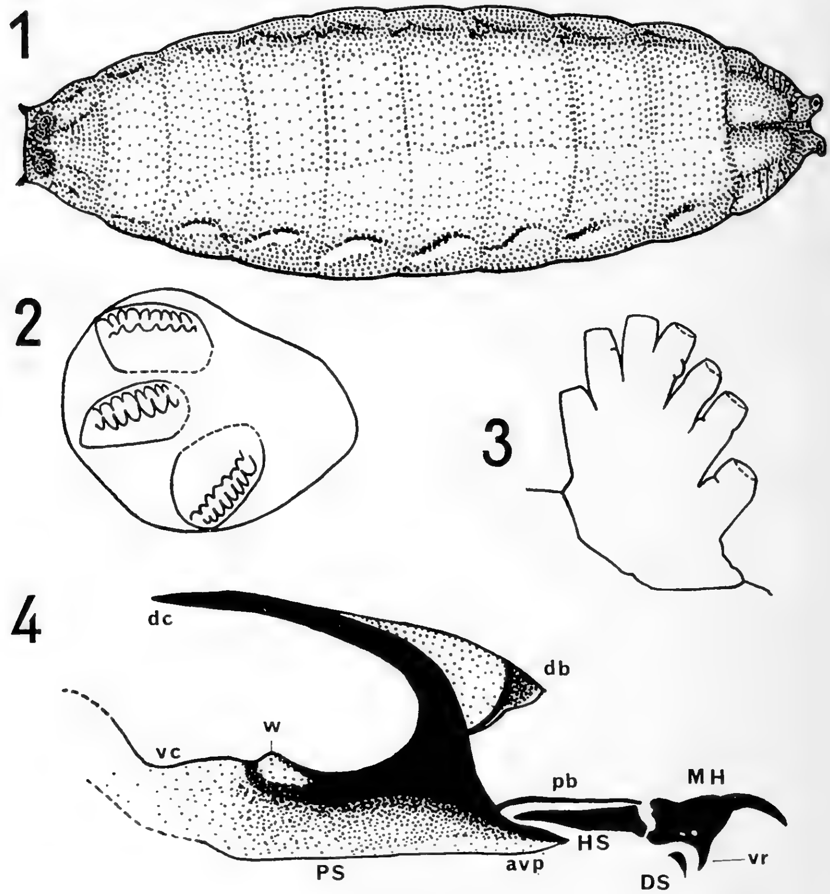
Copromyza (**Apterina**) **pedestris** Meigen
(Fig. 1–4)

Copromyza pedestris was the subject of an extensive morphological, genetical, and biological study by Guibé (1939). This fine paper apparently has been overlooked by many dipterists. It has been cited as, "Contribution à l' étude d' une espèce: *Apterina pedestris* Meigen.—Thesis, Fac. Sci. Caen. No. 29, 112 pp., Paris 1939," but it may be more easily found as cited below. Guibé obtained *C. pedestris* from dead *Theba pisana* (Müll.) and "*Helix variabilis*" found in nature, and reared the species from hatching to pupation in the laboratory on a mixture of decaying head lettuce and frog muscle. Richards (1930) recorded *C. pedestris* from "under cut sedge or in grass tufts in damp places" but the species was not encountered amongst the 3,683 specimens of 35 species of Sphaeroceridae found on cow manure by Laurence (1955).

We found larvae of *Copromyza pedestris* feeding in decaying snails (*Clausilia bidentata* (Strom.), *Hygromia hispida* (L.), *Monacha cantiana* (Mont.), *Zonitoides nitidus* (Müll.), and *Lymnaea palustris* (Müll.)) between May 8 and September 22 in Hertfordshire, England during 1963 and in Zealand, Denmark during 1964. The larvae remained immersed in and feeding on the liquified, malodorus tissues until puparium formation. None of the larvae ever attacked living individuals of the same snails which were included in the rearing boxes. The larvae continued to feed for three to eight days before pupating. All puparia were formed away from the shells of the food snails, amongst or under wet filter-paper in the plastic boxes used for rearing. Adults (all micropterous) emerged after pupal periods of 8 to 13 days.

Specimens reared:

1 ♀. England, Hertfordshire, Aldenham, Wall Hall lily pond. Larva collected 22.IX.1963, ex *Monacha cantiana*; pupated 25.IX; emerged 7.X.



Figs. 1–4. *Copromyza* (*Apterina*) *pedestris* Meigen. Fig. 1, Dorsal view of puparium; fig. 2, Posterior spiracular plate; fig. 3, Anterior spiracle; fig. 4, Third-instar cephalopharyngeal skeleton.

avp, anteroventral projection; **db**, dorsal bridge; **dc**, dorsal cornu; **DS**, dentary sclerite; **HS**, hypostomal sclerite; **MH**, mouthhook; **pb**, parastomal bar; **PS**, pharyngeal sclerite; **vc**, ventral cornu; **vr**, ventral ramus; **w**, window.

1 ♂, 2 ♀. Denmark, Zealand, Suserup Skov near Sorø. Larvae collected 8.V.1964, ex *Hygromia hispida* and *Clausilia bidentata*; pupated 10, 14, 16.V; adults emerged 26, 27.V.

1 ♂, 1 ♀. Denmark, Zealand, 0.5 km. west of Glumsø. Larvae collected 20.V.1964, ex *Zonitoides nitidus*; pupated 24, 25.V; adults emerged 1.VI.

1 ♂, 3 ♀. Denmark, Zealand, Frederikslund, near Holte. Larvae collected 27.V.1964, ex *Lymnaea palustris*; pupated 30.V; 1.VI; adults emerged 10, 11, 12.VI.

Goddard (1938) included descriptions and figures of the puparia of *C. glacialis* Meigen and *C. stercoraria* Meigen, and described the puparium of *C. equina* (Fallén), but did not treat *C. pedestris.* Guibé (1939) presented a number of figures of the immature stages of *C. pedestris,* but because he did not illustrate the puparium or the pattern of pigmentation of the third-instar cephalopharyngeal skeleton we have done so here. All adults which emerged from the puparia described below are of the micropterous form.

Third-instar cephalopharyngeal skeleton (Fig. 4). In regard to the cephalopharyngeal skeletons of several species which he figured, Goddard (1938) remarked that ". . . these appear to be practically identical in all species." The shapes of the hypostomal sclerites and mouthhooks and the pattern of pigmentation of the pharyngeal sclerite, however, do seem to afford good taxonomic characters.

Mouthhooks (crochets buccaux, Guibé) paired; hook-part well developed, without accessory teeth; two small windows near base of ventral ramus. Dentary sclerite (pièce supplementaire du crochet buccol, Guibé; not figured or described and apparently overlooked by Goddard) paired, located behind ventral ramus. Hypostomal sclerite (pièce intermédiare) elongate, acute posteriorly, posterior rami lying above anteroventral projection. Pharyngeal sclerite (pièce basilarie) with dorsal bridge (arcade chitinisée) joining the two halves anterodorsally; parastomal bars narrow, extending to anterior margin of hypostomal sclerite; indentation between dorsal and ventral cornua extending more than half-way to anterior margin of sclerite; dorsal cornu tapering posteriorly, longer than pigmented portion of ventral cornu, our specimens (unlike Guibé's figure) with very narrow window, visible only at an angle; ventral cornu darkly pigmented only along upper margin, with window in dorso-apical lobe.

Puparium: (Fig. 1–3). Light brown, shiny. Length, 3.5 mm; greatest width 1.1 mm. Shape elongate-cylindrical, anterior end dorsoventrally flattened, posterior end truncate. Anterior spiracles (Fig. 3) black; sessile on anterolateral angle of dorsal cephalic cap; with 7 subpalmately arranged and regularly spaced papillae (8 papillae shown by Guibé, 1939). Segmentation distinct, sides of segments II–X dorsoventrally compressed on both surfaces, thus forming distinct longitudinal fovea over the greater length of each segment. Segment XII intensively and extensively wrinkled. Posterior spiracles projecting; spiracular plates (Fig. 2) irregular, each with 3 radially arranged slits.

The puparium closely resembles that of *Copromyza* (*s. str.*) *stercoraria* Meigen as described and figured by Goddard (1938), but whereas the papillae of the anterior spiracle of *C. stercoraria* are irregularly spaced on an elongate axis, those of *C. pedestris* are more regularly spaced and the spiracle is more palmate. Goddard's figure of the ventral view of the puparium of *C. stercoraria* shows the posterior margins of segments III–VIII (especially VIII) as strongly concave, but in *C. pedestris* the posterior margins of the segments are not noticeably concave. Goddard refers to the puparium of *C.* (*s. str.*) *equina* Fallén as being practically inseparable from that of *C. stercoraria*. However, the cephalopharyngeal skeletons of these two species have not been figured, and they may differ from the cephalopharyngeal skeleton of *C. pedestris.*

Leptocera (**Limosina**) **clunipes** Meigen

Goddard (1938) described the puparium of this species under its synonym *L. crassimana* Hal. Laurence (1955) found *L. clunipes* to be the third most common of 35 species collected from cow manure at Harpenden, Hertfordshire. A larva found 19.VI.1964 in an egg-mass of *Succinea* sp. at Stenholts' Indelukke, Gribskov, near Hillerød, Zealand, Denmark pupated 29.VI, and a female fly emerged 9.VII. This specimen has the dorsal cercal hair rather strongly developed, as in *L. palmata* Richards, but in other respects both puparium and adult agree well with typical *L. clunipes.*

Leptocera (**Limosina**) **nana** Rondani

A single male was reared from a putrid *Helix* sp. found on the isle of Barra, Outer Hebrides, Scotland, in April, 1962.

Leptocera (**Limosina**) **palmata** Richards

The original description was based on specimens reared from a dead *Helix aspersa* found at Hammersmith, London. Hackman (1963) trapped this species on dead voles in burrows in southern Finland. Four males and one female were found in the nest cavity of a badger's set on May 18, 1963 at Selsdon Woods, Surrey, England, by R. L. Coe and J. Deeming. We reared four males and four females from several putrifying *Helix aspersa* collected at Potters Bar, Hertfordshire, during early May, 1963.

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THE NEARCTIC SAWFLIES OF THE GENUS HEMITAXONUS ASHMEAD
(HYMENOPTERA: TENTHREDINIDAE)

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The genus *Hemitaxonus* belongs to the Selandriinae, a subfamily which reaches its greatest development in the tropical and semitropical regions of the world, especially Southeast Asia and South America, where it is one of the dominant sawfly groups. *Hemitaxonus* is a Holarctic genus occurring chiefly in the temperate regions of eastern Asia and eastern North America; a species from Formosa represents the southernmost occurrence. The first species known from western North America is here described, making a total of four species known from the Nearctic region. One species is known to occur in Europe, and Takeuchi (1941) has recorded five species from the Japanese Empire.

So far as is known, members of this genus feed exclusively on ferns. The known hosts include *Osmunda*, *Onoclea*, and *Athyerium*. Little is known of their biology other than a few life history notes and larval descriptions.

ACKNOWLEDGMENTS

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Hemitaxonus Ashmead

Hemitaxonus Ashmead, 1898, Can. Ent. 30:311; Konow, 1905, Gen. Ins. 29:102; Rohwer, 1911, Proc. U.S. Nat. Mus. 41:397; Enslin, 1914, Deutsch. Ent. Zeitschr. Beiheft., p. 206; MacGillivray, 1916, Bull. 22, Conn. Geol. Nat. Hist. Surv., p. 46; Malaise, 1931, Ent. Tidskr. 52:140; Malaise, 1933, Ent. Tidskr. 54:56; Conde, 1934, Korresponden. Naturf. Ver. Riga 61:177; Ross, 1937, Ill. Biol. Monogr. 15:64; Takeuchi, 1941, Tenthredo 3:245–249; Ross, 1951, *in* Muesebeck *et al.*, U.S. Dept. Agr., Agr. Monogr. 2:22.

Type.—*Taxonus dubitatus* Norton, by original designation.

Epitaxonus MacGillivray, 1908, Can. Ent. 40:365; Rohwer, 1911, Proc. U.S. Nat. Mus. 41:397 (= *Hemitaxonus* Ashmead); MacGillivray, 1916, Bull. 22, Conn. Geol. Nat. Hist. Surv., p. 46; Malaise, 1933, Ent. Tidskr. 54:56.

Type.—*Taxonus albidopictus* Norton, by original designation.

Sahlbergia Forsius, 1910, Medd. Soc. Fauna et Flora Fenn. 36:49; Enslin, 1914, Deutsch. Ent. Zeitschr. Beiheft. p. 206 (= *Hemitaxonus* Ashmead).

Type.—*Sahlbergia struthiopteridis* Forsius, monotypic.

Description.—Body long and slender; antenna filiform, first segment globular, second segment as wide as long, third and fourth segments subequal, remaining segments decreasing gradually in length; clypeus truncate or slightly emarginate; genal carina present; malar area wider than diameter of front ocellus; an elevated circular ridge on the frons posterior to the antennae and including the front ocellus; prepectus present, defined as a distinct sclerite separated from the episternum by a suture, or as a raised ridge separated from the episternum by a furrow; tarsal claws simple or each with a small inner tooth situated some distance from the outer; fore wing with anal cross vein present, proximal anal cell twice the length of the distal anal cell, and Rs + M curved.

Key to Nearctic Species of **Hemitaxonus**

1. Female 2
   Male 5
2. Pectus rufous, or, if black, then mesepisternum is entirely black; tarsal claws each with a small inner tooth; prepectus separated by a suture or furrow 3
   Pectus black, mesepisternum always with a large triangular rufous area; tarsal claws simple; prepectus separated by a suture 4
3. Abdomen black with a central rufous band; prepectus separated by a furrow; sheath short, truncate (fig. 16) .... **albidopictus** (Norton)
   Abdomen entirely rufous; prepectus separated by a suture; sheath pointed (fig. 15) .... **dubitatus** (Norton)
4. Sheath broad at base, ventral margin at a 45-degree angle with dorsal margin (fig. 14); eastern .... **multicinctus** Hall
   Sheath narrow at base, dorsal and ventral margins subparallel (fig. 13); western .... **primarius**, new species
5. Pectus rufous, or, if black, then mesepisternum is entirely black; tarsal claws each with a small inner tooth; prepectus separated by a suture or furrow 6
   Pectus black, mesepisternum always with a large triangular rufous area; tarsal claws simple; prepectus separated by a suture 7
6. Abdomen entirely black, or, at most, with rufous areas on basal sterna; prepectus separated by a furrow .... **albidopictus** (Norton)
   Abdomen with rufous areas on terga 2 to 5 and sterna 1 to 6; prepectus separated by a suture .... **dubitatus** (Norton)
7. Abdomen rufous or straw-colored; eastern .... **multicinctus** Hall
   Abdomen dark rufous or entirely black; western .... **primarius**, new species

Hemitaxonus albidopictus (Norton)

Taxonus albidopictus Norton, 1868, Trans. Amer. Ent. Soc. 2:213, ♂, ♀; Provancher, 1878, Nat. Can. 10:166; Provancher, 1883, Faun. Entom. Can., Hymen., p. 215; Dalla Torre, 1894, Cat. Hym. 1:110; Dyar, 1897, Jour. New York Ent. Soc. 5:20.

Taxonus amicus Norton, 1868, Trans. Amer. Ent. Soc. 2:213, ♂, ♀; Provancher, 1878, Nat. Can. 10:166; Provancher, 1883, Faun. Ent. Can., Hymen., p. 215; Konow, 1891, Wein. Ent. Zeitg. 10:44; Dalla Torre, 1894, Cat. Hym. 1:110; Konow, 1905, Gen. Ins. 29:102; MacGillivray, 1916, Bull. 22, Conn. Geol. Nat. Hist. Surv., p. 47; Ross, 1951, *in* Muesebeck *et al.*, U.S. Dept. Agr., Agr. Monogr. 2:22 (= *albidopictus* Norton).

Hemitaxonus albidopictus (Norton), Konow, 1905, Gen. Ins. 29:102; Rohwer, 1911, Proc. U.S. Nat. Mus. 41:398; Ross, 1937, Ill. Biol. Monogr. 15:65; Ross, 1951, *in* Muesebeck *et al.*, U.S. Dept. Agr., Agr. Monogr. 2:22.

Epitaxonus albidopictus (Norton), MacGillivray, 1908, Can. Ent. 40:365; MacGillivray, 1916, Bull. 22, Conn. Geol. Nat. Hist. Surv., p. 46.

Hemitaxonus rufopectus Rohwer, 1910, Proc. U.S. Nat. Mus. 38:204, ♀; Rohwer, 1911, Proc. U.S. Nat. Mus. 41:398 (= *albidopictus* Norton).

Hemitaxonus dubitatus var. *amicus* (Norton), Rohwer, 1911, Proc. U.S. Nat. Mus. 41:397.

Female.—Length, 7.0 mm. Head and antennae black; labrum and clypeus white. Thorax black; tegulae and upper angles of pronotum white; pectus and mesepisternum, except upper angle of latter and prepectus, rufous. Coxae orange-yellow with apices white; trochanters white; femora orange-yellow; hind femur with extreme apex black; fore and mid tibiae orange-yellow with basal quarter of each white; hind tibia with basal third white, apical two-thirds black; fore and mid tarsi orange-yellow, infuscated apically; hind tarsus black, basal half of basitarsus white. Abdomen black with sterna 1 and 2 and segments 3 and 4 rufous.

General structure as for genus. Head smooth and shining with fine punctures and short dark hairs on para-antennal fields, supraclypeal area, malar areas, and genal areas; a narrow area parallel with genal carinae with irregular fine punctures. Clypeus roughened, slightly emarginate. Thorax smooth and shining; prothorax finely punctate; several large punctures present on posterior edge of scutellum; prepectus present as a raised ridge, separated from the episternum by a furrow. Tarsal claws each with a small inner tooth, situated at the base some distance from the outer tooth. Sheath short and truncate (fig. 16). Lance and lancet as in figs. 26, 27, and 28.

Male.—Length, 5.7 mm. Color pattern similar to female except the abdomen which is entirely black with rufous areas on sterna 1 to 3. Structure as in female. Genitalia as in figs. 10, 11, and 12.

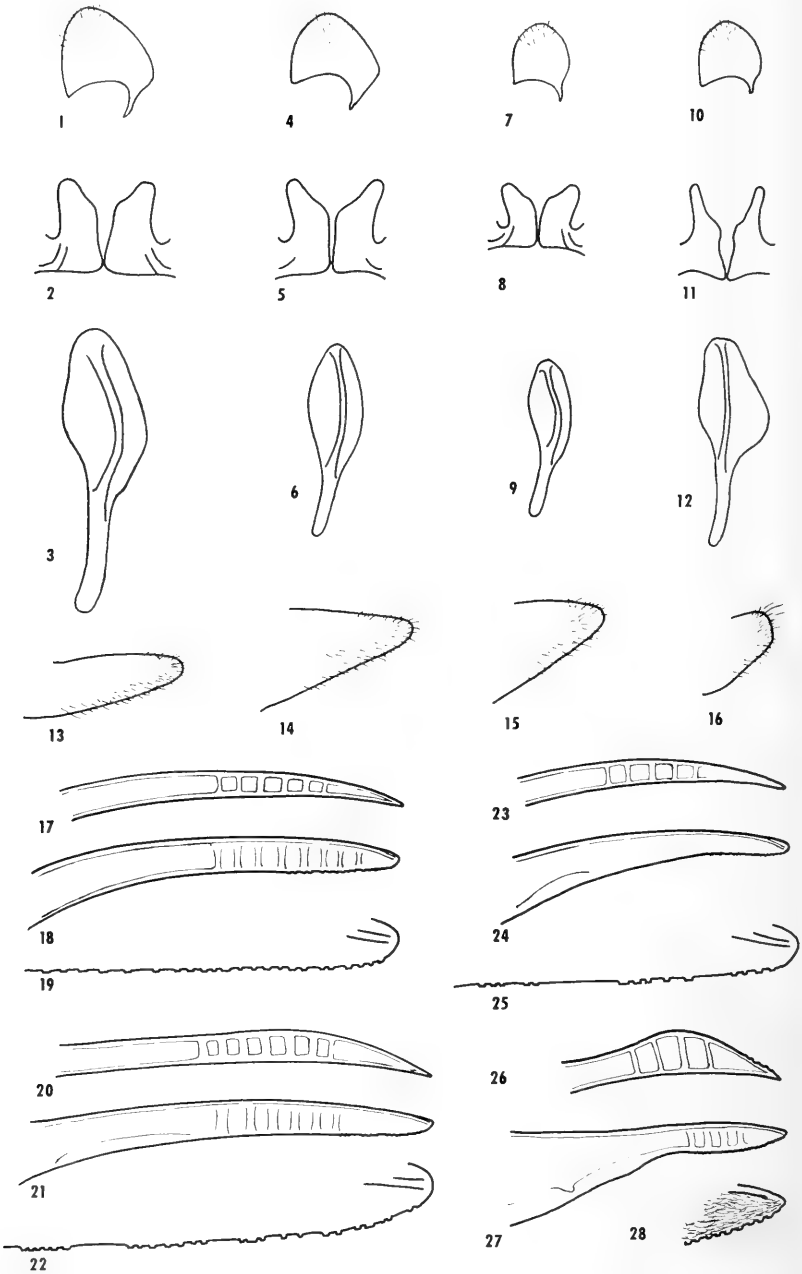
Types.—The types of *albidopictus* and *amicus* are in the Academy of Natural Sciences of Philadelphia; *rufopectus* is Type No. 12928 in the U.S. National Museum.

Type locality.—Virginia.

Distribution.—Eastern North America: Alabama, Connecticut, District of Columbia, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, New Brunswick, Michigan, Minnesota, Missouri, Ohio, Ontario, Pennsylvania, Quebec, Virginia, Wisconsin.

Hosts.—*Osmunda, Onoclea sensibilis.*

Both sexes of this species may be distinguished from other members of the genus by the prepectus which is present as a raised shoulder and separated from the episternum by a furrow. The coloration, sheath shape, and genitalia are also distinctive. Color variation was noted on the thorax, where the pectus and mesepisternum were either both black or both rufous, but never bicolorous. In the female, various amounts of rufous are present on the abdomen, but the apex is always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black. Also, the male may have an entirely black abdomen or several basal sterna rufous.

The specimen that Norton designated as the male of *Taxonus amicus* is actually a male of *dubitatus*.

Dyar (1897) reared this species on *Onoclea sensibilis*. He described the larvae and indicated that they bore in wood to pupate.

Hemitaxonus dubitatus (Norton)

Taxonus dubitatus Norton, 1862, Proc. Boston Soc. Nat. Hist. 9:119, ♂, ♀; Provancher, 1878, Nat. Can. 10:165; Provancher, 1883, Faun. Ent. Can., Hymen., p. 215; Dalla Torre, 1894, Cat. Hym. 1:110; Dyar, 1897, Jour. New York Ent. Soc. 5:20.

Hemitaxonus dubitatus (Norton), Ashmead, 1898, Can. Ent. 30:311; Konow, 1905, Gen. Ins. 29:102; MacGillivray, 1916, Bull. 22, Conn. Geol. Nat. Hist. Surv., p. 46; Ross, 1951, *in* Muesebeck *et al.*, U.S. Dept. Agr., Agr. Monogr. 2:22; Maxwell, 1955, Can. Ent. 81 (Suppl. 1):48; Krombein, 1960, Ent. News 71:30.

Female.—Length, 7.2 mm. Head and antennae black; clypeus, labrum, and base of mandibles white. Thorax mostly rufous except the cervical sclerites, lower angles of the pronotum, scutellum, post-tergite, mesepimeron, and metathorax which are black. Coxae orange-yellow, base of hind coxa black; trochanters white; femora orange-yellow; fore and mid tibiae orange-yellow with extreme apices white; hind tibia black with extreme base white; tarsi orange-yellow, infuscated apically with hind tarsus more darkly so. Abdomen rufous with basal plates and anterior half of second tergum black; infuscate areas on apical segments and sheath.

General structure as for genus. Head smooth and shining; fine punctures and short dark hairs on para-antennal fields, supraclypeal area, malar areas, and genal areas. Clypeus roughened, slightly emarginate. Thorax smooth and shining; prothorax finely punctate; scutellum with several large punctures on lateral and posterior margins. Prepectus present as a distinct sclerite, separated from the episternum by a suture. Tarsal claws each with a small inner tooth, situated at the base some distance from the outer tooth. Sheath with base broad, apex acute (fig. 15). Lance and lancet as in figs. 23, 24, and 25.

Male.—Length, 6.3 mm. Color similar to the female except the legs which are entirely orange-yellow with apices of tarsi infuscate, and the abdomen which is black with rufous areas on terga 3 to 5 and sterna 1 to 5. Structure as for female. Genitalia as in figs. 7, 8, and 9.

Type.—There is a specimen labeled as type in the Peabody Museum of Natural History, Yale University. The type bears the data "Ct. 1875." Associated with this is a specimen bearing the label "Alotype" with the data "Mass. 1876" (Correspondence, D. C. Ferguson, 1964).

←

Figs. 1–3, 13, 20–22, *H. primarius*, n. sp. Figs. 4–6, 14, 17–19, *H. multicinctus* Hall. Figs. 7–9, 15, 23–25, *H. dubitatus* (Norton). Figs. 10–12, 16, 26–28, *H. albidopictus* (Norton). 1, 4, 7, 10, **harpe**; 2, 5, 8, 11, **parapenis**; 3, 6, 9, 12, **penis valve**; 13–16, **sheath**; 17, 20, 23, 26, **lance**; 18, 21, 24, 27, **lancet**; 19, 22, 25, 28, **detail of lancet.**

Although the localities on these specimens agree with those in Norton's original description, the dates of collection, if they are such, are 13 and 14 years after the description. The exact location of the type is unknown except for this information.

Type locality.—"Ct." (?).

Distribution.—Eastern North America: Connecticut, District of Columbia, Illinois, Indiana, Massachusetts, Maine, Maryland, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Ohio, Ontario, Pennsylvania, Quebec, Texas, Virginia, Wisconsin.

Hosts.—*Osmunda, Onoclea, Pteridium*? (Krombein, 1960).

The color pattern varies considerably in both sexes. The pectus and mesepisternum may be entirely rufous or entirely black, but never of different colors. The dorsum of the thorax varies from nearly entirely rufous to nearly entirely black, with all intermediates. This species is easily separated from *albidopictus* by the prepectus, coloration, sheath shape and genitalia, and from *multicinctus* and *primarius* by the small inner tooth of each tarsal claw and coloration.

Dyar (1897) reared this species on *Onoclea* and described the last two larval instars. Maxwell (1955) obtained larvae from *Osmunda* and described the internal anatomy. Prepupae were found in sumach pith in Virginia by Krombein (1960) and adults reared from these.

Hemitaxonus multicinctus Hall

Hemitaxonus multicinctus Hall, 1917, Proc. Ent. Soc. Wash. 19:28, egg, larva; Ross, 1951, *in* Muesebeck *et al.*, U.S. Dept. Agr., Agr. Monogr. 2:22.

Female.—Length, 7.0 mm. Head and antennae black; clypeus and labrum white. Thorax black; tegulae and upper angles of pronotum white; a large triangular rufous area on mesepisternum with a smaller rufous area dorsal to it. Legs orange-yellow to white; tibiae and tarsi infuscate. Abdomen straw-colored; basal plates, sheath, and cerci black; areas on lateral margins and basal and apical terga infuscate.

General structure as for genus. Head smooth and shining with fine punctures and short hairs on para-antennal fields, supraclypeal area, malar areas, and genal areas. Clypeus roughened, slightly emarginate. Thorax smooth and shining; prothorax finely punctate. Prepectus present as a distinct sclerite, separated from the episternum by a suture. Tarsal claws simple. Sheath with base broad, apex acute (fig. 14). Lance and lancet as in fig. 17, 18, and 19.

Male.—Length, 6.1 mm. Color and structure as in the female. Genitalia as in figs. 4, 5, and 6.

Type.—A manuscript type bearing Rohwer's authorship is in the U.S. National Museum, Type No. 18701. Hall published the manuscript name in a biological note, therefore receiving credit for the species. In Hall's paper only the eggs and larvae are mentioned, and these are in the U.S. National Museum. I am considering this series of eggs and larvae as cotypes, and one larva has been chosen as the lectotype. This has been assigned U.S.N.M. No. 68050 and bears a label with the following data: "Wakeman, O., W. B. Hall."

Type locality.—Wakeman, Ohio.

Distribution.—Eastern North America: Maryland, Ohio.

Host.—*Athyerium thelypteroides.*

The adults available seem positively enough associated with the larvae since Hall probably reared these from representatives of the larval series, and adults and larvae are present in the same vial in the collection. Larval relationships are difficult to determine at present because of the lack of material of larvae of other species of *Hemitaxonus*, but the adults are very distinct from other members of the genus.

This species may be separated from *dubitatus* and *albidopictus* by the simple tarsal claws and coloration, and from *primarius* by sheath shape and coloration.

Hall collected specimens from the above host in a cultivated fern bed, the plants being native to Ohio. He stated that the "eggs are attached on end to the upper side of the leaf, often as many as ten or twelve on a frond."

Hemitaxonus primarius, new species

Female.—Length, 7.2 mm. Head black; clypeus, base of mandibles and rest of mouthparts white; antenna with the two basal segments light rufous, flagellum black. Thorax black; hind margins of pronotum white; tegulae, a large triangular area on mesepisternum, and lateral areas of pronotum light rufous. Legs white to orange-yellow; tarsi infuscate. Abdomen orange; sheath and cerci black.

Antenna long and slender; first segment globular, second segment as wide as long; third and fourth segments subequal in length; remaining segments gradually decreasing in length. Head with vertex and frons smooth and shining; punctures and short dark hairs on para-antennal fields, supraclypeal area, malar areas, and genal areas; upper inner orbits of eyes with roughened areas; a circular ridge on the frons posterior to the antennae and including the front ocellus; malar space wider than the diameter of the front ocellus; genal carinae present; clypeus roughened, slightly emarginate. Thorax smooth and shining; pronotum finely punctate. Prepectus present as a distinct sclerite, separated from the episternum by a suture. Tarsal claws simple. Fore wing with anal cross vein present; proximal anal cell twice the length of the distal anal cell; Rs + M curved. Sheath long and narrow, the dorsal and ventral margins subparallel, gradually tapering to a rounded apex (fig. 13). Lance slightly wider in center than at base (fig. 20); lancet with three groups of irregularly shaped teeth on apical third (fig. 21 and 22).

Male.—Length, 7.0 mm. Color similar to the female except for the abdomen which is dark rufous. General structure as for female. Harpes with inner margins protuberant (fig. 1); parapenis as in fig. 2; penis valves with dorsal and ventral margins slightly protuberant (fig. 3).

Holotype.—Female, Lagunitas, California, April 7, 1946, elevation 1000′, H. P. Chandler, U.S.N.M. Type No. 67983.

Allotype.—Male, Saddleback Mountain, Lincoln Co., Oregon, April 30, 1960, J. C. Dirks-Edmunds.

Paratypes.—BRITISH COLUMBIA: Steelhead, May 23, 1933, H. B. Leech (1 ♀). CALIFORNIA: Lake Pilarcites, San Mateo Co., April 16, 1939, E. C. VanDyke (1 ♀); Mt. View, August 10, 1902, Ehrhorn (1 ♀). OREGON: Benton Co., Mary's Peak, March 27, 1964, rotary trap (1 ♂); Benton Co., Mary's Peak, May 16, 1963 (1 ♀); 4 mi. N. Harlan, Lincoln Co., April 7, 1960, G. P. Carpenter (1 ♂).

Disposition of paratypes.—Paratypes have been distributed among the following: the California Academy of Sciences, the Illinois Natural History Survey, Oregon State University, and the U.S. National Museum.

Specimens examined.—8.

Host.—Unknown.

The color of the dorsum of the thorax and abdomen ranged from black to rufous in the females examined but was dark in all the males. The first and second antennal segments were both rufous, both black, or the first segment rufous and the second segment black.

The females of this species are easily separated from other members of the genus by the distinct shape of the sheath. Otherwise, both sexes differ from *albidopictus* by the prepectus, tarsal claws, coloration, and genitalia, from *dubitatus* by the tarsal claws, and coloration, and from *multicinctus* by genitalia.

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NOTES ON THE TYPES OF TEPHRITIDAE DESCRIBED BY R. W. DOANE

(Diptera)

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In 1898 and 1899, R. W. Doane of the then Washington Agricultural College and School of Science at Pullman described 21 tephritid species in what eventually proved to be an important segment of American taxonomic literature on fruit flies. Of the names proposed by Doane, 16 are in use at the present time for species nearly all of which have proved to be common and fairly widespread in North America and Mexico. Three names are synonyms of widespread species of economic or of potential economic importance, and 2 are synonyms of species which, although commonly encountered, are confined to the Western States or to the Pacific Northwest.

Shortly after the appearance of Doane's (1899) major contribution, D. W. Coquillett (1899) published in the same journal a similar work in which he synonymized some of Doane's names with those of already well known species. To defend his original taxonomic decisions, Doane (1900) presented a third note—some of his final conclusions are discussed briefly below under the individual species headings.

In April, 1965, it was my privilege to visit the Entomology Department of Washington State University (hereinafter designated WSU) at Pullman for several days to study the Doane tephritid types and to select lectotypes from the syntype series known to be present there.

In all cases involving syntype series, Doane himself selected and labeled one specimen to represent each species, but he neglected to designate any of them formally as holotypes in publication. In the following notes I have designated the Doane selections as lectotypes, except for two instances in which these specimens are now damaged beyond recognition. The heading for each species cites every Doane reference by date, page, and figure number. The species are arranged alphabetically regardless of their original or present generic position. The labels associated with each type specimen are quoted in the order in which they are affixed to the pin, from top to bottom. In every case but one it will be noted that a slide bearing the right wing of each of Doane's selections accompanies the pinned specimens, to which the wing is keyed by a number.

I wish to extend my gratitude to Maurice T. James of the Department of Entomology, Washington State University, for making these specimens available for study by loan and during my visit.

Urellia aldrichii Doane, 1899: 192, Pl. IV, fig. 11

Present name.—*Tephritis araneosa* (Coquillett).

Type.—Lectotype, here designated, ♀, "Brookings, S.D.," "28," "Type 102." Associated wing slide no. 28. WSU Type No. 19.

Remarks.—Although the head is missing, the wing pattern and the characters on the thorax and abdomen clearly demonstrate the synonymy of *aldrichii* with *araneosa*. Quisenberry (1951: 65) discusses this relationship at length.

Oedaspis anthracina Doane, 1899: 180, Pl. III, fig. 3

Present name.—*Procecidochares anthracina* (Doane).

Type.—Lectotype, here designated, wing on slide marked "#1." WSU Type No. 106.

Remarks.—Aldrich (1929: 6), in his revision of the genus *Procecidochares*, states that the types are in the WSU collection, but the slide bearing the right wing of a specimen supposedly chosen by Doane to represent the species is the only evidence of a type specimen I could find. The other female mentioned by Doane is likewise missing from the WSU collection. Neither specimen has found its way to the National Collection at the U.S. National Museum.

Eurosta aterrima Doane, 1899: 187, Pl. IV, fig. 2

Present name.—*Oxyna aterrima* (Doane).

Type.—Holotype, ♀, "Colo., 1885," "26," Type 93." Associated wing slide no. 26. WSU Type No. 11.

Remarks.—Quisenberry (1949a) has revised the North American species of *Oxyna*, a genus which superficially resembles *Eurosta* in that the species have an extremely wide frons and a tendency to appear greasy.

Eutreta aurantiaca Doane, 1899: 185, Pl. III, fig. 10

Present name.—*Xenochaeta aurantiaca* (Doane).

Type.—Holotype, ♀, "Whidby Id., Wash." "8.6.98," "46," "20," "Type 91." Associated wing slide no. 20. WSU Type No. 8.

Remarks.—The thorax, right fore leg, and left mid leg are all that remain of this holotype. Foote (1960b: 109) discusses the generic relationships of this interesting and rare species.

Neaspilota brunneostigmata Doane, 1899: 187, Pl. IV, fig. 3

Present name.—*Neaspilota brunneostigmata* Doane.

Type.—Lectotype, hereby designated, ♀, "Pullman, Wash.," "Collector C. V. Piper," "25," "Type 94." Associated wing slide no. 25. WSU Type No. 12.

Remarks.—The type specimen has been subsequently labeled "brunneostigma." Quisenberry (1949b: 83) presented a key to the known species of this solely Nearctic genus.

Tephritis californica Doane, 1899: 190, Pl. IV, fig. 7; 1900: 48

Present name.—*Tephritis californica* Doane.

Type.—Holotype, ♀, "L. S. Jr. U., Lot 98, Sub.," "Palo Alto, Cal., 17 Aug. 91," "16," "Type 98." Associated wing slide no. 16. WSU Type No. 16.

Remarks.—The specimen is badly rubbed and lacks many of its setae. Of the wings, only the one mounted on a slide remains. The species is distinctive, however, and can be traced easily in Quisenberry's (1951: 60) and my (1960a: 72) keys. Doane's (1900: 48) contention that Coquillett's (1899: 266) synonymy of *californica* with *araneosa* was incorrect is thus vindicated.

Rhagoletis caurina Doane, 1899: 182, Pl. III, fig. 5

Present name.—*Urophora formosa* (Coquillett).

Type.—Holotype, ♀, "Corvallis, Or., 6.20.98," "137," "21," "Type 86." Associated wing slide no. 21. WSU Type No. 5.

Remarks.—The specimen is in poor condition. One of the wings is missing and the head, ovipositor sheath, and ovipositor are misshapen. This species differs in many important respects from those of *Rhagoletis.* Cell 1st A is closed transversely without an apical extension along vein Cu_2 + 2nd A; the abdominal terga are completely dark; the apicodorsal corner of the third antennal segment is rounded; the oral margin is rather projecting; and the cheek below the eye is broad, with numerous dark subequal setae. The synonymy was first made by Foote and Blanc (1963: 90), but was not so indicated in that publication.

Eurosta conspurcata Doane, 1899: 186, Pl. IV, fig. 1; 1900: 47

Present name.—*Eurosta conspurcata* Doane.

Type.—Lectotype, here designated, ♂, "Pullman, Wash., 7 May 98," "12," "Type 92." Associated wing slide no. 12. WSU Type No. 10.

Remarks.—The specimen is in excellent condition, not greasy as many individuals of *Eurosta* are found to be. Doane (1900: 47) is apparently correct in his insistence that *conspurcata* is distinct from *Eurosta reticulata* Snow. However, the genus is in need of revision. There is not so much as a key to the known species at the present writing.

Aciura ferruginea Doane, 1899: 182, Pl. III, fig. 6

Present name.—*Aciurina ferruginea* (Doane).

Type.—Holotype, sex not known, "Pullman, Wash.," "2," "Type 87." Associated wing slide no. 2. WSU Type No. 9.

Remarks.—Missing are the abdomen and all but the 2 fore and the right mid leg. The species is keyed and briefly described in Foote and Blanc (1963: 8).

Tephritis murina Doane, 1899: 189, Pl. IV, fig. 5

Present name.—*Paroxyna murina* (Doane).

Type.—Lectotype, here designated, ♂ "Whidby Is., Wash.," "8.2.98," "*Grindelia.*" WSU Type No. 14.

Remarks.—Because the head is missing from the red-flagged specimen chosen by Doane, I have selected a male from the syntype series with the same locality and date to represent the species. *P. murina* is a grayish yellow species. The mesonotum and abdominal terga of both sexes are densely gray-dusted and without dark markings.

Aciura nigricornis Doane, 1899: 183, Pl. III, fig. 7

Present name.—*Myoleja nigricornis* (Doane).

Type.—Holotype, sex not known, "Penn.," "29," "Type," "Type 88." Associated wing slide no. 29. WSU Type No. 6.

Remarks.—Except for the abdomen, which is missing, this specimen is in good condition. The status of the genus *Myoleja* must be reassessed in light of recent taxonomic developments in the family.

Eutreta nora Doane, 1899: 184, Pl. III, fig. 9; 1900: 48

Present name.—*Xanthomyia nora* (Doane).

Type.—Holotype, ♀, "Moscow Mt., Idaho," "11," "Type 90." Associated wing slide no. 11. WSU Type No. 7.

Remarks.—This unique female and the genus to which it properly belongs are the subjects of a discussion (Foote, 1964: 140) in which I support Doane's contention (1900: 48) that *nora* and *Xanthomyia platyptera* (Loew) are distinct.

Acrotaenia otopappi Doane, 1899: 183, Pl. III, fig. 8

Present name.—*Acrotaenia otopappi* Doane.

Type.—Holotype, ♀, "Mexico," "In head of *Otopappus acuminatus*," "30," "Type 89." Associated wing slide no. 30. WSU Type No. 3.

Remarks.—The specimen is in very poor condition, having lost most of its bristles. Bates (1934: 7) omits the species in his discussion of the genus.

Urellia pacifica Doane, 1899: 192, Pl. IV, fig. 10; 1900: 48

Present name.—*Tephritis araneosa* (Coquillett).

Type.—Lectotype, here designated, ♀, "Corvallis, Or., 5.27.98," "daisy," "9," "15," "Type 101." Associated wing slide no. 15. WSU Type No. 18.

Remarks.—The type is somewhat rubbed but retains enough characters to demonstrate the synonymy with *araneosa* beyond a doubt. In this, Coquillett (1899: 266) was correct in spite of Doane's (1900: 48) protest. Quisenberry (1951: 65) discusses the relationship of *pacifica* to *araneosa* in detail.

Rhagoletis ribicola Doane, 1898: Pl. IV, figs. 1–6; 1899: 181, Pl. III, fig. 4

Present name.—*Rhagoletis ribicola* Doane.

Type.—Lectotype, designated by Bush (in press), ♀, "Wash. Exp. Sta. No. 66," "Type." WSU Type No. 4.

Remarks.—The "Type" retains both its wings, and the slide in the same box bears the right and left wings of another specimen, possibly a male, which I could not find in the WSU collection. Bush (in press) discusses this species in detail.

Tephritis rufipennis Doane, 1899: 190, Pl. IV, fig. 8

Present name.—*Tephritis rufipennis* Doane.

Type.—Lectotype, here designated, ♂, "L. S. Jr. U., Lot 74, Sub.," "Santa Cruz Mts., Calif., 18 July 91," "17," "Type 99." Associated wing slide no. 17. WSU Type No. 17.

Remarks.—This species, because of its distinctive wing pattern and color, can be traced easily in Quisenberry's (1951: 60) and my (1960a: 73) keys.

Spilographa setosa Doane, 1899: 178, Pl. III, fig. 1; 1900: 47

Present name.—*Rhagoletis basiola* (Osten Sacken).

Type.—Lectotype, designated by Stone (1951: 47), ♀, "Vollmer, Ida., 7.31.98," "J. M. Aldrich, Coll.," "Spilographa setosa Doane, type," "USNM Cotype No. 43546." The specimen chosen by Doane (♀, "Seattle, Wash.," "7-25," "23," "Type 83," associated wing slide no. 23, WSU Type No. 1) and red-flagged in the WSU collection must be considered a paralectotype.

Remarks.—Doane (1900: 47) was correct in maintaining that *setosa* is distinct from *Rhagoletis flavonotata* Macquart. The latter is a synonym of *Zonosemata electa* (Say) as shown by Stone (1951), who discusses in detail the taxonomy of this common and widespread rose-hip *Rhagoletis* species.

Trypeta straminea Doane, 1899: 179, Pl. III, fig. 2; 1900: 47

Present name.—*Orellia occidentalis* (Snow).

Type.—Lectotype, designated by Foote (1962: 177), ♂, "Pullman, Wash.," "24," "Type 84." Associated wing slide no. 24. WSU Type No. 2.

Remarks.—A lectotype for *occidentalis* from the Snow Museum, University of Kansas, Lawrence, was designated by McFadden and Foote (1960: 259). Doane (1900: 47) incorrectly insisted the names *occidentalis* and *straminea* were not properly applicable to the same species despite Coquillett's (1899: 262) synonymy.

Euaresta tricolor Doane, 1899: 191, Pl. IV, fig. 9

Present name.—*Gymnocarena tricolor* (Doane).

Type.—Lectotype, here designated, ♂, "S.D.," "Type 100." Associated wing slide no. 31. WSU Type No. 20.

Remarks.—This extremely rare species is included in my (Foote, 1960b: 112) revision of *Gymnocarena* Hering. In that paper I mistakenly referred to the "holotype." The only Doane syntype known to exist is the specimen designated as the lectotype above—the female discussed by Doane apparently has been lost.

Tephritis variabilis Doane, 1899: 188, Pl. IV, fig. 4

Present name.—*Paroxyna variabilis* (Doane).

Type.—Lectotype, here designated, ♀, "Corvallis, Or., 7.16.96." WSU Type No. 13.

Remarks.—In the selection of this lectotype I depart from the practice, followed in the preceding designations, of choosing the specimen flagged by Doane himself. The original "type" has lost its bristles. Although the wing of the lectotype is somewhat darker and has fewer hyaline spots than Doane's specimen, I am certain the two are conspecific. Doane (1899: 188) mentions that there are differences in size and in the ovipositor between the Washington and Oregon specimens. These differences may be accounted for by the fact that most of the Washington specimens are the naturally smaller males, and by the manner in which the female ovipositor sheath in the Oregon specimens are more exposed on account of the way in which they have dried on the pins.

Tephritis webbii Doane, 1899: 189, Pl. IV, fig. 6

Present name.—Tephritis webbii Doane.

Type.—Lectotype, here designated, sex not known, "Collins, Idaho, 27 July 98," "13," "Type 97." Associated wing slide no. 13. WSU Type No. 15.

Remarks.—Except for the missing abdomen, the specimen is in almost perfect condition. This large, dark, distinctive species is discussed by Quisenberry (1951: 69) and myself (1960a: 80).

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THE ANTHOCORIDAE OF THE GALÁPAGOS AND COCOS ISLANDS (HEMIPTERA)[1]

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The following report is based on the material collected by members of the Galápagos International Expedition of 1964.[2] This material, exclusive of types, has been divided, as quantity permits, among the following individuals and institutions: California Academy of Sciences, R. L. Usinger, P. D. Ashlock, U.S. National Museum, and B. P. Bishop Museum.

Up to this time no Anthocoridae have been recorded from the Galápagos or the Cocos Islands.

Amphiareus constrictus (Stål)

GALAPAGOS ARCH.: Isla Santa Cruz, Horneman Farm, 220 meters, 18 March 1964, D. Q. Cavagnaro, 13 ♂♂, 9 ♀♀, 3 nymphs.

This widespread species occurs from Africa through the Orient, over most of the Pacific Islands and in North, Central, South America and the West Indies.

Asthenidea nebulosa (Uhler)

COCOS ISLANDS: Chatham Bay, 8 March 1964, G. Kuschel, 2 ♂♂, 1 ♀.

This species is known from Guatemala, Panama, and the West Indies.

Buchananiella sodalis (White)

GALAPAGOS ARCH.: Isla Santa Cruz, Academy Bay, 22 January 1964, R. L. Usinger, 1 ♀.

This is another widespread species which occurs in Africa, over a large number of the Pacific Islands and in North, Central, South America, and the West Indies.

Cardiastethus limbatellus (Stål)

GALAPAGOS ARCH.: Santa Cruz Island, Academy Bay, 23 January 1964, P. D. Ashlock, 1 ♀, ex *Scalcia affinis*; 2 February 1964, R. O. Schuster, 1 ♀; Horneman Farm, 220 meters, 18 March 1964, D. Q. Cavagnaro, 2 ♀♀; Bella Vista Trail, 11 February 1964, R. O. Schuster, 1 ♂.

Known from Guatemala and Brazil.

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Lasiochilus pallidulus Reuter

COCOS ISLANDS: Chatham Bay, 8 March 1964, P. D. Ashlock, 6♂♂, 4♀♀, 1 nymph. GALAPAGOS ARCH.: Isla Santa Cruz, Academy Bay, 22 February 1964, P. D. Ashlock, 1♂, 2♀♀, at light; 20 February 1964, D. Q. Cavagnaro and R. O. Schuster, 2♂♂, 5♀♀; Horneman Farm, 220 Meters, 7 May 1964, D. Q. Cavagnaro, 1♀.

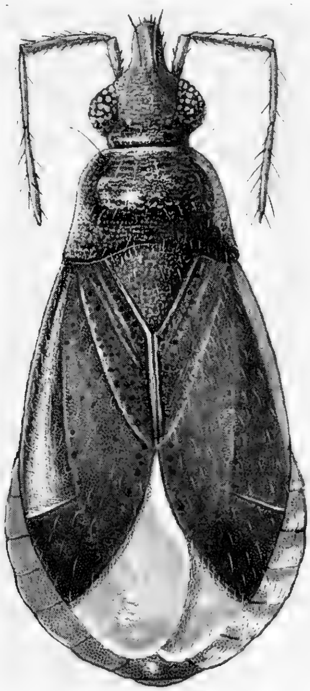
This species occurs in southern U.S., Mexico, Guatemala, Panama and the West Indies.

1

Lasiochilus ashlocki, n. sp.

(fig. 1)

Male: Head slightly longer than transocular width, 28: 26; chestnut brown, its apex slightly paler; smooth and shining; clothed with long pale hairs; eyes small, narrowest portion of vertex more than 4 times width of an eye, 18: 4. Antennae short, densely clothed with long, stiff, golden hairs, segment II rather stout, shorter than length of head, 24: 28; proportion of segments I-IV, 10: 24: 21: 20; straw yellow, segment I and apical half of II fuscous. Rostrum almost reaching bases of middle coxae. Pronotum more than 2 times as broad as long; 52: 22; concolorous with head; shining; lateral margins ciliate, almost straight; apex broader than head through eyes; disc smooth, posterior lobe finely rugulose, anterior lobe with a short distinct fovea at base; clothed with long, golden hairs. Scutellum dull, fuscous, only its extreme base shining. Hemelytra dull; fuscous except bases of clavus, corium and embolium and an irregular



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spot at cuneal fracture straw yellow; clothed with long, semi-erect golden hairs; indistinctly punctate; parallel-sided to cuneal fractures; the marginal hairs short; membrane completely fuscous except for a very narrow, pale, apical margin. Ventral surface reddish brown, femora mostly reddish brown, tibiae paler. Length 2.3 mm., greatest width 0.72 mm.

Female: Very similar to male in coloration and size. Length 2.25 mm., greatest width 0.72 mm.

Diagnosis: This species differs from all *Lasiochilus* known to me by the combination of small size, bicolored hemelytra, dark membrane, and dull texture of almost the entire scutellum.

Type data: Holotype ♂ (California Academy of Sciences), COCOS ISLANDS: Chatham Bay, 8 March 1964, G. Kuschel; allotype ♀ (USNM), P. D. Ashlock.

Nidicola mazda, n. sp.

(fig. 2)

Female: Head longer than transocular width, 27: 22; reddish brown, its apex more yellowish; coarsely rugose; clothed with few long hairs intermixed with short pubescence; eyes small, coarsely faceted, narrowest portion of vertex almost 3 times width of an eye, 14: 5. Antennae long, slender, prominently clothed with long hairs; proportion of segments I-IV, 6: 16: 14: 22; straw yellow, segment IV somewhat darker. Rostrum extending between hind coxae. Pronotum twice as wide at base as median length, 38: 19; explanate margins moderately wide; frontal lobe large, swollen, almost 3 times as long as hind lobe, densely, rugosely punctate; hind lobe depressed, transversely rugose; clothed with long appressed pubescence. Scutellum rugose, punctate. Hemelytra with veins poorly defined, punctures rather obscure; concolorous with head, pronotum and scutellum, base of clavus and corium yellowish brown; membrane fuscous. Connexiva broadly exposed. Ventral surface yellow to yellowish brown; legs pale. Length 1.70 mm., greatest width 0.90 mm.

Diagnosis: Because of the poorly elevated wing veins and the nonprominent anterolateral angles of the pronotum, this species runs to *N. mitra* Drake and Herring in their key (1964). However, it is easily separated from the species by its smaller size, strongly pyriform body shape, and the densely rugulose texture of the pronotum.

Type data: Holotype ♀ (USNM, No. 69025), GALAPAGOS ARCH.: Isla Santa Cruz, Academy Bay, 28 January 1964, R. O. Schuster.

Orius tristicolor (White)

GALAPAGOS ARCH.: Isla Santa Cruz, 750 meters, 5 May 1964, D. Q. Cavagnaro, 1 ♂, in grassland.

This is the common western U.S. species. It also occurs from Mexico to South America and in the West Indies.

Xylocoris sordidus (Reuter)

GALAPAGOS ARCH.: Isla Baltra, 3 February 1964, D. Q. Cavagnaro, 1 ♂, 1 ♀; Isla Santa Cruz, Academy Bay, 25 January, 24 February 1964, D. Q. Cavagnaro and R. O. Schuster, 2 ♀ ♀; Horneman Ranch, 16 February 1964, same collectors, 1 ♀.

This species occurs in the southern U.S., Mexico to Honduras, Brazil and the West Indies.

The Anthocoridae of the Galápagos and Cocos Islands seem to have their greatest affinities with the anthocorid fauna of Central America and the West Indies rather than with that of the coast of western South America.

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A NOTE ON HYLAEUS FABRICIUS IN TRAP-NESTS IN WISCONSIN (HYMENOPTERA: COLLETIDAE)[1]

Species of *Hylaeus* are known to nest in stems of pithy plants, including the old burrows of other bees and wasps, and it was not unexpected to collect these bees in sumac trap-nests in Wisconsin. The trap-nest borings utilized by these bees were each 6.4 mm in diameter. It seems probable that a burrow with a 6.4 mm diameter is at the upper acceptable limit as only seven nests were obtained from hundreds of traps used during a ten-year period, 1952–1962.

Four nests of *H. ellipticus* (Kirby) (Det. T. B. Mitchell) were obtained: one in Bayfield Co., 1955; two in Washburn Co., 1956; and one in Waushara Co., 1962. A precise association of bees and their cell sequence could not be made, because the membranous cells were constructed together in a way that did not allow separation for individual rearings. Thus, each nest appeared to have a single, transparent, silken "cell" 20–30 mm long in the bottom of the 150 mm long hole. Plugs made with scrapings from the walls of the hole were placed next to the "cell" or near the hole orifice. The respective nests contained 3, 3, 3 and 8 bees. Thirteen adults were reared—a single male with a head width measurement of 1.3 mm, and twelve females, 1.5 ± 0.1, range 1.3–1.6 mm.

The two 1956 nests contained pupae when brought to the laboratory on July 29. Adult bees emerged during August 5–10. A two generation life cycle is suggested by this record, although univoltinism was reported in Ontario by Fye (1965, Canad. Ent. 97: 863–877).

A nest of *H. modestus* Say was obtained at Wyalusing State Park, Grant Co., September 6, 1962. This overwintering nest contained five cells at the bottom of the 150 mm long trap hole. A plug made with pith scrapings was constructed next to cell 5. A male *H. modestus* (Det. K. V. Krombein) emerged from cell 4. Cell 3 produced a *Gasteruption* sp. male. The provisions in cells 2 and 5 were spoiled, and the specimen in cell 1 died.

Although specimens of bees were not reared, it is thought that two other nests obtained side by side in Waushara Co., September 6, 1962, represented this species. Each nest produced specimens of *Gasteruption kirbii* (Westwood) (Det. R. D. Shenefelt). The parasites, two females in one nest and a female and a male in the other, were the only occupants reared.

The Wisconsin data supplement previous reports on the nesting habit of *H. modestus* in sumac twigs in Missouri by Rau (1930, Psyche 37: 173) and the biologies of *H. basalis* (Smith), *H. ellipticus* and *H. verticalis* (Cresson) in trap-nests in Ontario by Fye (op. cit.).

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NEW SYNONYMY IN DROSOPHILIDAE (DIPTERA)

The species described as *Drosophila flexipilosa* Pipkin 1964 (Proc. Ent. Soc. Wash. 66 (4): 238–240) is synonymous with *D. immigrans* Sturtevant 1921.

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NOTES ON THREE FOSSIL GENERA OF ICHNEUMONIDAE (HYMENOPTERA)

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Through the kindness of Prof. F. M. Carpenter of Harvard University, and Professor Urless Lanham of the University of Colorado, I have been able to study specimens of the fossil ichneumonid genera *Protohellwigia*, *Hiatensor*, and *Lithotorus*. *Protohellwigia* proves to be a synonym of *Hellwigia*. Notes on the three genera are below.

Genus **Hellwigia**

Hellwigia Gravenhorst, 1823. Nova Acta Acad. Caesareae Leopoldina—Carolinae Nat. Curio. 11: 318. Type: *Hellwigia elegans* Gravenhorst. The only species certainly included.

Diamon Gistel, 1848. Naturgeschichte des Thierreichs für höhere Schulen, p. IX. New name for *Hellwigia*.

Protohellwigia Brues, 1910. Bul. Mus. Comp. Zool. 54: 66. Type: *Protohellwigia obsoleta* Brues. Original designation.

Heinrichiella Hedwig, 1949. Ent. Ztschr. 59: 54. Type: (*Heinrichiella monstrosa* Hedwig) = *obscura* Gravenhorst. Monobasic.

Brues proposed the new genus and species *Protohellwigia obsoleta* for nine fossil specimens from Florissant, Colorado (lower Oligocene?). These have been studied, with the conclusion that they represent a species of *Hellwigia* (subfamily Porizontinae). *Hellwigia* contains two living species of Europe and the Mediterranean area (*elegans* Gravenhorst and *obscura* Gravenhorst). The fossil species *obsoleta* is close to the Recent *obscura*, closer to this species than *obscura* is to *elegans*. *Obsoleta* differs from *obscura* in having the intercubitus less strongly bent and either interstitial with the second recurrent vein or only a little distad, nervellus a little longer than in *obscura* and broken a little below the middle; antenna a little shorter, and punctures on mesoscutum a little smaller and denser. The wing venation, general proportions, and sculpture of the mesoscutum are plainly indicated in the fossil specimens, but nothing is indicated of the frons, emargination of the eyes, or mouth parts. Brues' figure of the venation has minor inaccuracies in the stigma. The actual specimens show this area to be identical with that in *H. obscura*. Several specimens are females, from which it may be seen indistinctly that the ovipositor is about as in *H. obscura*.

One of the two specimens reported by Cockerell as *Protohellwigia obsoleta* (1924, Entomologist 57: 10) has been borrowed from the University of Colorado Museum (specimen no. 16649). This is specifically distinct from *obsoleta*, from which it differs in being slightly larger, with the intercubitus almost straight (and interstitial with

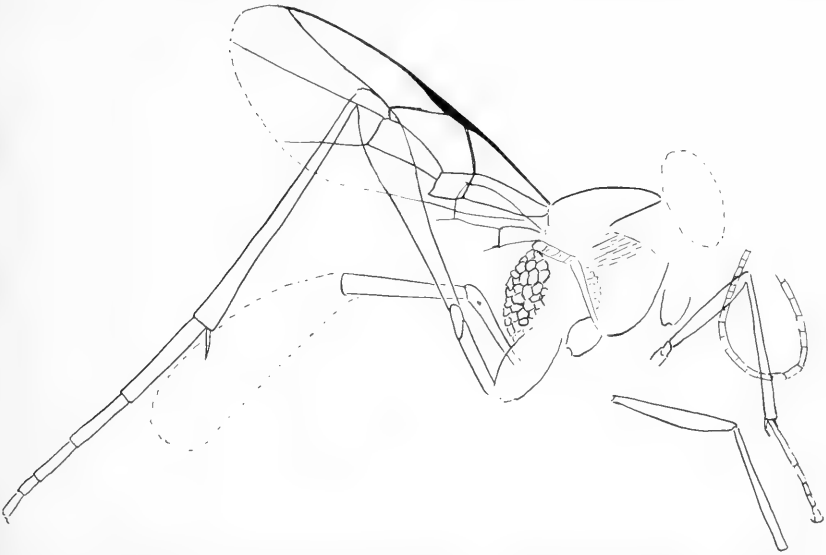

Fig. 1. *Hiatensor semirutus*, drawn from the type of *H. funditus* (a synonym of *semirutus*), with details added from the type of *H. semirutus*.

second recurrent), microtrichia on wings smaller and denser, and nervellus broken at the middle rather than a little below.

There is thus the interesting case of a very distinctive ichneumonid genus now represented by only two species in the Mediterranean area, but formerly occurring in Colorado.

Genus **Hiatensor**
(Fig. 1)

Hiatensor Brues, 1910. Bul. Mus. Comp. Zool. 54: 73. Type: *Hiatensor semirutus* Brues. Original designation.

Front wing 4.7 to 5.0 mm. long. Other characters as in figure.

This genus is known from two fossil type specimens from Florissant, Colorado (lower Oligocene?), discussed below under *Hiatensor semirutus*. The generic drawing is a composite of what can be observed on them, but represents particularly specimen no. 2261. In the original description, and in the present figure, the abdomen is shown as very short. Superficially, both specimens appear to have the abdomen as illustrated, but it is not certain whether or not the abdomen is complete. Possibly the apical segments are missing and the abdominal length was as normal for the Gravenhorstiini. Only one spur can be observed on the hind tibia, but the possibility of two being present is not disproved.

This genus belongs in the Anomalinae, tribe Gravenhorstiini. The venation distinguishes it from all living genera.

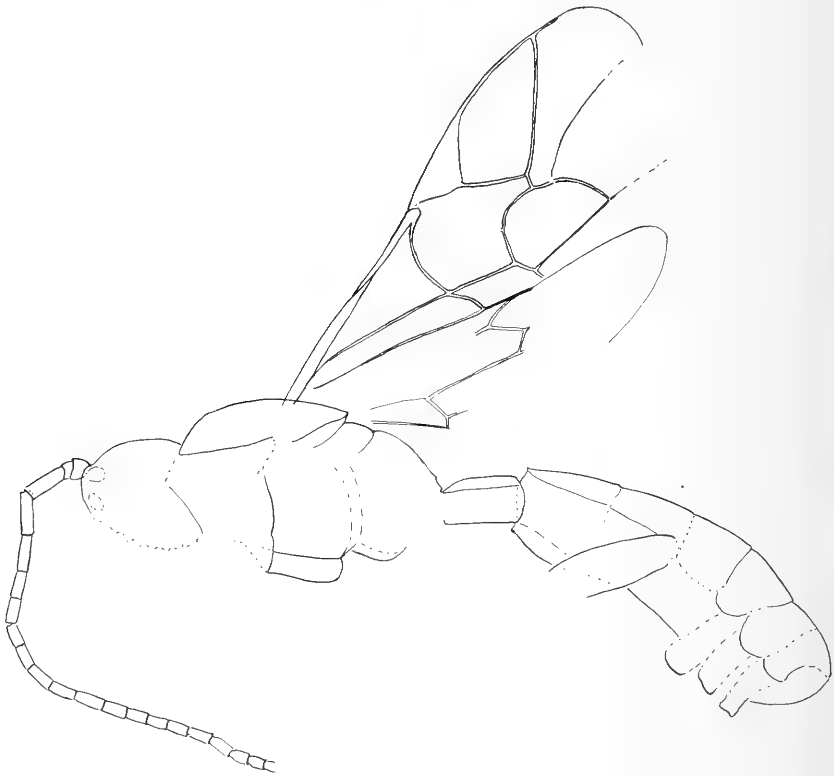

Fig. 2. *Lithotorus cressoni*, drawn from the type.

Hiatensor semirutus Brues

Hiatensor semirutus Brues, 1910. Bul. Mus. Comp. Zool. 54: 74. Type: Fossil specimen from Florissant, Colo., no. 2260 (Cambridge).

Hiatensor funditus Brues, 1910. Bul. Mus. Comp. Zool. 54: 75. Type: Fossil specimen from Florissant, Colo., nos. 2261 and 2262 [obverse] (Cambridge). **New synonymy.**

Examination of the above types discloses only one noteworthy difference: the radial cell of *semirutus* is 3.83 as long as wide; that of *funditus* is 4.55 as long as wide. On the other hand the reticulate sculpture of the propodeum, longitudinal wrinkling on mesopleurum, shape of abdominal tergites 1 and 2, and leg proportions of the two types are identical. One might presume that the difference in proportions of the radial cells is due either to distortion or to individual variation. Brues stated that the second abdominal segment was shorter in *funditus* than in *semirutus*. Measurements show it to be 0.34 as long as the front wing in *funditus* and 0.33 as long in *semirutus*.

Genus **Lithotorus**
(Fig. 2)

Lithotorus Scudder, 1890. The fossil insects of North America 2: 609. Type: *Lithotorus cressoni* Scudder. Monobasic.

Front wing 2.75 mm. long. Other characters as in figure.

The single known specimen is from Green River, Wyoming. The figure illustrates the characters that can be discerned on it. These suggest the subfamily Diplazontinae, or perhaps a microleptine related to *Hemiphanes* or *Hyperacmus*. The figure is drawn without an areolet, but the condition of the specimen prevents certainty as to whether the areolet is present or absent. Probably the relations of the genus will remain uncertain until more specimens from the same deposit are available, and additional characters are known.

ON THE IDENTITY OF CLYMENE AEGERFASCIELLA CHAMBERS
(TRICHOPTERA: HYDROPTILIDAE)

In 1873 Chambers described (Can. Ent. 5:114, 124) two insects as micro-Lepidoptera, but later (Can. Ent. 5:147) he transferred both to the Hydroptilidae. One, described as *Cyllene minutisimella*, is now placed in *Neotrichia*. The other, described as *Clymene aegerfasciella*, has been generally overlooked in subsequent publications. Recently while studying material in the national collection I discovered a series of hydroptilids bearing the following labels "D.C. July 24/27 trunk of apple tree" "No. 259 Hydroptila aegerfasciella Cham. V.T. Chambers Det. c/79." This series of 3 males and 12 females are what is presently known as *Orthotrichia americana* Banks, 1904.

Subsequently the Chambers collection at the Museum of Comparative Zoology, was searched for a possible type of this species, but none was found. In Chambers' descriptions he states that ocelli are lacking, the spur count is 0, 3, 4, and the wings are acuminate. These characters will fit either *Orthotrichia* or *Hydroptila*. His description of the color pattern will fit most any hydroptilid. Inasmuch as these specimens fit the description and are determined by Chambers, I, as first reviser, recognize *C. aegerfasciella* to be the same as the species commonly known as *Orthotrichia americana* Banks.

The description of *Orthotrichia* Eaton bears a mast-head date of May 1873, whereas *Clymene* Chambers bears a mast-head date of June 1873, and in addition is preoccupied several times. Therefore, *Clymene* Chambers (type-species *Clymene aegerfasciella* Chambers 1873) will fall into the synonymy of *Orthotrichia* Eaton (type-species *Hydroptila angustella* MacLachlan 1865). However, *Orthotrichia americana* Banks, 1904, becomes a synonym of *aegerfasciella*. The correct name for this species now is *Orthotrichia aegerfasciella* (Chambers), new combination. OLIVER S. FLINT, JR., *Department of Entomology, Smithsonian Institution, Washington, D.C.*

NOTES ON THE DISTRIBUTION, ECOLOGY AND OVERWINTERING HABITS OF CULEX APICALIS ADAMS IN UTAH[1]
(Diptera: Culicidae)

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Culex apicalis Adams was originally reported from Utah by Rees and Nielsen (1951) on the basis of a larva collected at Kamas, Summit County. That larva was later determined to be *Culex territans* Walker (Nielsen and Rees, 1961). Musser (1959) listed a *Culex* sp. from the desert region of southeastern Utah in Lake Canyon, in San Juan County. Although represented by only poorly preserved larval material it was suspected that the species involved was *C. apicalis.* Nielsen and Rees (op. cit.) after collecting and rearing additional *Culex* larvae from the Lake Canyon area substantiated the presence of this species. Although *C. apicalis* was abundant in Lake Canyon, the species was not known to occur elsewhere in Utah until adults were collected near St. George, Washington County, in 1963 (Nielsen and Linam, 1964). Subsequently, we found another population of *C. apicalis* in Zion National Park in August, 1964.

In Utah, the larvae of *C. apicalis* occur in fresh water pools that are generally well shaded. These pools are almost always of a semi-permanent or permanent nature and are often quite small. They usually contain grasses and moderate to heavy growths of algae and often various species of emergent aquatic plants belonging to the genera *Eleocharis, Juncus, Scirpus* and *Typha. Lemna* species are frequently present and the pool bottoms are often littered with dead leaves. In Lake Canyon, larvae were present in side, overflow or seepage pools along a small canyon stream which generally persisted throughout the year and was subject to occasional flash flooding. Most of the pools contained considerable algae and *Lemna* and growths of *Scirpus* and *Typha.* Larvae of *Culex tarsalis* Coquillett were found with those of *C. apicalis* in almost every pool. *Anopheles freeborni* Aitken larvae also were associated in one instance. At Zion National Park larvae of *C. apicalis* were found in two areas. One was a well shaded marshy area containing *Typha, Scirpus, Eleocharis,* and much algae and *Lemna.* The other was a large deep pool in a sandstone basin. This pool was covered with dense mats of algae and was exposed to the afternoon sun. Although a few larvae were found in the deeper exposed parts of the pool the greatest concentrations were in the margins in fingers shaded for all or most of the day by large boulders. No other mosquito species were associated with the Zion Park

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larval material. In the St. George area of southern Utah, larvae were found in the pools of water formed by seepage out of the sandstone rock walls of an abandoned shaft. Small amounts of stunted *Typha* and heavy growths of algae appeared as the season progressed. Larvae of *A. freeborni*, *C. tarsalis* and *Culiseta inornata* (Williston) were associates of *C. apicalis* in this area.

The water temperature in all collection localities ranged from 59–77° F.

At the St. George site the first larvae generally appeared in April and were collected until October or November. The time required from hatching to maturity for the first brood was approximately one month.

Culex apicalis has been found in Utah only at elevations of less than 4,000 ft. Chapman (1961), however, has collected larvae of this species in three Nevada counties at elevations ranging from 4,700 ft. to 6,400 ft.

Bohart (1948) stated that although the evidence was scanty, it appeared that *C. apicalis* passed the winter as adult females in hibernation. The site at St. George contained an extensive sheltered area. It thus appeared to offer promise for a study of the overwintering habits of this species. Monthly observations were made from October, 1963, to May, 1965. These observations have shown that *C. apicalis* overwinters as adult females in the recesses of an abandoned shaft in a sandstone hillside. Adult males were collected until December, but only the females persisted throughout the entire winter. These overwintering females remained active and flew readily when disturbed. During the entire period of this study the temperature in this environment remained near 55° F and the relative humidity remained near 65%. Overwintering adults of *A. freeborni*, *C. tarsalis* and *C. inornata*, also were found in the shaft.

The 50-year average minimum temperature for St. George, as reported by Cottam et al. (1959), indicated December to be the coldest month with an average minimum of 24.4° F. January followed closely with an average minimum of 24.5° F. These data indicate that *C. apicalis* adults must find protected areas of more favorable temperatures for overwintering or else be capable of withstanding short-term periods of occasional sub-zero temperatures and more prolonged periods of below freezing temperatures. Our observations indicate the former possibility to be most likely. *Culex apicalis* is southern in its distribution in the inland western United States and is probably restricted from invading more northern areas by unfavorable temperatures.

Larvae of the population found at Zion National Park persisted into November. The overwintering retreats of the adults in this area have not been located. No data are available on the seasonal extent of larval development or the overwintering habits of the Lake Canyon population.

Lake Canyon is a side canyon of the Colorado River in what is now the Lake Powell area. Both localities in Washington County are in close proximity to the Virgin River. It thus seems probable that *C. apicalis* has utilized the Colorado and Virgin Rivers as northern dispersal routes into southern Utah. It seems probable that this species is close to its northern distributional limit in the inland western United States in this area of Utah.

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BIOLOGY OF EUMENINE WASPS IN TRAP-NESTS IN WISCONSIN[1]

(Hymenoptera: Vespidae)

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Holes in wood are the natural nesting places of many species of eumenine wasps. A student of wasp biology may have difficulty in finding holes used for nesting in nature, and when found, such holes may be situated in places that do not permit detailed research on their contents. A simple and practical method of studying the biology of these wasps is to provide nesting holes in various habitats. The holes, or "trap-nests," can then be observed conveniently, and after utiliza-

[1] This work was supported in part by the Research Committee of the Graduate School of the University of Wisconsin from funds supplied by the Wisconsin Alumni Research Foundation.

tion by the wasps for nest building, the traps can be brought to the laboratory for detailed study and rearing of the contents.

During 1952–1962, many hundreds of trap-nests were set out in various locations in Wisconsin. Among the several eumenine wasps nesting in the traps the most common species were *Ancistrocerus antilope* (Panzer) and *Rygchium foraminatum* (Saussure). The information on the biology of these two species was reported by Medler and Fye (1956) and Medler (1964b). The data on two other not so common species, *Rygchium leucomelas* (Saussure) and *Ancistrocerus tigris* (Saussure), were reported by Medler (1964a, 1965). Also, the records on parasitism of the eumenine wasps by Chrysididae were published by Medler (1964c). This article gives information on *Ancistrocerus catskill* (Saussure), *A. campestris* (Saussure) and *Symmorphus albomarginatus* (Saussure), and completes the series of papers on the eumenine wasps in Wisconsin.

A trap-nest consisted of an 8-inch length of sumac stem with a hole drilled in the center pith to a depth of 6 inches (150 mm). Diameters of the holes were 3/16, 1/4 or 5/16 inch (4.8, 6.4, 7.9 mm). Usually five or six stems were bundled together and hung in a horizontal position on the limb of a tree, a fence wire, or other convenient location. The traps containing nests were brought to the laboratory, split open and diagrammed on a standard data sheet. Contents of cells were transferred singly to 10×35 mm glass vials, plugged with cotton, and reared at room temperatures or in an incubator. A system of code letters and numbers was used to identify the vials so that each reared insect was associated with its exact location in any particular nest.

Ancistrocerus catskill (Saussure)

The nest architecture of this species consisted typically of clay partitions that formed a linear series of caterpillar-provisioned cells, an empty vestibule, and an orifice plug. The partitions were about 0.5 mm thick, except that the orifice plug was considerably thicker, normally 3–6 mm. Some nests had the first cell started against the pith in the bottom of the hole. In other nests the wasp constructed a clay partition at various distances from the bottom of the hole, and this partition then served as the base of the first cell.

In plugged nests the empty vestibular space between the orifice plug and the outer partition of the last cell was variable, as the length depended upon the placement of the last partition in relation to the number and length of cells, both of which varied in a boring that was uniformly 150 mm long. An interesting feature was that 55% of the vestibules had an intercalary partition, which created two empty chambers. Also, in two nests the vestibular space was divided by two partitions, thus forming three empty chambers. The average length of 11 single vestibules was 33.6 mm. In 16 nests with double vestibules

Table 1. Rearing data on the contents of cells from trap-nests of three species of eumenine wasps, 1952–1962.

Category	*Ancistrocerus catskill*	*Ancistrocerus campestris*	*Symmorphus albomaculatus*
Number of nests	39	5	18
Adult males	21	17	10
Adult females	63	1	18
Empty cells	16	1	4
Provisioned cells, rearing failures	60	20	44
Cells parasitized by *Chrysis*	18	—	2
Cells parasitized by *Melittobia chalybii*	1	—	18
Total number of cells	179	39	96

the spaces averaged 32.0 and 15.0 mm. The triple spaces in two nests were 36, 20, 10 and 9, 9, 22 mm respectively.

Thirty-nine nests were obtained, of which 34 represented a summer generation and five were the second or overwintering generation. The mean number of cells in the summer nests was 4.4 ± 2.5, range 1–12; in the winter nests 3.2 ± 0.8, range 2–4. The difference between the means was not significant. For all nests the mean number of cells was 4.3 ± 2.4.

The mean length (in mm) of 43 cells in 4.8 mm diameter holes was 12.1 ± 4.5, range 7–30; of 76 cells in 6.4 mm holes, 10.9 ± 4.0, range 5–22; and of 29 cells in 7.9 mm holes, 12.1 ± 4.5, range 7–32. The mean length of all cells combined was 11.5 ± 4.3 mm. The differences in the above means were not significant.

The rearings of cell contents produced three times more females than males (Table 1). Contents of some cells were unsuitable for rearing because the caterpillar provisions were spoiled and in some instances the wasp larvae died during the rearings or were parasitized. Therefore, the above sex ratio was provisional.

Table 2 gives the sequence of sexes in the cells and the location of the chrysidid parasites in eleven nests. In nests containing both sexes, female wasps were in the innermost cells, males in the outermost. Some nests contained all females or all males. With regard to the chrysidid parasites, there was no consistent pattern in their location, parasites being found in both first-made or last-made cells. Fourteen *Chrysis coerulans* Fab. and four *C. nitidula* Fab. were reared from ten nests. Based on the available cells in the ten nests the parasitism was 28 per cent.

Six nests were attacked by Diptera. In each of four nests a phorid, *Megaselia* sp., destroyed the contents of a single cell. As the four nests contained a total of eleven cells, the incidence of parasitism was 36 per cent. In each of the other two nests, a sarcophagid, probably

Table 2. Number of cells in trap-nests of three species of eumenine wasps each with an orifice plug, and sexes of the reared wasps.

	Cell number (innermost to outermost)											
Nest No.	1	2	3	4	5	6	7	8	9	10	11	12
Ancistrocerus catskill (Saussure)												
1	♀											
2	♀	♀	♀									
3	♀	♀	♀	♀								
4	♀	†	♀	♀	♂							
5	†	†	♀	♀	♀	♂						
6	†	†	♂	♂	♂	♂						
7	†	†	♀	♀	*	♀	*	†	♀	♀	*	♀
8	♀	♂	♀ Cn									
9	Cc	♂	Cc									
10	♂	♂ Cc	†	♂	♂	♂						
11	♀	♀	♀	♀	♀	♀	♀ Cc					
Ancistrocerus campestris (Saussure)												
3	†	♂	♂									
4	†	†	†	♂	♂	♂	♂	♂				
5	♂	♂	♂	♂	♂	♂	♂	♂				
Symmorphus albomarginatus (Saussure)												
1	♂											
2	†	♀										
3	♂	♂	♂									
4	♀	†	♀	Mc	♀	♀	†					
5	†	♀	♀	♀	♀	†	♀	♀	♀			
6	†	†	†	†	♂	Mc	♂	♂	†	†	†	

† = died during rearing. * = unprovisioned cell. Cn = *Chrysis nitidula* F. Cc = *Chrysis coerulans* F. Mc = *Melittobia chalybii* Ashm.

Amobia sp., was established in a single cell. The incidence of parasitism of total cells in the two nests was 22 per cent.

The parasite record of *Melittobia chalybii* Ashm. in a single cell was caused by contamination during rearing.

Within nests containing both females and males, there was a distinct tendency for females to be in the larger cells and males in the smaller cells. Between nests, however, there was a considerable variation in the sizes of cells occupied by females and males, so that the difference in means was not significant. For example, 62 cells producing females had a mean length of 12.4 ± 3.5, range 7–32 mm, whereas 15 cells with males had a mean length of 9.7 ± 3.9, range 5–22 mm. The construction of cells of different sizes was no doubt associated with the different amounts of food provided for females and males, and could be correlated with significant differences in the sizes of the adult wasps. A measurement of the wasp head across the eyes was used as the size index. Sixty-two females had a mean head width (in mm) of 2.69 ± 0.23, range 2.2–3.2, and 21 males were 2.3 ± 0.23, range 1.8–2.7.

The food provided in the cells was exclusively caterpillars. The mean number of caterpillars used to provision a cell was 8.1 ± 2.7, range 5–13, as determined by samples from 16 cells. However, the numbers of caterpillars only roughly indicated the mass of food available, as the species and sizes of caterpillars varied. Some of the caterpillars were species of Olethreutidae. Probably the foundress wasp of this species, in common with other eumenines, utilizes a wide range of tortricid, olethreutid, and gelechiid prey according to its availability in various habitats and during the time of the season that the nest is being provisioned.

Limited observations on the development of the progeny during laboratory rearings suggested that the larval stadia required only 8–10 days, but the pupal period lasted at least 16 days. Seven traps placed in the field June 12–14, 1962, contained pupae when opened during July 14–25. Adults emerged during July 26–31. Therefore, the nesting cycle, which consisted of the foundress selecting the nesting niche, laying eggs, constructing and provisioning cells and closing the nest, followed by the development of the progeny and adult emergence, required approximately 40 days.

In nests of the second or overwintering generation, a larval diapause is required before development of the pupa. Cold treatments were given to overwintering larvae in diapause. A regime of 4.5°C for 30 days followed by 21°C for 50 days did not break diapause, but an additional 16 days at 4.5°C followed by 21°C temperature resulted in emergence of adults in less than 30 days. Not enough larvae were available to conduct more detailed research, but it appeared that a relatively long period of cold treatment was necessary to break diapause of this species.

According to Bequaert (1943) typical *catskill* has yellow markings, and the propodeum of the female has lateral yellow spots. In the color variety *albophaleratus,* the body markings are white or creamy-white, and the propodeum normally is without lateral spots in the female. Both typical *catskill* and variety *albophaleratus* were obtained, but the color variant occurred only in Bayfield and Ashland counties in northern Wisconsin. The typical form was not taken in Bayfield Co. Although twelve nests of *albophaleratus* were recorded, the distribution was extremely limited, as nine of the records were obtained in 1954 from traps hung on the wall of a shed on a farm near Washburn, Bayfield Co., and two nests were taken in 1955 from a bundle of traps on a farm near Cornucopia, Bayfield Co. The other nest was collected in 1953 at the Ashland Branch Experiment Station, Ashland Co., along with a nest of the typical form. The distribution of typical *catskill* was statewide, as it was recorded in the following counties: Ashland, Dane, Grant, Green, Jefferson and Waukesha. However, in 1962 a concentration of nesting activity in a favored habitat on the Crawfish River in Jefferson Co. accounted for fourteen nests.

Ancistrocerus campestris (Saussure)

Only five nests of this species were found during the 1952–1962 period of research. Two nests were obtained at Yellowstone Lake, Lafayette Co., in 1961, and three nests were collected in the University of Wisconsin Arboretum, Dane Co., in 1962. The nest architecture of cells and a vestibule formed by clay partitions was similar to other species of *Ancistrocerus* using the traps.

The two nests at Yellowstone Lake were taken on June 25 from a bundle of five traps that had been put out on May 28 at head height in an old apple tree at the edge of an abandoned pasture. Both nests were in 6.4 mm holes that had been closed with orifice plugs of clay. Each plug was of similar construction, consisting of inner and outer partitions 3–4 mm thick separated by a 3 mm space. The outer partition was smoothly finished off flush with the rim of the hole. Empty vestibules preceded the plugs, consisting of spaces 8 mm and 15 mm long in nest 1, and a single space 20 mm long in nest 2.

Nest 1 had 13 cells that ranged in length from 5 to 10 mm. Each cell had caterpillar provisions except cell 11, which was empty. Considerable mortality of wasps was experienced during rearings, and only one adult male was obtained from cell 13 on July 17.

Nest 2 had 8 cells. Cells 1–4 and 6–8 were approximately of the same sizes (7, 13, 11, 12, 5, 6, 8 mm), but "cell" 5 was an empty space 57 mm long. When the nest was opened on June 26, cells 2–3 contained no wasp larvae, but dried up remains of the caterpillar provisions. Cells 1, 4, 6, 7 and 8 each contained a small wasp larva, but cell 4 was contaminated by Diptera (probably *Amobia*) with two puparia already present. The larvae in cells 1, 4 and 7 were dead on June 30, but the larvae in cells 6 and 8 were successfully reared, producing a female in cell 6 and a male in cell 8 during July 18–20.

In 1962, three nests were obtained from a bundle of six traps hung at head height on a branch of a large oak tree in a small clearing with underbrush at the edge of a woods and adjacent to a prairie. The traps were set out on June 7 and collected on July 10. Nest 4 was in a 6.4 mm hole, and nests 3 and 5 were in 4.8 mm holes. All three nests had a single orifice plug (4, 6 and 10 mm respectively) preceded by an empty vestibule. Rearings from these nests are shown in table 2.

Nest 3 had three cells, with nearly full grown larvae in cells 2–3, but only caterpillar provisions in cell 1. Rearings produced two males that emerged during July 28–31.

Nest 4 contained 8 cells. Cells 1–3 contained only dead caterpillar provisions, but cells 4–8 had nearly mature larvae. Males emerged from the larvae in each cell on July 21.

Nest 5 was a fine example of a linear series of eight completed cells each with a wasp pupa. Adults emerging during July 14–16 all were males.

From the general appearance of large and small cells in nest 1 it seems probable that female progeny were provided for only in cells 1–6. If the same foundress wasp was responsible for nests 1 and 2, a female : male sex ratio of 1 : 2 can be estimated. In the 1962 nests a skewed female : male sex ratio of 1 : 3 can be deduced, providing that the three nests were constructed by the same foundress. Actual rearings in the five nests produced one female and 17 males (Table 1). The head width measurement of the female was 2.3 mm. Males were 2.45 ± 0.22, range 2.0–2.8 mm.

The average number of cells in the five nests was 7.8 cells per nest. The mean length of 28 provisioned cells in the 6.4 mm holes was 8.8 ± 2.8, range 5–15 mm. In the 4.8 mm holes 11 cells were 10.4 ± 3.4, range 6–19 mm. The average length of all cells combined was 9.3 mm.

Symmorphus albomarginatus (Saussure)

A positive identification of this species was possible with adults reared from seven nests. Eleven additional nests from which no adults were reared are believed to have been made by this species also, as the cells were provisioned with coleopterous larvae. Such prey is characteristic of the genus. The nests were found in Dane, Door, Grant, Green and Manitowoc counties. The majority were obtained from bundles hung at head height in isolated trees in various habitats, such as open meadows, the edges of a cedar thicket, or low and wet ground covered with underbrush.

The nests contained a linear series of cells, an empty vestibule and an orifice plug. The clay cell partitions were 1–2 mm thick, and frequently appeared to be constructed in two layers. The orifice plug was built up in layers until it had substantial thickness, and in ten nests had the following lengths: 7, 13, 13, 15, 15, 18, 18, 19, 19, and 20 mm.

The contents of more than half of the cells were not reared (Table 1). In many cells, the egg or young larva of the wasp was dead when the nest was opened. The prey, which were larvae of *Chrysomela* sp. exclusively, appeared severely paralyzed by the sting of the wasp. In 21 cells, the mean number of beetle larvae was 11.9 ± 4.7, range 5–23. Although first-made cells had more beetle larvae and were larger than last-made cells, no positive correlation could be made between prey counts, size of cell and sex of wasp. However, limited data suggested that in a few nests females were in first-made cells and males in last-made cells, and in other nests cells containing all females or all males were present (Table 2). Ten of the reared males had a mean head width measurement of 2.19 ± 0.19, range 1.7–2.4 mm, and eighteen females were 2.58 ± 0.24, range 1.9–2.9 mm.

A preference for 6.4 mm holes was shown in 13 nests, but two were obtained in 4.8 mm and three in 7.9 mm diameter holes. The number of cells in a nest ranged from 1 to eleven, with a mean of 5.2 ± 2.8. The length of cells was 11.9 ± 0.91, 14.6 ± 3.35 and 11.2 ± 2.62 mm in 4.8, 6.4 and 7.9 mm holes respectively. The mean length of cells in all nests combined was 12.7 ± 3.18 mm.

Information on the life cycle was limited because of rearing failures, and also heavy attack by *Melittobia chalybii* (Table 1). This parasite contaminated the contents of cells being reared in incubators in 1956, but was controlled subsequently by changing corks to cotton plugs in the rearing vials.

Five nests were collected with larvae and seven with cocoons during the last of July. In August, one nest had larvae and two nests contained cocoons. Also, two nests opened in September had cocoons. The cocoons, unlike *Ancistrocerus* cocoons, were chalky white, and frequently attached at the base to cell partitions by the larval meconium. A larva spun its cocoon in 1–2 days. Smaller cocoons, 9–13 mm long, produced males, and larger cocoons, 12–14 mm, gave females.

In 1956, a trap with a 6.4 mm hole was set out on July 12 at Point Beach, Manitowoc Co. When opened in the laboratory on August 20, it contained seven completed cells but lacked an orifice plug. Cells 1–3 had mature larvae, cells 4, 5 and 6 had progressively smaller larvae, and in cell 7 there was an unhatched egg. It can be deduced that the construction and provisioning of the cells covered a period of about a week, as that period of time was required for the growth of small to mature larvae during rearing studies.

Also, in 1956, a trap with a 7.9 mm diameter hole was set out on June 12 in the University of Wisconsin Arboretum. The habitat was low and wet and covered with brush. When the plugged nest was opened on July 3, it contained seven cells each provisioned with the following numbers of coleopterous larvae: 17, 12, 12, 23, 17, 5, and 12. Cell 1 had an egg 1.5 mm long, dark yellow in color and attached by a short thread to a patch of clay and sand grains on the wall of the cell at the inner end. Cells 2–7 had very small wasp larvae 2–3 mm long. The contents of the cells were placed in rearing vials, but wasps in cells 1–3 were dead at 6 days, and those in cells 4 and 7 also died after spinning cocoons and attaining the prepupal stage in 10 days. The wasps in cells 5 and 6 emerged in February, 1957, and proved to be a female and male of *Chrysis coerulans* F.

Discussion

For many years the information on the biology of the eumenine wasps, such as the publication of Phil and Nellie Rau (1916) was based mostly on observations of nests found by chance in nature. Recently, the trap nest technique has been used extensively by several investigators. Although much new information has been published as a result of the trap-nest research, it can be pointed out that many behavioral and biological problems remain to be elucidated.

It was of interest to rear *Ancistrocerus campestris* from trap-nests, as the only previous nesting records were reports by Rau (1916, 1922) that the wasp occupies without modification the old mud cells of *Sceliphron caementarium* Drury.

All the eumenids nesting in trap-nests construct partitions of clay or mud that divide the boring into a linear series of provisioned cells, an empty vestibule and an entrance plug. The average number and size of cells has been calculated in summer and overwintering generation nests of the several species, but of more basic interest is the evidence that considerable variation exists from nest to nest. Apparently, the foundress wasp does not have an inflexible behavior procedure for nest construction in a uniformly deep hole, but adjusts cell number and nest plugging in response to extrinsic factors such as the weather, availability of prey, parasitism, and possibly other unknown factors.

It is well known in general that females emerge from the larger, first-made cells and males from smaller, last-made cells. Many combinations occur in the sequence of sexes in the cells, including nests with all females or all males. As the eumenine wasps lay an egg in a cell prior to gathering the provisions and forming the outer cell wall, and females are normally larger than males, it appears that the foundress has an ability to relate female eggs with the storing of greater amounts of food for female larval development. However, the amount of food may be inadequate at times for the female-to-be or excessive for the male-to-be, with the result that the sexes show a wide range in sizes, and even may overlap in sizes, as determined by head width measurements on the reared wasps.

It is not known whether a food volume or a food weight factor is the sole discriminatory mechanism that governs the provisioning activity of the foundress in relation to female or male eggs. Fye (1965) determined provision masses of 0.025–0.50 g for males and 0.051–0.12 g for females of *A. c. albophaleratus*. Within a particular nest the number of larvae per cell may be useful as an approximate estimate of the mass of food provided, particularly in instances where the foundress exhibits fidelity in searching for and utilizing the same species and size of prey. However, examination of large numbers of trap nests in Ontario and Wisconsin has revealed that eumenine wasps utilize a wide range of prey, and that even several species and ages of caterpillars may be used in the same nest.

Provisioning is determined both by local availability of prey and by wasp preferences, according to Fye (1965), who reported that *A. c. albophaleratus* had a marked preference for smaller gelechiid larvae in *Recurvaria* and *Eucordylea,* whereas *A. c. catskill* had a marked preference for larger larvae of geometrids, pyralids, phycitids, olethreutids and gelechiids.

Bequaert (1943) pointed out that climatic factors, particularly sunshine, temperature and humidity, appear to be of outstanding importance in connection with color variations in *Ancistrocerus*. The usual color pattern of bright or sulfur yellow on a black background predominates where temperate climatic conditions prevail, winters are rather mild and short, temperature and amount of sunshine are moderate during the summer and rainfall is ample and fairly well distributed over the year. For wasps where the ground color is black and the pale markings are pure white to creamy-white, the environment is boreal or semi-boreal, with long and severe winters, cool and often cloudy summers, little sunshine even during the summer and abundant atmospheric moisture either as rain or as mist.

The general description of the environment summarized by Bequaert helps to explain the distribution of typical *catskill* in southern Wisconsin and the variety *albophaleratus* in northern Wisconsin, but it does not explain the occurrence of both color phases at the same time in the same habitat, such as recorded at the Ashland Experiment Station in 1953. Also, Bequaert (1943) recorded the occurrence of the variants together in the same localities, notably near Boston, and Fye (1965) reported on both variants in trap nests at Black Sturgeon Lake, Ontario, with 61% of the nests *c. albophaleratus* and 12.4% *c. catskill*. Possibly other factors or mechanisms are involved in the production of the color variants.

Fye (1965) observed that in summer generations the females predominated while in overwintering generations the males predominated. A tendency toward skewed sex ratios does not seem to be entirely associated with voltinism in Wisconsin, but results from nests containing wasps of one sex, particularly when the cell series is short. For example, in the 1962 summer generation nests of *A. campestris* 15 males emerged from 19 cells. This gives no less than a 3 : 1 ratio, even if the four remaining cells possibly contained females. Several summer generation nests of *A. catskill* contained only male progeny, whereas 3 of 5 overwintering nests were occupied solely by females. The loss of cell contents during rearing can affect the calculations on apparent sex ratios in trap nests, and the ratios that are obtained are not necessarily those that occur in the natural population.

Published information on the biology of *Symmorphus albomarginatus* was not available. However, Krombein (1958) reported on *S. canadensis* (Saussure) in trap nests in Arlington, Virginia. This species was almost entirely univoltine. Provisions were larvae of the chrysomelid leaf miner in locusts, *Chalepus dorsalis* Thunberg. The species was parasitized by *Chrysis cembricola* Krombein.

Fye (1965) collected S. *cristatus* (Saussure) in five trap nests in Ontario. The prey were larvae of *Gonioctena americana* Brown. The wasp larva in one cell was parasitized by *Chrysis coerulans* Fab. Fye also reported on unpublished data of Smereka at Cedar Lake in northwestern Ontario, indicating a relatively high frequency of nests and *Chrysomela crotchi* Brown as prey.

The record of S. *cristatus* by Koerber and Medler (1958) may be in error. The data sheets of Koerber do not show that adults were reared from the four nests collected in 1956. No specimens were found among accumulated material in the writer's collection, and the species was not listed among the determinations of specimens sent to specialists at the U.S. National Museum.

Acknowledgment

The writer gratefully acknowledges the help of specialists at the U.S. National Museum who made determinations as follows: H. W. Capps (Lepidoptera); K. V. Krombein (Vespidae and Chrysididae); and G. B. Vogt (Chrysomelidae).

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A NEW SPECIES OF OPSIGALEA HAMPSON FROM TEXAS
(LEPIDOPTERA: NOCTUIDAE)

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In September, 1963, Mr. Andre Blanchard and his wife collected two examples of the cuculliine genus *Opsigalea* Hampson in Brewster and Jeff Davis Counties, Texas. The specimens agreed in maculation with *O. ocellata* (Walker), the characteristic type-species, but were considerably smaller than the examples of *O. ocellata* in the collection of the United States National Museum. In 1964, 19 more specimens of the Texas entity were collected, all of which were decidedly smaller than the examples of *ocellata*. Examination of the genitalia revealed that the Texas examples were specifically distinct. The new species is described below so the name will be available for a list of the Lepidoptera of Texas proposed by Mr. Blanchard.

Opsigalea blanchardi, n. sp.

Head with proboscis well developed; labial palpi oblique, scarcely reaching to middle of frons, apical segment small (about 1/4 length of second segment) and slightly decumbent; frons nearly flat, scarcely exceeding anterior margin of eyes; eyes large, hemispherical, naked, with only a few short dorsal lashes; ocelli present, small, adnate to dorsal margin of eye caudad of base of antenna; antenna filiform in both sexes, white-scaled dorsally, minutely pubescent ventrally and laterally. Vestiture mostly of narrow scales usually bifid or trifid at apices, mostly light gray but with some dark gray scales mixed; frons roughly and loosely scaled, mostly dark gray except a diffuse, narrow, whitish band between antennae; patagium darkest dorsally, a large, oval, fine black ring medially, the center of the ring nearly white; metathorax with a dense, truncate, caudally-directed tuft, the scales of metathoracic tuft dark-tipped with brown dorsally, gray ventrally; abdomen with a small dark dorsal tuft on basal segment, the remainder of abdomen gray. Pectus clothed with long white hairs; tympanum moderate, only partially shielded by abdominal hood and alular fan; legs moderate, clothed with scales and dense hair, mostly gray, sprinkled with darker scales, tarsus of middle leg dark brown, tibiae with dorsal tufts of long hair and scales, that of middle leg longest. Forewing elongate, triangular, apex slightly produced, 15 to 18 mm. in length (19 males average 16.4 mm., 2 females average 17.5 mm.); forewing with R_1 free from outer 1/3 of cell; R_{2+3} from outer 1/6 of cell; R_3 from R_2 anastomosing with R_4 for 2/5 its length forming an elliptical areole; R_5 from basal point of fusion of R_3 and R_4; M_1 from upper angle of cell; M_2 arising slightly above M_3, both from slightly above lower angle of cell; Cu_1 from lower angle of cell; Cu_2 from apical 1/4 of cell; discocellular above M_2 very weak. Hindwing with Sc shortly-fused with R at basal 1/4 of cell; Rs and M_1 connate from upper angle of cell; M_2 arising shortly above lower angle of cell; M_3 and Cu_1 connate from lower angle of cell; Cu_2 from apical 1/3 of cell; discocellular very concave and weak between M_1 and M_2.

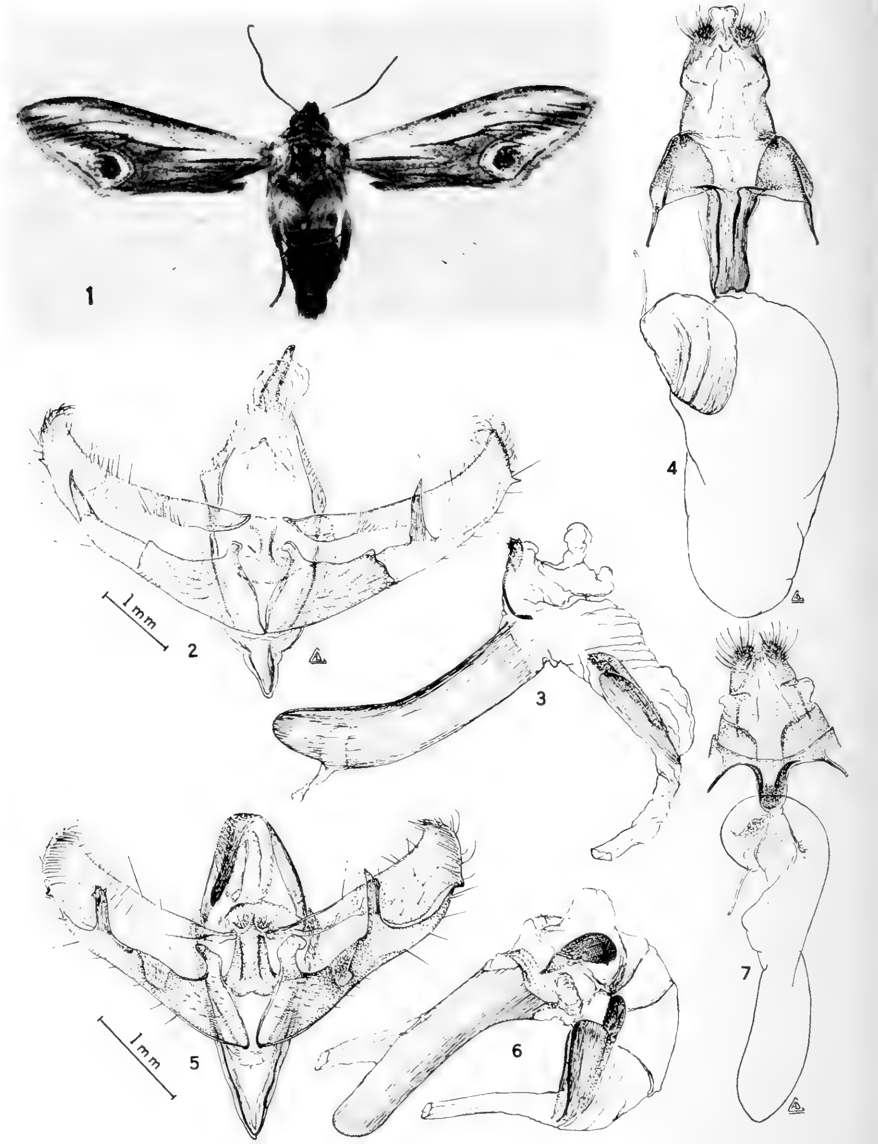

Figure 1, *Opsigalea blanchardi*, n. sp.; figs. 2–4, *O. ocellata* (Walker); figs. 5–7, *O. blanchardi*, n. sp. Fig. 1, adult, approximately 2 × natural size; figs. 2 and 5, male genitalia (aedeagus removed); figs. 3 and 6, aedeagi; figs. 4 and 7, female genitalia.

Pattern of maculation as illustrated (fig. 1), the same for both sexes except females have a weak dark marginal band between apex and Cu_2 of the hindwing; the longitudinal pale area of the anterior half of the forewing and the pale area distad of the ocellate spot off-white, suffused with yellow brown, the remainder of wing mostly gray, darkest along costa, oblique bar near apex and along basal part of inner margin; ocellate spot white basally followed by black, gray, and brown; basal dash and parts of veins M to Cu, black; a black terminal line between M_2 and tornus. Hindwing mostly white, a fine, black terminal line usually present from Rs to Cu_2 but sometimes obsolescent. Underside of wings mainly white, the gray area of upper surface of forewing weakly indicated and veins of apical half of forewing dark.

Male genitalia as illustrated (figs. 5 and 6), smaller than in *ocellata* (figs. 2 and 3), the valvae proportionally broader, the clavus larger, the sacculus shorter with a distinct membranous area immediately distad, the claspers irregular or toothed at apex (not sharp-pointed as in *O. ocellata*), the saccus more elongate, the basal cornutus a heavy, broad-based, single spine.

Female genitalia as illustrated (fig. 7), smaller than in *O. ocellata*, the ductus bursae shorter and less sclerotized. The apparent difference of position in the lobe of the corpus bursae bearing the ductus seminalis may not in fact exist. In the specimen of *O. blanchardi* the corpus bursae contains two stout curved spermathecae which undoubtedly caused a twisting of that structure. The slide of the only female of *O. ocellata* in the USNM was prepared more than 15 years ago, and the lobe of the corpus bursae may not be in the natural position.

Type, ♂, Alpine, Texas, September 9, 1963, A. and M. E. Blanchard, ♂ genitalia on slide no. 2036; E. L. Todd, USNM type no. 64643; 2 ♂ paratypes, same place and collectors, September 6, 1964; 3 ♂ paratypes, Fort Davis, Texas, August 29, 1964, same collectors; and 1 ♀ paratype, Alpine, Brewster Co., Texas, August 2, 1964, same collectors in the collection of the U.S. National Museum, Washington, D.C. Three ♂ and 1 ♀ paratypes, Alpine, Brewster Co., Texas, September 6, 1964, A. and M. E. Blanchard; 1 ♂ paratype, same place and collectors, September 14, 1963; 5 ♂ paratypes, Fort Davis, Jeff Davis Co., Texas, August 29, 1964, same collectors; 1 ♂ paratype, Grapevine Hill, Big Bend National Park, Texas, September 3, 1964, same collectors; 1 ♂ paratype, Oak Spring, Big Bend National Park, Texas, August 5, 1964, same collectors; and 1 ♂ paratype, Dugout Wells, Big Bend National Park, Texas, August 7, 1964, same collectors in the personal collection of Mr. Andre Blanchard, Houston, Texas.

At the present time *O. blanchardi* is known only from the Big Bend area of Texas and *O. ocellata* from south central Mexico. *O. ocellata* apparently is distinctly larger, the three males in the U.S. National Museum all have a forewing length of 22 mm.; the female forewing is 23 mm. long.

ATRAZONOTUS, A NEW GENUS OF GONIANOTINI FROM NORTH AMERICA

(HEMIPTERA: LYGAEIDAE)[1]

JAMES A. SLATER[2]
and
PETER D. ASHLOCK[3]

In the present paper we review the status of the taxon first described as *Dorachosa* Distant, and discuss its relationship to the widespread black gonianotine lygaeid that has most frequently been listed in North American literature under the name *Aphanus umbrosus.*

Distant 1893 established the genus *Dorachosa* for *D. illuminatus* n. sp. and a variety *umbrosus* listed as "var. *umbrosus* (n. sp.?)." Typical *illuminatus* was described from Mexico ("Omilteme in Guerrero 8,000 ft., H. H. Smith") and Guatemala Quiche Mts., 8,000 ft., Champion. Of this series the British Museum lacks the Mexican specimen but possesses three males labeled "Quiche Mts. 7,000–9,000 ft. Champion." The British Museum red "type" label is on a pin bearing two specimens on a single card. Of these we here select the left specimen as LECTOTYPE of *illuminatus.*

The type situation relative to "var. *umbrosus*" is more complex and very important to the nomenclature of the species occurring in the United States. The type series of *umbrosus* consists of eleven specimens as follows: 3 females, 1 male "Quiche Mts., 7,000–9,000 ft., Champion"; 1 female "V. de Chiriqui, 4,000–6,000 ft., Champion"; 1 female "Ostuncalco, 7,500, Champion"; 2 males, 2 females "Presidio, Mexico, Forrer"; 1 male "Boll, Texas, 1875, Distant Coll." Of the eleven specimens those from Quiche, V. de Chiriqui and Ostuncalco are certainly conspecific with *illuminatus* and differ only in possessing dark legs and antennae. The specimens from Boll, Texas, and Presidio, Mexico, however, represent an entirely different species, which has been called "*umbrosus*" in most subsequent North American literature.

Before attempting to advocate a solution to the problem raised by this type series, it appears desirable to review briefly the nomenclatoral and taxonomic history of the taxa involved. (A complete documentation will be found on pages 1418–1420 of the 1964 Slater Catalogue and will not be repeated here.)

Dorachosa Distant 1893 was found to be preoccupied and the taxon was renamed *Delochilocoris* by Bergroth 1893, at which time he also treated "*umbrosa*" as a distinct species, not a variety of *illuminatus.*

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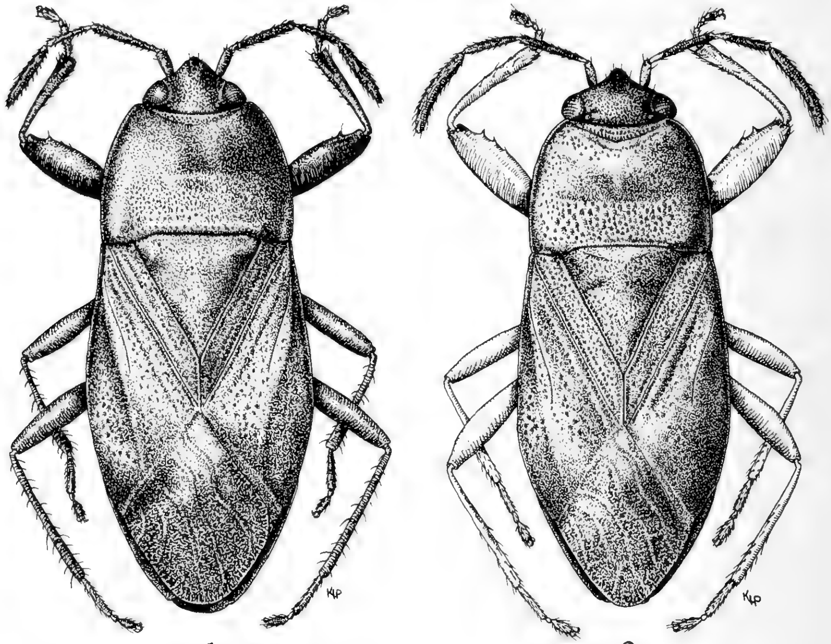
Horvath 1908 synonymized *Delochilocoris* with *Aphanus* (of authors *nec* Laporte) and, except for misidentifications of *umbrosus* as the Palearctic *Microtoma carbonaria* (Rossi) and *M. atrata* (Goeze), the species was generally listed under *Aphanus umbrosus* until Ashlock 1960 correctly pointed out that *Delochilocoris* was not congeneric with *Aphanus* (nor *Rhyparochromus*: see Slater Catalogue for this confusing synonymy) and in fact represented a distinct genus in the rhyparochromine tribe Gonianotini.

The problem then is to determine the proper procedure to follow relative to "var. *umbrosus*," since the type series contains two distinct species. There are, of course, two alternatives. 1) Selecting a specimen from "Quiche" as lectotype of *umbrosus* would result in the placing of *umbrosus* in the synonymy of *illuminatus*, since the variety would have no geographic significance. The populations in the United States would be left without a name and would need description as a new species. 2) Selecting a specimen from Boll, Texas, or Presidio, Mexico, as lectotype of *umbrosus* would retain the specific name *umbrosus* for the North American taxon that has generally been so designated. The latter alternative seems to us patently the more desirable, and we hereby select the male specimen from Boll, Texas, as LECTOTYPE of *Dorachosa illuminatus* var. *umbrosus*.

Generic concepts in the Western Hemisphere gonianotines are complex and in need of careful analysis; *umbrosus*, however, appears to us to represent a distinct genus more closely related to *Malezonotus* than to *Delochilocoris*. Indeed, the relationship with some species of *Malezonotus* is very close, the aedeagus of *umbrosus* being almost identical with the condition found in *Malezonotus barberi* Ashlock and *Malezonotus obrieni* Ashlock. The aedeagus of *umbrosus* differs only in possessing a series of small spines on the dorsal lobes at the base of the vesica (fig. 4). The aedeagus of *Delochilocoris illuminatus* (Distant) possesses a much simpler vesica: the lateral lobes at the fold near the base are only two-parted and while the "bump-like" lobes are present dorsally on the base of the vesica, the two distally directed spine-bearing lobes are absent (fig. 3). The helicoid process has the usual two turns but the gonoporal process continues on for three and one-half turns instead of two as in *umbrosus*.

Delochilocoris, as indicated in the following key, can be readily recognized by the reticulate membrane and the formation of the spines on the fore femora (fig. 2). *Trapezonotus caliginosus* Distant 1882, by our concepts, belongs to *Delochilocoris*. Despite the obvious affinity to *Malezonotus*, *umbrosus* is easily differentiated by the strongly arcuate pronotum, surface texture, and such superficial criteria as completely black body and appendages. We feel that *umbrosus* merits generic status as described below.

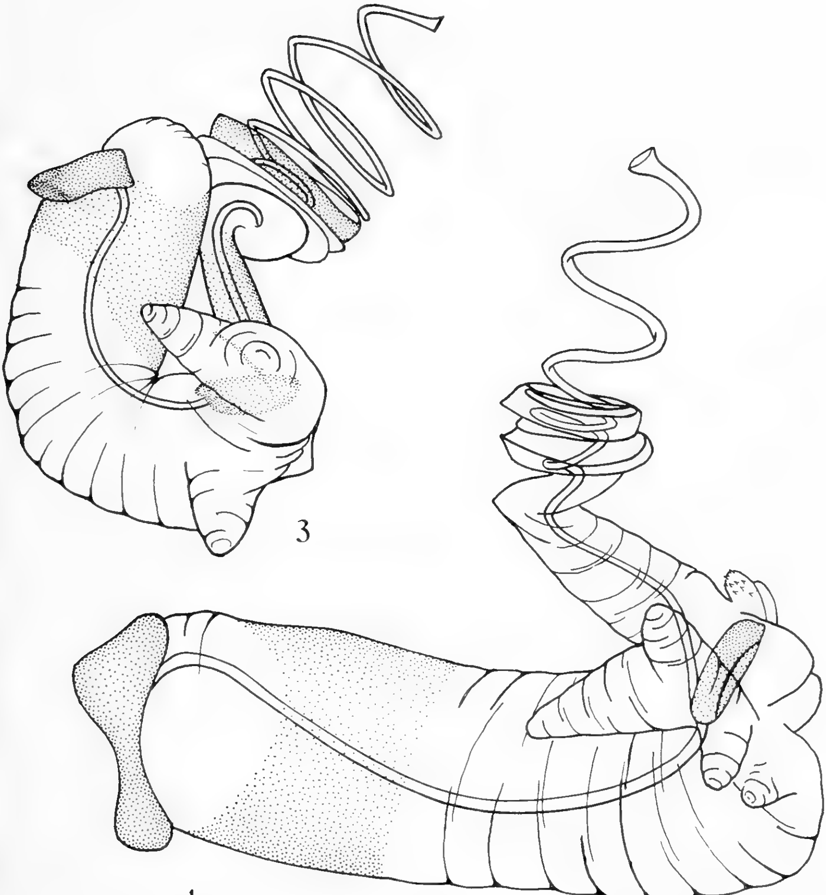


1 2

Fig. 1, *Atrazonotus umbrosus*, dorsal view; fig. 2, *Delochilocoris illuminatus*, dorsal view.

Atrazonotus, new genus
(Fig. 1)

Head wider than long, finely punctate or rugose, nearly glabrous except for several setae at apex of tylus. Pronotum much wider than long, indistinctly divided into two lobes, not constricted laterally, anterior lobe one half again length of posterior lobe at midline, anterior lobe obscurely punctate, posterior lobe with punctures smaller than those of hemelytra, lateral margin everywhere curved, nowhere straight or constricted, evenly expanded, not widened between lobes, impunctate, concolorous with disk, posterior margin evenly emarginate, not sinuately so. Scutellum about as long as broad, nearly flat, very lightly punctate. Hemelytra with lateral margins rather strongly curved, clavus with three straight rows of punctures plus additional confused punctures between inner two rows, corium with linear rows of punctures near clavus, becoming confused posteriorly, disk with scattered punctures, impunctate adjacent to costal margin. Membrane with veins unbranched and concolorous with dark disk. Metapleuron with shining area above dull evaporative area greater in height than height of eye viewed from side. Fore femur with a single row of spines



3

4

Fig. 3, *Delochilocoris illuminatus*, aedeagus; fig. 4, *Atrazonotus umbrosus*, aedeagus.

consisting of one major and several smaller setigerous spines, in all less than six, fore tibia not at all or but slightly curved. Aedeagus with simple phallotheca and conjunctiva, but with a pair of small lateral lobes distally on conjunctiva; vesica with a pair of lateral three-part lobes basally at the conjunctival fold, dorsally with a pair of bump-like lobes followed by a pair of short, apically directed lobes that bear tiny spines, distad of ventral bend vesica continues as a short tapering tube, then bends dorsally at base of helicoid process, the latter with two complete turns, followed by two complete turns of gonoporal process (fig. 4).

Type-species: *Dorachosa illuminatus umbrosus* Distant 1893

KEY TO THE GENERA OF GONIANOTINI OF AMERICA N. OF MEXICO

1. Expanded lateral margins of pronotum punctate dorsally .... **Emblethis**
   Expanded lateral margins of pronotum impunctate 2
2. Fore femur with spines in two ranks, more than ten spines present, major spines interspersed with minute spines 3
   Fore femur with spines in a single rank, no more than six spines present, major spines not interspersed with minute spines 4
3. Veins of membrane simple; species sometimes brachypterous .. **Trapezonotus**
   Veins of membrane reticulate (fig. 2); species never brachypterous .... **Delochilocoris**
4. Lateral margin of pronotum in part straight or constricted; appendages in part pale .... **Malezonotus**
   Lateral margin of pronotum arcuate, never straight or constricted; appendages entirely black (fig. 1) .... **Atrazonotus**

We wish to extend our sincere appreciation to Dr. W. E. China for his kindness in allowing us to study material present in the British Museum (Natural History).

AUTHORSHIP OF THE ICHNEUMONID PARASITE "NEPIERA BENEVOLA VAR. FUSCIFEMORA" (HYMENOPTERA)

A. B. Gahan described the campoplegine species *Nepiera benevola* in 1914 (Proc. U.S. Natl. Mus. 48: 157) and *benevola* var. *fuscifemora* in 1917 (Proc. U.S. Natl. Mus. 53: 208). The description of *fuscifemora* was published nearly four months after U. S. D. A. Bulletin No. 427 (1917) by J. E. Graf entitled: The Potato Tuber Moth. Graf's reference (pp. 46–47) to "*Nepeira* (sic!) *benevola* var. *fusifemora* Cushm." in this bulletin has been considered as validating the name with Graf as the author (Townes, 1945, Mem. Amer. Ent. Soc. No. 2 (Pt.2):244, and Townes *in* Muesebeck, Krombein, and Townes, 1951, USDA Agr. Monogr. No. 2: 375).

I consider *Nepiera fuscifemora* to be a *nomen nudum* in Graf's paper and Gahan to be the author, for the following reasons: (1) The only "indication" in Graf's paper is the figure (fig. 44) which the legend states is *benevola*. (2) Gahan in his description of *fuscifemora* (footnote) refers to fig. 44 unequivocally stating that it is *benevola*, and he gives the complete bibliographic reference. (3) The figure shows the hind femora with the apices and bases dark. This is true of *benevola* but not of *fuscifemora*. The latter species has the outer side of the hind femur dark brown or blackish. There is no fuscous basal area on the inner side of the femur unless it extends nearly to the middle or more usually nearly to the apex.

It is my opinion that more specimens of these species may show the two to be conspecific. The slight structural and sculptural differences could be infraspecific.

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DISTRIBUTION RECORDS FOR THE GENUS DIOXYS IN THE PACIFIC NORTHWEST (HYMENOPTERA: MEGACHILIDAE)

The genus *Dioxys*, which occurs principally in the southwestern United States and California (Hurd, 1958, Univ. Calif. Pub. Ent. 14 (4): 275–302), is poorly known from the Pacific Northwest. However, specimens from a number of collections from Idaho and Washington, representing three species and subspecies, have been found. Since these distributional records may constitute significant extensions of the known range of the genus, this information is presented for other workers in the field.

Determinations were made by Drs. G. E. Bohart, Logan, Utah; P. D. Hurd, Jr., Berkeley, California; P. H. Timberlake, Riverside, California, and the author.

Dioxys aurifuscus (Titus)

The first occurrence of this species in Idaho is based on the following collections: One male and one female, Craters of the Moon National Monument, Butte County, 3 July 1965; one male, 13 July 1964 (D. S. Horning, Jr.); one male, seven miles southwest Fairfield, Camas County, 7 July 1956 (W. F. Barr); one male, 16 miles southwest Grasmere, Owyhee County, 28 June 1953 (W. F. Barr); one male, Murphy Hot Springs, Owyhee County, 20 June 1965 (L. S. Hawkins, Jr. and R. L. Westcott); one female, St. Anthony sand dunes, Fremont County, 24 June 1964 (R. L. Westcott). The collection from St. Anthony sand dunes, Fremont County, constitutes a 40-mile extension of Hurd's proposed northeastern range of this species and extends the known northern range of this species approximately 100 miles.

Dioxys pomonae pomonae Cockerell

This subspecies was first recorded from four miles east of Terreton, Jefferson County, Idaho by Gittins (1959, Bull. Brooklyn Ent. Soc. 54 (5): 135). Additional specimens have been collected from the following Idaho localities: One male, Atwater Lake, Latah County, 19 June 1962 (W. F. Barr); one female, City of Rocks, Gooding County, 13 June 1960 (A. R. Gittins); one female, Craters of the Moon National Monument, Butte County, 3 July 1965 (D. S. Horning, Jr.), on flowers of *Phacelia hastata* var. *leucophylla* (Torr.) Cronq.; one male, one mile south of Parma, Canyon County, 27 June 1962 (A. R. Gittins); one female, ten miles west Rock Creek Ranger Station, Sawtooth National Forest, 17 June 1960 (A. R. Gittins). These records show a distinct east-west distribution in southern Idaho. The Atwater Lake, Latah County, collection extends the known northern range of this subspecies approximately 250 miles.

Dioxys productus productus (Cresson)

One female specimen was collected at Palouse, Whitman County, Washington, 23 June 1961 (R. W. Dawson) (Washington State University Collection). This collection constitutes an approximate 100-mile extension of Hurd's proposed northern range of this subspecies and the known northern range approximately 125 miles and constitutes the first record of the presence of the genus in Washington. DONALD S. HORNING, JR., *Department of Entomology, University of Idaho, Moscow, Idaho.*

A REVIEW OF *APHILANTHOPS* AND RELATED GENERA
(Hymenoptera: Sphecidae)

R. M. Bohart, *Department of Entomology, University of California, Davis 95616*

Aphilanthops Patton, *Clypeadon* Patton and *Listropygia* Bohart are North American philanthine elements which have been treated previously as subgenera but which seem sufficiently distinct in structure and habits to be treated as genera. As a subtribe Aphilanthopsina, they can be separated from *Philanthus* Fabricius by their nearly straight inner eye margins, and from *Trachypus* Klug by the sessile rather than petiolate abdomen. *Aphilanthops*, *Clypeadon* and *Listropygia* all provision their nests with ants, the first genus using winged forms and the other two selecting workers only. Evans (1962) has summarized nesting behavior and mechanics of ant prey carriage. His conclusions on the "ant-clamp" in *Clypeadon* are especially significant. Other papers of note on *Aphilanthops* in the broad sense have been those of Dunning (1898), Pate (1947), Burks (1951) and Bohart (1959).

The three genera have most of their species concentrated in the southwest United States. The only transcontinental species are in *Aphilanthops.*

With respect to the synonymy, I have examined the types of all of the species names except *Nomada dawsoni* Swenk. Additional description and details of distribution will be found especially in Bohart (1959) and Dunning (1898).

Curators of various collections have been most helpful but I would like to thank especially K. V. Krombein of the U. S. National Museum for his help in connection with the types of *Aphilanthops utahensis* Baker and *A. concinnulus* Cockerell.

Depository collections are indicated by the following symbols: American Museum of Natural History (AMNH), Academy of Natural Sciences at Philadelphia (ANSP), British Museum of Natural History (BMNH), California Academy of Sciences (CAS), California Insect Survey at Berkeley (CIS), Cornell University (Cornell), Canadian National Collection (CNC), University of Kansas (KU), Museum of Comparative Zoology at Harvard (MCZ), University of Arizona (U.Ariz.), University of California at Davis (UCD), University of Nebraska (U.Nebr.), U. S. National Museum (USNM).

Key to the Subtribe Aphilanthopsina

1. Antenna distinctly capitate, last four flagellomeres making up swollen part of club; female pygidium with a mediodistal, sharply projecting knob; male sternites III to VII depressed into a densely silver-haired trough; ocellocular distance nearly equal to diameter of lateral ocellus; clypeal rim not dentate in either sex .... **Listropygia** R. Bohart

Antenna not capitate; female pygidium without a strongly projecting knob; male sternites III to VII not trough-like; ocellocular distance equal to about two lateral ocellus diameters or more 2

2. Pygidium of female plate-like, somewhat "duck-billed" in appearance; clypeal rim toothed toward middle in both sexes; male sternite IV with a distinctive apical hair fringe; postscutellum without an angular lamina overhanging dorsolateral sinus on propodeum .... **Aphilanthops** Patton

Pygidium of female greatly enlarged, scoop-shaped, opposed by greatly prolonged and divided sternite VI; clypeal rim of female entire, of male tridentate; male sternite IV without a special apical hair fringe; post-scutellum with an angular lamina (under hindwing base) overhanging dorsolateral sinus on propodeum .... **Clypeadon** Patton

Genus **Aphilanthops** Patton

Aphilanthops Patton, 1880. Proc. Boston Soc. Nat. Hist. 20:401. Type: *Philanthus frigidus* Smith, orig. desig.

The simple pygidium of the female, and the apical fringe on sternite IV (as well as V) of the male are distinctive among the *Aphilanthops*-like genera. Four species are recognized, two of which range widely across the country and are known to prey upon winged ants of the genus *Formica*. The other two *Aphilanthops* are strictly southwestern and their prey is unknown.

Key to the Genus **Aphilanthops**

1. Tergite II with obvious, dense punctures toward dorsal middle; lower carina or edge of forewing articulation area (beneath tegula) angled downward near middle 2

Tergite II without obvious punctures toward dorsal middle; lower carina or edge of forewing articulation area somewhat sinuate but nearly straight overall 3

2. Flagellum extensively fulvous .... ***frigidus*** (Smith)

Flagellum all black .... **subfrigidus** Dunning

3. Tergite I with abundant long whitish hair much of which is longer than flagellomere II; latter not depressed toward base beneath; scutum with a pair of large, elongate, discal yellow spots or stripes .... **foxi** Dunning

Tergite I with hair inconspicuous (female) or mostly or all shorter than flagellomere II; latter depressed toward base beneath, especially in male; scutum usually all black, discal area sometimes with narrow discal yellow lines .... **hispidus** Fox

Aphilanthops foxi Dunning

Aphilanthops foxi Dunning, 1896. Trans. Amer. Ent. Soc. 25:21. Lectotype male, "San Diego Co., Cal." (ANSP).

This species has been known previously from the type series of four males. I have seen 102 males and 130 females collected from April 18 to May 24 in southern desert areas of California as follows: *Riverside Co.*: 10 mi. S. Garlic Springs (D. Clancy); Palm Springs (P. H. Timberlake); 6 mi. W. Indio (E. G. Linsley *et al.*); Hopkins Well

(J. G. Rozen); 18 mi. W. Blythe (P. H. Timberlake); *San Diego Co.*: Borrego Valley (R. M. Bohart *et al.*); Ocotillo (P. H. Timberlake).

Characteristic are the extensive yellow markings and the striped scutum. The two sexes are remarkably similar in appearance, agreeing even in the three teeth on the clypeal rim and the black band across the head at the level of the ocelli. The female pygidium is yellowish basally but brown otherwise.

Aphilanthops frigidus Smith

Philanthus frigidus F. Smith, 1856. Cat. Hym. Brit. Mus., V. 4, p. 475. Holotype male, Nova Scotia (BMNH).

Aphilanthops bakeri Dunning, 1896. Canad. Ent. 28:203. Lectotype male, "Colorado" (ANSP), present designation, **new synonymy.**

Nomada dawsoni Swenk, 1912. Nebraska Univ. Studies 12:83. Holotype male, Harrison, Nebraska (U.Nebr.).

The 52 males and 66 females of this species which I have seen were transcontinental in distribution as far north as Nova Scotia, Quebec, Wyoming and Washington. Southern limits were Virginia, Michigan, northern New Mexico, Utah and California (Felton, Santa Cruz Co.). Nine males and one female of the above specimens fall within the color form represented by the type of *bakeri* since they have extensive pale markings and mostly whitish pubescence. Males from Albuquerque, New Mexico and Craig, Colorado have been seen with and without parallel discal stripes on the scutum. Markings of *frigidus* vary from whitish to yellow, often in the same population. All of these color variations seem to be identical in structure. A photograph of the pygidium of the female was given by H. E. Evans (1962, fig. 4a). Evans summarized the nesting habits, also.

The pale-marked antenna, angled projection of the upper mesopleuron, and abdominal punctation readily separate the species.

Aphilanthops hispidus Fox

Aphilanthops hispidus Fox, 1894. Proc. Calif. Acad. Sci. (ser. 2) 4:106. Holotype male, "San José del Cabo," Baja California (CAS).

Altogether, I have studied 77 males and 44 females of this southwestern species. It occurs in central and eastern Arizona (Santa Rita Mts., Tucson, Sahuarita, Mohawk, Roosevelt Lake, Baboquivari Mts., and Wellton) and Californian desert areas of Inyo, Riverside, San Bernardino, Los Angeles, Imperial and San Diego counties. There is one record from Coalinga, Fresno County. The type specimen from the Cape region of Baja California is the only one known from Mexico.

The structure of the basal flagellomere, which is depressed beneath at the base, is distinctive in the genus.

Males have been collected at flowers of *Baccharis* and *Prosopis.*

Aphilanthops subfrigidus Dunning

Aphilanthops subfrigidus Dunning, 1898. Trans. Amer. Ent. Soc. 25:21. Lectotype female, "Nevada" (ANSP).

Aphilanthops elsiae Dunning, 1898. Trans. Amer. Ent. Soc. 25:23. Holotype female, "Cal." (ANSP), **new synonymy**.

Of this relatively abundant species I have identified 133 males and 97 females. It ranges from coast to coast in New York (Ithaca), Montana, Wyoming, Colorado (Pinecliffe), Idaho (Parma), British Columbia (Goldstream, Robson), Washington, Oregon, Nevada and California. In the last-named state it occurs in mountainous areas at low to moderate elevations as far south as Idyllwild, Riverside County. The markings may vary from whitish to yellow, the former often dominating in dryer regions such as Orovada, Nevada and Green River, Wyoming.

The all-black flagellum, together with the angled upper mesopleural projection and the abdominal punctation, distinguish the species.

Genus **Clypeadon** Patton

Clypeadon Patton, 1897. Ent. News 8:13. Type: *Aphilanthops quadrinotatus* Ashmead, monobasic. (=*laticintus* Cresson).

As postulated by Evans (1962), females in this genus use the modified pygidium and hypopygium in conjunction with the mid and hind coxae to fashion an "ant clamp" in which they lock their prey during transport. Only worker ants of the genus *Pogonomyrmex* seem to be utilized as prey. Eight species of *Clypeadon* are known from the western and southwestern parts of the country, and in northern Mexico.

The excavated but knob-less female pygidium and the presence of special apical fringes on sternites V and following in the male, but not on IV are distinctive in the subtribe. The clypeus in females has a median flange-like lobe which is not toothed; in the male the clypeus has three small teeth near the distal middle. The face in the male is covered by dense, coarse, somewhat appressed silvery hair, with an apicolateral tuft of broadened and darker hair. Both sexes, but especially the females, have a fore-tarsal comb.

Key to the Genus **Clypeadon**

1. Tergite VI simple; antenna with eleven flagellomeres; males 2
   Tergite VI forming a greatly enlarged and scoop-shaped pygidium, opposed by the greatly prolonged and divided sternite VI; females 9
2. A large smooth area adjacent to dorsoposterior point of eye; no yellow or ivory spot on mandible basally or clypeus laterally 3
   At most a narrow smooth area adjacent to dorsoposterior point of eye; a yellow or ivory spot on mandible basally; or on clypeus laterally, or on both 4

3. Median vertex tubercle well developed, polished area larger than lateral ocellus; clypeus with usually transverse, submedian ivory spots or a median line; hind tibia dark brown to black, marked with ivory .... **haigi** (R. Bohart)
   Median vertex tubercle weakly developed, largest polished area less than lateral ocellus; clypeus all black; hind tibia red and ivory yellow .... **dreisbachi** (R. Bohart)
4. Eye without a conspicuous, adjacent, dorsoposterior smooth strip, area behind eye closely and densely punctate; median vertex tubercle small, if present 5
   Eye with a conspicuous adjacent, dorsoposterior smooth strip; or a large, polished median vertex tubercle; or both 6
5. Wing membrane lightly but distinctly smoky; tergites rather finely punctate; femora and tibiae usually with very little red .... **californicus** (R. Bohart)
   Wing membrane clear; tergites rather coarsely and closely punctate; femora and tibiae usually extensively red .... **laticinctus** (Cresson)
6. Sternite V with hair rather extensive but not sharply divided medially 7
   Sternite V with a prominent dense hair tuft, sharply divided medially (best seen from rear) 8
7. Clypeus usually with a lateral yellow spot only; femora with very little red; flagellum nearly all black; average body length about 12 mm .... **taurulus** (Cockerell)
   Clypeus usually all pale or at least banded all across; femora extensively red; flagellum with considerable reddish; average body length about 8 mm .... **utahensis** (Baker)
8. Punctation of scutum irregular; median vertex tubercle usually large, polished and more extensive than either lateral area; tergal pale bands complete on I to V; tentorial pits not prominent .... **evansi** R. Bohart
   Punctation of scutum rather close and even; median vertex tubercle raised but often punctate, in any case not so extensively polished as either lateral area; tergal pale bands somewhat broken medially; shiny black tentorial pits unusually prominent .... **sculleni** (R. Bohart)
9. Vertex, including dorsoposterior border of eye, closely and finely punctate except sometimes for a small median vertex tubercle; pale band on tergite IV complete or nearly so 10
   Vertex punctation somewhat irregular; dorsoposterior border of eye with a very narrow to broad smooth area; median vertex tubercle or other vertex areas often extensively smooth 11
10. Wing membrane lightly but plainly smoky; abdomen usually without red markings and with a complete pale band on tergite III .... **californicus** (R. Bohart)
   Wing membrane not at all stained; abdomen with extensive red markings and usually with two well separated spots on tergite III .... **laticinctus** (Cresson)
11. Pygidial margin almost equally trilobed or without any trace of a median lobe 12
   Pygidial margin with a small but distinct median lobe, or at least not evenly concave 13
12. Pygidial margin with median lobe a little narrower but nearly as promi-

nent as lateral lobes; body ground color mostly red, at least on abdomen; antenna mostly red; smooth strip along dorsoposterior border of eye very narrow, much less prominent than moderate to large median vertex tubercle .... **utahensis** (Baker)

Pygidial margin evenly concave; body ground color dark, antenna mostly dark; smooth area along dorsoposterior border of eye extensive, often broader than median vertex tubercle .... **haigi** (R. Bohart)

13. Ground color on neck and on dorsum of abdomen extensively red 14

Ground color on neck and on dorsum of abdomen black to dark mahogany 15

14. Frons, scutum and propodeal enclosure black; punctures toward middle of tergite III one or two puncture diameters apart; tergites IV and V with complete pale bands; median vertex tubercle well defined, polished; ocellar triangle not more than its breadth from eye .... **evansi** R. Bohart

Frons, scutum and propodeal enclosure red; punctures toward middle of tergite III four or five puncture diameters apart; tergites IV and V with lateral ivory spots; median vertex tubercle weakly defined; ocellar triangle more than its breadth from eye .... **sculleni** (R. Bohart)

15. Clypeus with a pair of horn-like projections toward middle; shiny hump at middle of vertex usually longitudinal; clypeus laterally and mandible base with yellowish spots .... **taurulus** (Cockerell)

Clypeus without horn-like projections; shiny hump toward middle of vertex weakly developed; clypeus and mandible without yellowish marks .... **dreisbachi** (R. Bohart)

Clypeadon californicus (R. Bohart)

Aphilanthops californicus R. Bohart, 1959. Ann. Ent. Soc. Amer. 52:108. Holotype male, Davis, California (CAS).

Altogether, I have seen about 60 males and 35 females of this species from Upper and Lower Sonoran localities over the length of the State west of the Sierra, and in Klamath Co., Oregon (Lower Klamath Lake, August, J. Schuh).

Clypeadon dreisbachi (R. Bohart)

Aphilanthops dreisbachi R. Bohart, 1959. Ann. Ent. Soc. Amer. 52:107. Holotype male, Davis Mts., Texas (CAS).

The 66 males and 65 females which I have studied of this species came from Zacatecas, Jalisco, Nayarit, Queretaro, Durango, San Luis Potosi and Chihuahua in Mexico, as well as the states of Texas (western), Oklahoma and Colorado (Beaver Co.).

The prey was recorded by Evans (1962) as *Pogonomyrmex barbatus rugosus* Emery, based on a record from *Zacatecas*, Mexico.

Clypeadon evansi, new species

Male: Length 10 mm, length of forewing 8 mm. Black, marked with clay-yellow as follows: mandible mostly, clypeus except tentorial spot, scape mostly, pronotal collar and lobe, tegula, prescutellar fold, stripes across scutellum and postscutellum, large propodeal spots, upper mesopleural spot and two smaller ones below it, femora distally, tibiae externally, broad bands on tergites I to V, spots on sternite II, broken bands on sternites III to IV. Reddish brown are: mandible distally, flagellum, spots on femora and tibiae, tarsi, wing veins partly; wing membrane slightly stained. Punctation moderate, mostly spaced nearly a puncture diameter apart, two or more diameters apart over most of vertex, punctures of scutum rather irregular in size and spacing; dorsoposterior margin of eye narrowly smooth, a large, mostly smooth, median vertex hump. Pubescence generally moderate, thick on gena and thoracic sternum where it is silvery; sternites V to VII with tufts of erect brownish hair, that on V sharply divided medially. Head about as long as broad, least interocular distance about 3.0 times flagellomere I; ocellocular distance shorter than breadth of ocellar triangle, about 2.5 times diameter of lateral ocellus; flagellomere I about 3.0 times its breadth, as long as the two following combined.

Female: Length about 12 mm, forewing 9 mm. Markings as in male but with extensive red areas primarily as follows: much of mandible, clypeus, prothorax, propodeum, legs, and abdomen; main black areas are face and back of head, scutum, mesopleuron mostly, mesosternum, propodeal enclosure, tergites IV to V basally; pale markings are ivory and on abdomen are tergal only: pairs of large spots on I to III, broad bands on IV to V. Vertex punctation about as in male. Pygidium broad, apical margin with a slight but distinct median lobe.

Holotype male (CAS), Rodeo, New Mexico, August 21, 1958, on *Lepidium* (R. M. Bohart). Paratypes, 46 males, 19 females, at or near Rodeo, New Mexico (R. M. Bohart, D. D. Linsdale, P. M. Marsh, G. R. Pitman, R. H. James, R. E. Rice, C. G. Moore, UCD, CAS, USNM, CNC, MCZ, KU, U. Ariz; P. D. Hurd, E. G. Linsley, CIS; M. A. Cazier, AMNH; H. E. Evans, Cornell). Metatypes, 36 males and 18 females from the following localities: NEW MEXICO: Steins, Granite Pass; ARIZONA: Douglas, Apache, Patagonia, Portal, Sabino Canyon, Tucson, 30 mi. S. Safford; CALIFORNIA: 20 mi. S. Darwin in Inyo Co. Collecting dates are from June 4 to September 26. Evans (1962) under "*Aphilanthops* (*Clypeadon*) species A" has described nest-building and the ant prey, *Pogonomyrmex barbatus rugosus* Emery in the Rodeo, New Mexico area. A miltogrammine parasite, *Senotainia trilineata* Wulp, was recorded by Evans, also. Nectar plants indicated on specimen labels are *Lepidium*, *Baileya pleniradiata*, *Baccharis glutinosa*, *Chrysothamnus*, *Eriogonum abertianum*, *Acacia greggii* and *Haplopappus hartwegi*.

C. evansi shows similarities to several other species. In the male it agrees with *utahensis*, *taurulus* and *sculleni* in having a smooth dorsoposterior eye border and a median vertex tubercle. From the first two above it differs in having the apical fringe of sternite V broadly interrupted medially. From *sculleni* male the differences in punctation, abdominal banding and tentorial pit marks, as given in the key, are distinctive. Also, *evansi* is a larger species, averaging 10 rather than 8.5 mm in length. The female is superficially like some specimens of *laticinctus* and the pygidia are similar. However, the shiny vertex areas of *evansi* are distinguishing. From *sculleni*, with which it keys on the basis of vertex punctation and extensive red markings, there are many points of difference, such as tergal markings and punctation, size of the median vertex tubercle, and especially the ocellocular distance.

The species is named for Howard E. Evans who has contributed so much to our knowledge of the habits of this species and others in the subtribe.

Clypeadon haigi (R. Bohart)

Aphilanthops haigi R. Bohart, 1959. Ann. Ent. Soc. Amer. 52:106. Holotype male, Sonoita, Arizona (CAS).

The 261 males and 86 females which I have identified as this species were collected in west Texas (El Paso), New Mexico and Arizona as far west as the Grand Canyon and the Baboquivari mountains. Evans (1962) gave details of nests, prey (*Pogonomyrmex barbatus rugosus* Emery), and prey carriage (Evans' fig. 3). A photograph of the female pygidium was given by Evans in his figure 4b.

Clypeadon laticinctus (Cresson)

Philanthus laticinctus Cresson, 1865. Proc. Ent. Soc. Phila. 5:91. Holotype male, "Col." (ANSP).

Aphilanthops quadrinotatus Ashmead, 1890. Colo. Biol. Assoc. Bul. 1:7. Holotype female, "Col." (ANSP).

I have seen about 500 males and 250 females of this relatively abundant and widespread species in western United States. Its range includes Texas (western), New Mexico, Colorado, Utah, Arizona, Nevada, Idaho, Oregon and California (eastern and southern). Since California localities may be critical, they are as follows: *Lassen Co.*: Hallelujah Junction; *Mono Co.*: 11 mi. N. Bridgeport, Hot Creek, Mammoth P. O., Pickel Meadows; *San Bernardino Co.*: Rialto; *Los Angeles Co.*: 9 mi. N. Llano, 8 mi. E. Lancaster; *Riverside Co.*: Riverside, Anza, Temecula; *San Diego Co.*: Warner Springs, Carrizo Creek, Scissors Crossing. Nesting habits were given by Evans (1962). The prey were workers of *Pogonomyrmex occidentalis* Cresson. Nectar plants taken from specimen data are *Bigelovia*, *Asclepias*, *Helianthus*, *Tetradymia* and *Pastinaca*. The species is very similar to *californicus* but even where the ranges of the two overlap, as in the area of Riverside, California, the clearer wings, coarser tergal punctation and extensively red-marked legs of *laticinctus* seem to offer a ready means of separation.

Clypeadon sculleni (R. Bohart)

Aphilanthops sculleni R. Bohart, 1959. Ann. Ent. Soc. Amer. 52:107. Holotype male, Willcox, Arizona (CAS).

I have studied 33 males and 11 females of this handsome species. It ranges from Mexico (Chihuahua), through west Texas, New Mexico, Colorado, and Arizona as far west as Yuma. The prey was reported by Evans (1962) as *Pogonomyrmex maricopa barnesi* M. R. Smith.

Clypeadon taurulus (Cockerell)

Aphilanthops taurulus Cockerell, 1895. Trans. Amer. Ent. Soc. 22:293. Lectotype male, Las Cruces, New Mexico (ANSP).

Aphilanthops phoenix Pate, 1947. Pan-Pacific Ent. 23:66. Holotype female, Phoenix, Arizona (ANSP), **new synonymy**.

The peculiar clypeal horns occur in the female sex only. The laterally spotted clypeus is usually diagnostic among *Clypeadon* males. I have studied 91 males and 41 females from west Texas, New Mexico and Arizona. The prey has been recorded as *Pogonomyrmex barbatus rugosus* Emery by Ainslie (1909).

Clypeadon utahensis (Baker)

Aphilanthops utahensis Baker, 1895. Canad. Ent. 27:335. Holotype male, "S. W. Utah" (USNM).

Aphilanthops concinnulus Cockerell, 1896. Canad. Ent. 28:221. Lectotype male, Rincon, New Mexico (USNM), present designation, **new synonymy**.

I have studied 261 males and 100 females of this species from southwestern United States and two localities in Mexico. It is entirely a desert species ranging from southwest Texas through southern New Mexico, southern Arizona, southwestern Utah, southern and western Nevada as far north as Pyramid Lake, and the southern deserts of California ranging into the Owens Valley. The following are specific localities: TEXAS: McNary, Fort Hancock, Sierra Blanca, El Paso; NEW MEXICO: Las Cruces, Rincon, Playas Lake; ARIZONA: Parker, Congress Junction, Willcox, Eloy, Toltec, Clifton, Quartzite; NEVADA: Fallon, Alamo, Nixon, Pyramid Lake, Lovelock, Schurz, Logandale; UTAH: Veyo, Dixie State Park, "S. W. Utah"; CALIFORNIA: San Felipe Creek, Salton Sea, Indio, Palm Springs, Hopkins Well, Whitewater, Thousand Palms, Yermo, Ludlow, Barstow, Rialto, Vidal, Borrego Valley, Santa Catalina Island, Llano, Victorville, Cronise, Johannesburg, Walker Pass, Lone Pine, Bishop; SONORA (Mexico): 2 mi. S. W. Sonoyta; QUERETARO (Mexico): San Juan del Rio. Nectar plants have been reported as *Tetradymia*, *Asclepias* and *Chilopsis*. The ant prey was given by Evans (1962) as *Pogonomyrmex barbatus* F. Smith.

The species is close to *laticinctus* and occasionally occurs with it. Males with red-marked head or scutum are easily identified as *utahensis* but darker specimens of the latter must be separated by the more subtle punctation characters given in the key. Females of *utahensis* have a distinctive pygidium with a well developed median lobe. Evans (1962) gave a photograph of the female pygidium (as *concinnula*) in his figure 4c.

Genus **Listropygia** R. Bohart

Listropygia R. Bohart, 1959. Ann. Ent. Soc. Amer. 52:106. Type: *Aphilanthops bechteli* R. Bohart, orig. desig.

The single species is known to utilize *Pogonomyrmex californicus* Buck as prey (Evans, 1962). Generic features are the scoop-shaped and terminally knobbed female pygidium, subcapitate antennae in both sexes, a concave and hairy trough on sternites III and following in the male, non-toothed clypeal rim in both sexes, and a slightly projecting but not angular lamina over the dorsolateral propodeal sinus.

Listropygia bechteli (R. Bohart)

Aphilanthops bechteli R. Bohart, 1959. Ann. Ent. Soc. Amer. 52:106. Holotype male, Borrego Valley, San Diego Co., California (CAS).

I have studied 79 males and 53 females of this beautiful species. Collecting dates have been from March 20 to April 29 in the far southern counties of California as follows: *Riverside Co.*: Hopkins Well, Thousand Palms, Edom; *Imperial Co.*: Fish Creek Mts.; *San Diego Co.*: Borrego Valley. Also, I have seen one male from 21 mi. N. Yuma, Arizona (F. D. Parker, UCD). Males have been collected on flowers of *Croton californicus*, *Sphaeralcea ambigua* and *Baccharis*. A photograph of the unique female pygidium was given by Evans (1962) in his figure 4d.

References

Ainslie, C. N. 1909. A note on the habits of *Aphilanthops*. Canad. Ent. 41:99–100.

Bohart, R. M. 1959. New species of *Aphilanthops* from western North America. Ann. Ent. Soc. Amer. 52:105–108.

Burks, B. D. 1951. *In* Muesebeck *et al.*, Hymenoptera of America North of Mexico, Tribe Philanthini. U. S. Dept. Agr., Agr. Monogr. 2:1000–1004.

Dunning, S. N. 1898. Monograph of the species of *Aphilanthops* inhabiting Boreal America. Trans. Amer. Ent. Soc. 25:19–26.

Evans, H. E. 1962. A review of nesting behavior of digger wasps of the genus *Aphilanthops*, with special attention to the mechanics of prey carriage. Behaviour 19:239–260.

————. 1963. Predatory wasps. Scientific American 208:145–154.

Pate, V. S. L. 1947. On the genera of the philanthine wasps, with the description of a new species from Arizona. Pan-Pacific Ent. 23:63–67.

BOOK REVIEWS

Advances in Insect Population Control by the Sterile-male Technique. International Atomic Energy Agency, Technical Reports Series No. 44, Vienna, Austria, November, 1965. 79 pp. Price $2.00 (available from International Publications, Inc., 317 E. 34th St., New York, N.Y. 10016).

The report, edited by G. C. LaBrecque and J. C. Keller, summarizes the findings of a second panel of experts convened July 20–24, 1964, for the purpose of reviewing progress in this important field and suggesting recommendations for future action.

The report is especially valuable in that it covers the entire range of sterile male methodology. It reviews in considerable detail the mass-rearing techniques that have been developed for many insects so far investigated; discusses the results of field studies on biology and releases; presents the status of our knowledge about not only radiation effects but of chemosterilization, gene manipulation, and integrated systems for control; and includes a discussion of the theory of dominant lethality.

The report is a must for those reviewing progress throughout the world in these particular means of controlling our harmful pests. RICHARD H. FOOTE, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

A Synopsis of the North American Galerucinae (Coleoptera: Chrysomelidae). By John A. Wilcox. New York State Museum and Science Service, Bulletin Number 400, pp. 1–226, 160 figs., 17 plates. Issued August, 1965, $1.75 per copy; order from New York State Museum and Science Service, State Education Department, Albany, New York 12224; make remittance payable to New York State Education Department.

This is the first of a series of papers which are intended to cover the world fauna of Gelerucinae not already monographed. This work presents keys to the tribes, genera, and the 212 species of Galerucinae in the United States and Canada. The subfamily Galerucinae, as it occurs in North America, is defined, the tribes, subtribes, and most genera are re-defined, and descriptions and illustrations are given for some species. In addition 4 new genera and 15 new species are described, and nomenclatural changes are made. The tribal classification is considerably revised; 4 tribes are recognized compared to the 13 in Leng's 1920 catalogue. The departure from previous schemes is due to the groups being here defined on the basis of male characters. The appendices include Periodical Title Abbreviations, Index to Food Plants, and Index to Beetle Taxa.

Close examination shows this to be a very carefully done piece of work. The only fault worthy of mention this reviewer finds is that despite the claim that the genera are re-defined some of the descriptions are from earlier works.

This bulletin will be indispensable to a chrysomelid specialist and will be welcomed by all who are serious students of beetles. Studies which encompass large groups and revise old classification schemes are one of the most pressing needs in the Coleoptera. The author is to be commended for this work and encouraged in his future studies of world Galerucinae.—R. E. WHITE, *Entomology Research Division, ARS, Department of Agriculture, Washington, D.C.*

A CASE OF HOMONYMY IN THE GENUS HERCOSTOMUS

(DOLICHOPODIDAE)

Hercostomus synolcus, new name

Gymnopternus convergens Van Duzee, 1920. Proc. Calif. Acad. Sci. (4) 10: 49; not Loew, 1857, Neue Beiträge 5: 17.

This species is placed in the genus *Hercostomus* since it and its relatives are so placed in the Catalog of Diptera of North America (Stone *et al.*, 1965, U.S. Dept. of Agric., Agric. Handbook 276). Many authors do not recognize the genus *Gymnopternus*, but at any rate that genus is subsequent to *Hercostomus*. GEORGE C. STEYSKAL, *Entomology Research Division, ARS, U.S. Dept. of Agriculture, Washington, D.C.*

SUMMARY REPORTS OF SOCIETY OFFICERS FOR 1965

CORRESPONDING SECRETARY

(For the fiscal year 1 November 1964 to 31 October 1965)

Membership on 1 November 1964		477
Reductions:		
Resigned	10	
Dropped	4	
Deceased	7	
Total	21	
Increases:		
Elected to Membership	28	
Reinstated	0	
Total	28	
Membership on 31 October 1965		484
Classes of Membership:		
Dues paying	462	
Life	5	
Retired	15	
Honorary	2	
Total	484	

The membership is distributed among 47 states, the District of Columbia, 2 Territories, and 22 foreign countries.

Circulation of the Proceedings (September 1965 issue):		
States	484	
District of Columbia	85	
U. S. Possessions	9	
Foreign Countries	178	
Total		756
Distribution of the Proceedings (September 1965 issue):		
To members	469	
To subscribers	287	
Total		756

The *Proceedings* go to members and subscribers in 50 states, the District of Columbia, 2 territories, and 51 foreign countries. D. M. ANDERSON, *Corresponding Secretary*

TREASURER

(For the period 1 November 1964 to 31 October 1965)

	General Fund	Publications Fund	Total
Cash on hand Nov. 1, 1964	$ 1,511.99	$ 9,353.03	$10,865.02
Plus **Receipts**	5,902.26	1,139.09	7,041.35
Totals	$ 7,414.25	$10,492.12	$17,906.37
Minus **Expenditures**	$ 6,287.62		$ 6,287.62
Cash on hand Oct. 31, 1965	1,126.63	10,492.12	11,618.75
Totals	$ 7,414.25	$10,492.12	$17,906.37

Copies of the complete Treasurer's report, approved by the Auditing Committee are on file with the Recording Secretary and the Treasurer. Respectfully submitted, C. C. Blickenstaff, *Treasurer*

CUSTODIAN

(For the period 1 November 1964 to 31 October 1965)

The value of stock sold by the Custodian's office amounted to $1343.25. Of these items, $242.60 was for 39 copies of the *Memoirs*, $24.00 for 13 copies of the Weld volumes, $776.15 for one complete set and miscellaneous volumes and numbers of the *Proceedings*, and $0.50 for miscellaneous reprints.

Sales of the *Memoirs* were: No. 1, 1 copy; No. 2, 3 copies; No. 3, 6 copies; No. 4, 23 copies; No. 5, 6 copies.

A copy of the complete, detailed report is on file with the Recording Secretary. Respectfully submitted, Robert L. Smiley, *Custodian*

EDITOR

(For the calendar year 1965)

Four numbers of the *Proceedings* were published in 1965. Of the 272 pages published, 12 were devoted to advertising and 260 to scientific papers, notes, obituaries, book reviews, minutes of meetings and announcements. Fifty-seven scientific papers and notes were published during the year. The Society and the Proceedings benefitted from 1 paid paper of 6 pages. This did not cause the articles of regular contributors to be postponed. Respectfully submitted, Jon L. Herring, *Editor*

NOTICE

A stock inventory has now been completed on the back issues of the Proceedings. Many issues, particularly volumes 24 (1922) through 50 (1948), are in short supply or depleted. If any one wishes to send their back issues to the custodian, postage will be refunded.

SOCIETY MEETINGS

734th Regular Meeting—May 6, 1965

The 734th meeting of the Society was called to order by the President, Dr. Paul A. Woke, on May 6, 1965, at 8:00 p.m. in Room 43, U.S. National Museum. Thirty-five members and eighteen guests were in attendance. Minutes of the previous meeting were approved as read.

The following names of candidates for membership were read for the second time and received into the Society: *Arthur K. Burditt* and *Thor Lehnert*. The following new candidates for membership were presented: *David R. Smith, Lt. Colonel Gordon Field, Ralph F. Glasser, Lt. j.g. Donald Buysse, George H. Bick, J. E. Gilmore* and *William D. Field.*

Program Chairman Victor Adler requested suggestions from the membership concerning possible speakers for the October meeting.

Louise M. Russell gave additional information on the annual meeting of the Society to be held on May 24, 1965.

President Woke announced that the Washington Academy of Sciences had invited the Society's participation in the 100th anniversary celebration of Gregor Mendel's discovery of the laws of heredity to be held in November of this year.

President Woke introduced two Science Fair exhibits and the students who prepared them. Originally, four exhibits were to have been presented; however, Mr. Howard Ozer of Fairfax, Virginia, with an exhibit on pesticide cross-resistance in "Blue-Gill" fish, and Miss Martha Moore of Montgomery County, Maryland, with an exhibit on an ecological study of soil dwelling microarthropods were unable to be present. Miss Linda Garrison and Miss Sherry Garland of Regina High School, Prince Georges County, Maryland, presented an exhibit dealing with insecticides and intelligence. Mr. Mark Liu of Highpoint High School, Prince Georges County, Maryland, presented an exhibit on thermally-induced dimorphism in mosquitoes. Each of the exhibitors was presented a book as a small token of the Society's appreciation.

The speaker for the evening, Dr. Arthur M. Heimpel, Insect Pathology Pioneering Research Laboratory, U.S. Department of Agriculture, presented an extremely interesting illustrated report on microbial control agents for insects.

After the introduction of visitors, the meeting was adjourned at 9:40 p.m. Respectively submitted, W. DONALD DUCKWORTH, *Recording Secretary*

735th Regular Meeting—May 24, 1965

The 735th meeting of the Society was held jointly with the Insecticide Society of Washington in the Ballroom of the Student Union, University of Maryland, at 7:00 p.m. on May 24, 1965. One-hundred and forty-six persons were present. After a delicious buffet dinner, members and their friends were entertained by scintillating square dancers performing in "black light," under the direction of Philip Luginbill, Master of Ceremonies, and by pictures of Asia and comments by Paul Oman. The meeting adjourned at 9:00 p.m.—LOUISE M. RUSSELL.

736th Regular Meeting—October 7, 1965

The 736th meeting of the Society was called to order by the President, Dr. Paul A. Woke, on October 7, 1965, at 8:00 p.m. in Room 43, U.S. National

Museum. Twenty-six members and twelve guests were in attendance. Minutes of the previous meeting were approved as read.

The following names of candidates for membership were read for the second time and received into the Society: *David R. Smith, Lt. Col. Gordon Field, Ralph F. Glasser, Lt. j.g. Donald Buysse, George H. Bick, J. E. Gilmore* and *William D. Field.* The following new candidates for membership were presented: *Paul W. Bergman, Eugene M. Bravi, Major Frank H. Dowell, Donald S. Horning, Jr., Andrew J. Main, Jr., C. M. Monroe, Wallace Pierce Murdoch, Frederick J. Santana, George L. Sims, Jr., Harlan E. Smith, Robert E. Williams, Douglas J. Williams, Eugene R. Turner, Carl E. Stegmaier, Jr., Lee E. Terbush, Edwin M. Imai* and *Richard E. White.*

President Woke extended his congratulations to the Membership Committee for their fine job in obtaining new members.

President Woke announced the formation of two committees. A Nominating Committee composed of W. H. Anderson, Chairman, C. W. Sabrosky and W. E. Bickley; and an Auditing Committee composed of B. D. Burks, Chairman, K. O'Neill and P. Marsh.

President Woke announced the deaths of two Society members, Dr. Charles Waggle and Dr. C. J. Drake. R. H. Nelson and Floyd Smith were appointed to an Obituary Committee for Dr. Waggle and W. W. Wirth, A. B. Gurney and J. P. Kramer to an Obituary Committee for Dr. Drake.

Helen Sollers-Ridell noted the death of Dr. K. Dorward.

Dr. Shepard, Society Delegate to the Washington Academy of Sciences, announced a call for nominations from the Academy for its 1965 Awards for Scientific Achievement.

The speaker for the evening, Dr. James L. Vaughn of the Insect Pathology Laboratory, U.S. Department of Agriculture, gave an interesting, illustrated discussion of insect tissue culture and its use in the study of insect pathogens. The formal presentation was followed by a lively discussion period.

After the introduction of visitors, the meeting was adjourned at 9:30 p.m. Respectfully submitted, W. DONALD DUCKWORTH, *Recording Secretary*

737th Regular Meeting—November 4, 1965

The 737th meeting of the Society was called to order by the President, Dr. Paul A. Woke, on November 4, 1965, at 8:00 p.m. in Room 43, U.S. National Museum. Thirty-two members and thirteen guests were in attendance. Minutes of the previous meeting were approved with one addition.

The following names of candidates for membership were read for the second time and received into the Society: *Paul W. Bergman, Eugene M. Bravi, Major Frank H. Dowell, Donald S. Horning, Jr., Andrew J. Main, Jr., C. M. Monroe, Wallace Pierce Murdoch, Frederick J. Santana, George L. Sims, Jr., Harlan E. Smith, Robert E. Williams, Douglas J. Williams, Eugene R. Turner, Carl E. Stegmaier, Jr., Lee E. Terbush, Edwin M. Imai* and *Richard E. White.* The following new candidates for membership were presented: *Robert E. Stevens, R. Joseph Kowal, Tokuwo Kono* and *William H. Bennett.*

Dr. William H. Anderson, Chairman of the Nominating Committee, presented the slate of officers for the coming year: President, Miss Louise M. Russell; President-elect, Mr. Louis G. Davis; Recording Secretary, Dr. W. Donald Duckworth; Corresponding Secretary, Dr. Donald M. Anderson; Treasurer, Dr. Arthur K.

Burditt, Jr.; Editor, Dr. J. L. Herring; Custodian, Mr. Robert Smiley; Program Committee Chairman, Mr. Victor Adler; Membership Committee Chairman, Cdr. William B. Hull; Delegate to the Washington Academy of Sciences, Dr. H. H. Shepard.

President Woke announced the appointment of Mr. Louis G. Davis to write Dr. Dorward's obituary for the Proceedings.

Dr. Shepard reminded the Society of the forthcoming Mendelian Centennial Meeting being held at George Washington University. Dr. Shepard also announced the death of Mr. J. Everett Bussart, who, until his sudden death, was serving as President of the Entomological Society of America.

The first speaker for the evening, Dr. John G. Franclemont, gave an interesting illustrated talk on Lepidopterous larvae reared during the past summer in Arizona.

The second speaker for the evening, Dr. Clare R. Baltazar, discussed current activities and problems in Entomology in the Philippine Islands.

After the introduction of visitors, the meeting was adjourned at 10:00 p.m. Respectfully submitted, W. DONALD DUCKWORTH, *Recording Secretary*

739th Regular Meeting—January 6, 1966

The 739th meeting of the Society was called to order by the President, Miss Louise M. Russell, on January 6, 1966, at 8:00 p.m. in Room 43, U.S. National Museum. Twenty-five members and eight guests were in attendance. Minutes of the previous meeting were approved as read.

The following candidate for membership was read for the second time and received into the Society: *Gary J. Smith.* The following new candidate for membership was presented: *John Milton Campbell.*

President Russell announced the following committee appointments: Membership, Edward W. Baker, Ronald W. Hodges, D. H. Messersmith, H. Ivan Rainwater; Program, James F. Cooper, Helen Sollers-Riedel, George C. Steyskal; Publications, continuing 1 year—Eugene J. Gerberg, continuing 2 years—James P. Kramer, new 3 year term—Paul M. Marsh; Advertising, continuing 1 year—John M. Kingsolver, new 2 year term—James R. Foster.

President Russell read letters received from E. N. Cory and F. W. Poos expressing their appreciation to the Society for their election to honorary membership.

Dr. Bickley noted that Dr. Messersmith's students had collected a large number of Zoraptera on the University of Maryland campus in College Park.

Dr. Messersmith noted that he would be happy to trade some Zoraptera for Embioptera.

T. L. Bissell noted the discovery of carpet beetles in a razor he borrowed from a friend.

The first speaker for the evening, Dr. Melissa Stanley, gave an interesting lecture on some possible applications of in vitro culture of insect embryos.

The second speaker for the evening, Mr. T. L. Bissell, gave an interesting, illustrated discussion of his search for Asa Fitch's hickory aphid. As a part of this search Mr. Bissell visited the site of Fitch's home in upstate New York and presented some interesting comments concerning the landscape and the people of the area.

Following the introduction of visitors, the meeting was adjourned at 9:30 p.m. Respectfully submitted, W. DONALD DUCKWORTH, *Recording Secretary*

740th Regular Meeting—February 3, 1966

The 740th meeting of the Society was called to order by the president, Miss Louise M. Russell, on February 3, 1966, at 8:00 p.m. in Room 43, U.S. National Museum. Eighteen members and eight guests were in attendance. Minutes of the previous meeting were approved as read.

One new member was received into the Society, *John M. Campbell,* and one name was presented as candidate for membership, *Raymond J. Gagné.*

Mr. L. J. Davis placed on exhibit and distribution several pamphlets from the Plant Pest Control Division, USDA, concerning quarantined pests. Mr. Davis also mentioned the serious illness and recovery of W. G. Bruce.

The first speaker for the evening, retiring president Dr. Paul A. Woke, presented a talk entitled "Perspectives in Medical Entomology." Dr. Woke outlined our present knowledge and problems and discussed future goals and suggestions in the field of medical entomology.

The second speaker was Dr. Lee E. Terbush of the Food and Drug Administration. His talk, The Medical Significance of Mites in Stored Food Products, reviewed the mites commonly associated with stored food and the diseases or reactions caused by these mites in humans and other animals.

Following the introduction of visitors, the meeting adjourned at 9:45 p.m. Respectfully submitted, PAUL M. MARSH, *Acting Recording Secretary*

1966 MEMBERSHIP DRIVE
ENTOMOLOGICAL SOCIETY OF WASHINGTON
WASHINGTON, D. C.

MEMBERS: Let's increase the membership of our Society! If you know someone interested in the science of entomology who is not now a member please pass this application on to that person. If the blank is cut along the rule at left, this issue of the Proceedings will not be spoiled. However, it is not necessary to use this form as long as the requested information is furnished to the Chairman, Membership Committee or the Editor. For information concerning the Society and its officers, see the inside cover of this issue.

MEMBERSHIP APPLICATION

Date ____________________

Application is hereby made for membership in the Entomological Society of Washington.

____

Name

____

Mailing Address

____

Interest in and/or association with the science of entomology:

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Applicant's Signature

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PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY of WASHINGTON

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON · 1884 ·

U.S. NATIONAL MUSEUM
WASHINGTON, D.C. 20560

PUBLISHED QUARTERLY

CONTENTS

(Continued on back cover)

THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

Organized March 12, 1884

MEETINGS.—Regular meetings of the Society are held in Room 43 of the U.S. National Museum on the firs Thursday of each month from October to June, inclusive, at 8 P.M. Minutes of meetings are published regularl in the *Proceedings.*

MEMBERSHIP.—Members shall be persons who have demonstrated interest in the science of entomology Annual dues for members are $5.00; initiation fee is $1.00 (U.S. currency).

PROCEEDINGS.—Published quarterly beginning with March by the Society at Washington, D.C. Members i good standing are entitled to the *Proceedings* free of charge. Nonmember subscriptions are $6.00 per year both domestic and foreign (U.S. currency), payable in advance. All remittances should be made payable t *The Entomological Society of Washington.*

The Society does not exchange its publications for those of other societies.

All manuscripts intended for publication should be addressed to the Editor. Acceptable papers submitted b members only will be published in the order received. Immediate publication may be obtained at a cost to th author of about $15.00 per printed page. Titles of papers should be concise but comprehensive and shoul indicate the systematic position of the subject insect. Bylines should indicate present mailing address of th author and his organizational affiliation, if possible. Citations in the text of papers longer than one printed pag should be by author and date and should refer to a list of concluding references in which author, year, title name of publication, volume, and page are given in that order. In shorter articles, references to literature shoul be included in parentheses in the text.

Proportions of full-page illustrations should closely approximate $4\frac{5}{16} \times 6''$ (26×36 picas); this usuall allows explanatory matter to appear on the same page.

Proofs and forms for the abstract and reprint order will be sent to authors.

This issue mailed September 20, 1966

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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 68 SEPTEMBER 1966 No. 3

NOTES ON THE GENUS HELINA ROBINEAU-DESVOIDY WITH A NEW SPECIES FROM WYOMING
(DIPTERA, MUSCIDAE)

GEORGE C. STEYSKAL, *Entomology Research Division, ARS*
U. S. Department of Agriculture, Washington, D.C.

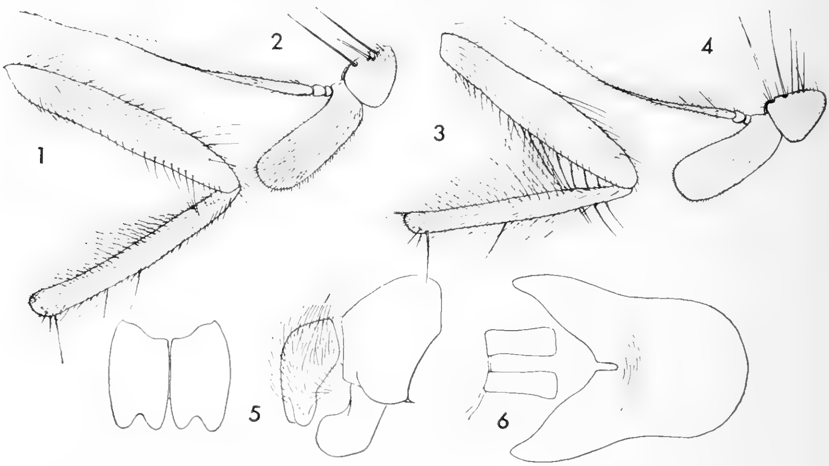
The receipt of a few specimens of flies collected in rodent holes in Wyoming by A. W. Lindquist prompted the following notes, including the description of *Helina snyderi*, new species, and additional data concerning *H. oregonensis* Malloch, a species until now poorly understood.

Helina snyderi, n. sp.

Male. Length, 6.5–7 mm. Head black, light brownish gray pruinescent. Front at narrowest part distinctly narrower than distance across ocelli. Parafrontal and parafacial bright white-pruinescent, parafrontals narrowly separated, each approximately as wide as anterior ocellus and with about 7 pairs of bristles extending to narrowest part of front. Parafacial slightly wider than third antennal segment. Cheek 2.5 times as high as width of third antennal segment. Antenna wholly black; third segment twice as long as second. Aristal hairs (fig. 4) fine and closely spaced, biseriate, the longest three times as long as greatest diameter of arista and ⅔ as long as width of third antennal segment. Palpus wholly black. Eye bare.

Thorax black, brownish gray pruinescent, quadrivittate, also with faint blackish lateral stripes; humerus and scutellum black. Presutural *acr* setulae in 4 regular rows, the outer rows longer and stronger than the inner rows, *acr* bristles 0:1; *dc* 2:3; *pra* 0.6 as long as posterior *ntpl.* Scutellar setulae not descending below level of marginals. *Stpl* 2:2, the lower anterior one weaker and more posterad than upper anterior one. Legs black, t_1 brown (especially basally), t_2 and t_3 and extreme apex of all f yellowish; t_1 without median bristle; f_2 with complete row of *av*, of which about 8 from basal fifth to apical third are longer than femoral diameter, also with one small *ad* and 3 *pd* apicals; t_2 with 2 (usually) or 3 median posterior bristles; f_3 with a group of 9–10 long *av* and a group of long ventral hairs in apical half; t_3 with strong median *ad* and several more setulose but nearly as long ones basad and apicad of it, ventral surfaces with several irregular rows of long fine hairs, longest at basal quarter and becoming shorter apicad, longest at least a quarter as long as tibia.

Wing pale brownish, a little deeper in color anteriorly and basally. Crossveins hardly more infuscated than surrounding areas. Costal thorn and setulae not con-



Figs. 1–6, Details of *Helina* spp. Fig. 1, mesal view of right hind femur and tibia; fig. 2, mesal view of right antenna of *H. oregonensis* Malloch; fig. 3, mesal view of right hind femur and tibia; fig. 4, mesal view of right antenna; fig. 5, lateral and posterior views of male postabdomen; fig. 6, fifth and sixth sternites of *H. snyderi* n. sp.

spicuous. Third and fourth veins slightly divergent apically. Calyptrae and halter light yellowish.

Abdomen black, grayish brown pruinescent; a pair of brown spots on each of first 3 apparent tergites, those of second tergite parallel-sided or a little wider basally (anteriorly), about half as wide as long, those of second tergite roughly triangular in apical part of tergite; distinct brown pruinescence at base of larger dorsal and lateral abdominal bristles. Basal sternite bare, others with a pair of apical bristles and many long hairs.

Postabdomen as in Fig. 5, black, surstylus slightly longer than cercus (mesolobus), broad and strongly curved; cerci together a little broader than long, each terminating in two rounded lobes; fifth sternite (Fig. 6) apically with 90° emargination at base of which is a narrow slit; sixth sternite extending in narrow strip down the right hand side and terminating as a connection between the posterior ends of two strips of sclerotic tissue.

Female. Unknown.

Holotype (No. 66434 in USNM) and one paratype, males, Evanston, Uinta County, Wyoming, July 9, 1961, ex rodent hole (A. W. Lindquist); 4 male paratypes, same data, July 17, 1961. The specific name is in honor of Fred M. Snyder for his fine work in the Muscidae.

This species is closely related to *Helina oregonensis* Malloch, which was left appended to Snyder's revision of the Nearctic species of *Helina* (1949, Bull. Am. Mus. Nat. Hist. 94, art. 3: 110–160) as the only species not seen or included. Through the courtesy of Hugh B. Leech of the California Academy of Sciences, I have been able to examine the type of *H. oregonensis*, to prepare the accompanying figures 1 and 2, and to place the species together with *H. snyderi* in the following revised section of Snyder's key (1949, p. 117):

64. Longest aristal hairs at least 2.0 times as long as greatest aristal diameter; wings usually with crossveins very inconspicuously infuscated 65

Longest aristal hairs not over 1.5 times as long as greatest aristal diameter; wings with crossveins distinctly infuscated; legs mostly or entirely black; scutellum entirely black 67

65. Dorsocentrals 2:4; posteroventral bristles of hind femora longest at base; wings distinctly brownish hyaline .... **H. ute** Snyder

Dorsocentrals 2:3; posteroventral bristles of hind femora longest on apical half or less 66

66. Scutellum in part fulvous (margins and under side) 66a

Scutellum wholly black in ground color; humeri and fore coxae infuscated 66b

66a. Humeri and fore coxae infuscated; fore tibiae without median posterior bristle; front at narrowest part not as wide as distance across posterior ocelli inclusive; middle tibiae with 2 posterodorsal bristles .... **H. keremeosa** Snyder

Humeri and fore coxae fulvous; fore tibiae with median posterior bristle; front at narrowest part distinctly wider than distance across posterior ocelli inclusive .... **H. villihumilis** Snyder

66b. Longest aristal hairs barely twice as long as diameter of base of arista (Fig. 2); upper apex of second antennal segment reddish; hind femora reddish; *pra* less than half as long as posterior *ntpl*; wings quite hyaline, crossveins with but very faint clouding; middle tibiae with 3 posterodorsal bristles; hind femora with long anteroventrals on apical ⅔ only (Fig. 1) .... **H. oregonensis** Malloch

Longest aristal hairs at least 3 times as long as diameter of base of arista (Fig. 4); second antennal segment wholly black; hind femora black except at extreme tips; *pra* somewhat over half as long as posterior *ntpl*; wings light brownish, especially anteriorly, crossveins with scarcely perceptible clouding; middle tibiae with 2 or 3 posterodorsal bristles, usually 2; hind femora with long anteroventrals on apical ⅗ (Fig. 3) .... **H. snyderi**, n. sp.

All of these species form a compact group with **H. maculipennis** (Zetterstedt) (syn., *H. obscuripes* [Zett.]), of the Palaearctic region. The only male postabdomen described for the Nearctic species, that of *H. snyderi*, differs but little from that of *H. maculipennis*, as shown by Hennig (1956, Die Fliegen der palaearkt. Region, Fam. 63b, Lfg. 197, pl. 9, fig. 181).

TWO ICHNEUMONIDS DESCRIBED INCORRECTLY AS FROM SOUTH AMERICA
(HYMENOPTERA)

HENRY TOWNES, *American Entomological Institute, Ann Arbor, Michigan*

In 1961 I published a paper that listed some ichneumonids whose type localities were given incorrectly in their original descriptions (Proc. Ent. Soc. Washington 63: 165–178). Two additional cases are discussed below.

Gelis cayennator Thunberg, **new combination**

* *Ichneumon cayennator* Thunberg, 1822. Mém. Acad. Imp. Sci. St. Pétersbourg 8: 271. key; 1824. *ibid.* 9: 337. [♂]. description. Type: ♂, published as from "Guiana" (Uppsala). [Thunberg labeled his type "Cayenne".]

Hemiteles cayennator Roman, 1912. Zool. Bidrag från Uppsala 1: 241. ♂. Type redescribed.

Thunberg (1822 & 1824) described this species from "Guiana". Roman (1912) carefully redescribed the type of *cayennator* and stated that it looked like a European species. He was not able, however, to identify it with any of the European species known to him. Through the courtesy of Dr. Lars Hedström, I was able to study this type again. It belongs in the genus *Gelis,* and has a coloration and general appearance similar to that of several Palearctic species. No species belonging truly to the genus *Gelis* is known from South America, except for *Gelis tenellus* Say, reported in 1960 from Argentina by De Santis and De Santis.

I believe that *cayennator* is not from South America, but from somewhere in the Holarctic Region. The species of *Gelis* are very poorly known, and it is not possible now to be sure about the origin of the type. I have, however, a specimen collected at 2,200 meters on Mt. Norikura, Japan, which is either the same species as the type or very closely related. Thunberg did travel in Japan and it is possible that his type came from there. It is also possible that the type came from Europe, and even possible that the species occurs in both Japan and Europe. At any rate, it seems safe to conclude that the type did not come from South America.

Lissonota bifasciata Brullé

* *Lissonota bifasciata* Brullé, 1846. *In* Lepeletier: Histoire naturelle des insectes. Hyménopterès. 4: 110. ♀. description. Type: ♀, published as from "South America" (Paris).

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* An asterisk is used to mark the proposal of a new name.

The type of *bifasciata*, in the Paris Museum, has no locality label but has a dark green circular tag with the numbers "136" and "18". Such a dark green, circular tag occurs on some of the other specimens in the Paris Museum that Brullé studied, but these are all from Africa. On this evidence alone it seems likely that the type of *bifasciata* is from Africa, and that it was published from South America through a clerical error. More conclusive evidence is from its zoological affinities. The species represented by the type belongs to a genus of Lissonotini known only from the Ethiopian Region. It is strictly congeneric with the species *Asphragis arambourgi* Seyrig, *A. antennalis* Seyrig, *A. alluaudi* Seyrig, and *A. chappiusi* Seyrig, all of which are Ethiopian. The proper generic name for this group of species is not certain. They belong neither in *Asphragis* nor in *Lissonota*, but until their correct generic positions are clear, it seems best to leave them in their original genera.

The number of cases where Brullé is known to have given incorrect locality data now makes a sizeable list. He was a regular offender.

PUPAL MORPHOLOGY OF EXOTELEIA CHILLCOTTI FREEMAN
(LEPIDOPTERA, GELECHIIDAE)

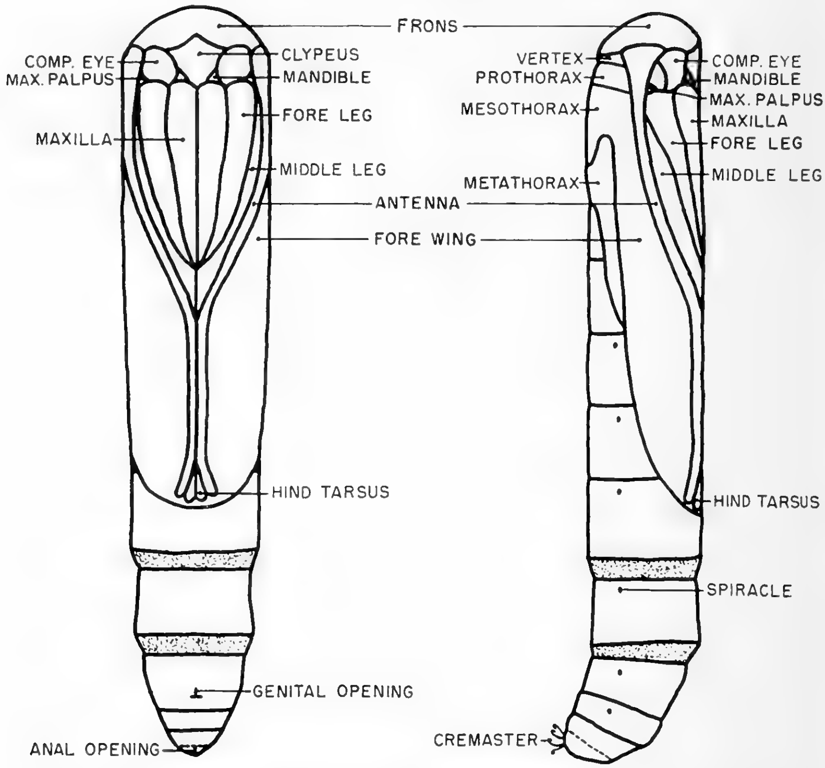
WILLIAM H. BENNETT, *Southern Forest Experiment Station, Forest Service, U. S. Department of Agriculture, Alexandria, Louisiana*

Exoteleia chillcotti Freeman (1963) is a common needle miner attacking longleaf pine, *Pinus palustris* Mill., in central Louisiana, and probably elsewhere throughout the range of the host. Pupal morphology is similar, as is the manner of adult emergence, to that of *E. pinifoliella* (Chamb.), a miner of several pine species in the Northeast (Bennett 1954 a-c).

In both insects, the hooked setae of the pupal cremaster become entangled with silk spun by the larva, and serve to hold the pupal exuviae in place when the adult leaves the needle. Further, during ecdysis the pupal frons splits along the epicranial and epistomal sutures, providing a protective helmet over the head of the emerging adult. *E. chillcotti* does not, however, spin a silken sheet over the exit hole prior to pupation.

MORPHOLOGY

Pupa (Fig. 1) cylindrical, elongate, varying in length from 4.7 to 5.3 mm.; general color shiny, dark golden brown. Most imaginal appendages present, folded and closely appressed to each other and to the body. Head, thorax, and abdomen distinct, without pubescence.



Pupa of *Exoteleia chillcotti* Freeman. Ventral view at left, dextral at right.

Head.—Vertex reduced to a narrow dorsal collar, separated from the frons by a transverse epicranial suture. Frons bluntly rounded, smooth, without a "cutting plate;" differentiated from the clypeus by a very narrow epistomal suture; labro-clypeal suture invisible. Compound eyes and antennal bases laterad to frons. Antennae filamentous, converging ventrally at about one-half of wing length, reaching the fifth abdominal segment, and diverging there to expose hind tarsi. Mandibulary sclerites and maxillary palpi apparent as small triangular areas adjacent to compound eyes. Maxillae slightly longer than fore legs; labial palpi invisible.

Thorax.—Pro-, meso-, and metathoracic segments distinct dorsally, extending somewhat laterally. The narrow-banded pronotum slopes dorsally toward vertex. Front wings indistinctly separated from the large mesothorax, reaching the middle of the fifth abdominal segment ventrally. Fore and middle legs folded between antennae and maxillae. Apices of hind wings covered by fore wings and hind tarsi.

Abdomen.—Ten abdominal segments present, last two indistinctly separated; posterior portions of segments 5 and 6 constricted, tapered, and flexible. Spiracles present on segments 2 to 8. Cremaster consisting of 12 minute, finely and apically hooked setae. Anal and genital openings slit-like, the latter apparently single in both sexes.

Remarks.—Distinguishing features of the pupa, as compared to that of *E. pinifoliella*, are the lack of a "cutting plate" on the frons, the absence of a labro-clypeal suture, the almost equal length of the maxillae and forelegs, and the fusion of terminal abdominal segments.

References

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A NEW SISYRA FROM ISRAEL
(Neuroptera: Sisyridae)

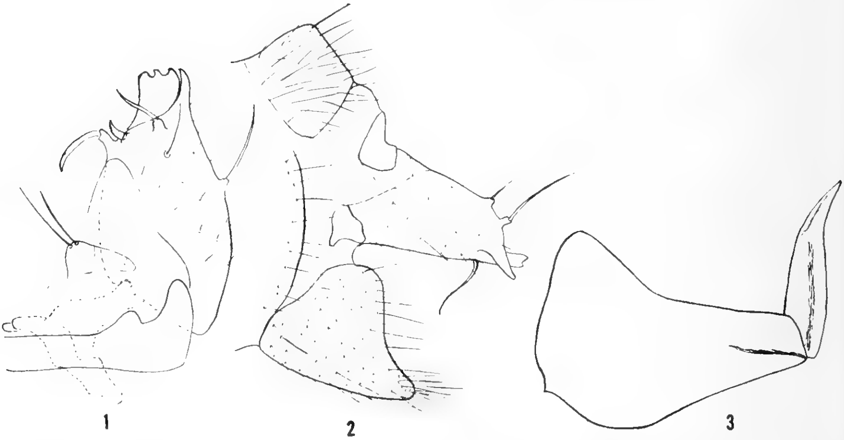
Oliver S. Flint, Jr., *Department of Entomology, Smithsonian Institution, Washington, D.C.*

In July, 1964, a series of spongilla flies from Israel was received for identification. Unfortunately only a single male was present in this lot, but more recently a second lot has been received which contains two more males. On the basis of these three males and eleven females it is evident that this is an undescribed species. In order to make a name available for a list of insects of the Jordan Valley the species is described below.

Sisyra trilobata, n. sp.

On the basis of male genitalia the species seems to be very closely related to *Sisyra delicata* Smithers, described from Southern Rhodesia. The clasper in dorsal view has three lobes on the apical process and in lateral view this plate is thin, whereas in *delicata* there are only two lobes and the plate is about as thick as the clasper. The female of *trilobata* differs in having a very broad ninth tergite with a bulging ventral margin.

Male: Length of forewing 5 mm. Color uniformly yellowish-brown. Antennae brown; in some examples gradually becoming paler apically. Wings yellowish-



Sisyra trilobata new species: fig. 1, male clasper, dorsal view; fig. 2, male genitalia, lateral view; fig. 3, female genitalia, lateral view.

brown, slightly darker toward the apical and posterior margins. Venation similar to *S. fuscata*. Genitalia: (figs. 1, 2) Ninth sternum strongly developed into a cone-shaped process. Clasper short and broad; apex developed into a strong lateral spine and a flattened plate the tip of which is divided into 3 small lobes; a slightly sclerotized lobe dorsally near base which bears two apical setae; several very large setae near apex, each set on an enlarged base. Gonarcus strap-like, lateral margin angled caudally, with a small tooth on posterior margin sublaterally. Paramere roughly Y-shaped in caudal view, one arm articulating with gonarcus submesally, second arm articulating with corresponding arm of other paramere ventrally, third arm articulating with base of clasper.

Female: Length of forewing 4–5 mm. Color identical to that of male. Genitalia: (fig. 3) Ninth tergite broad basally with ventral margin convex. Gonapophysis lateralis with tip slightly bent.

Holotype male, Israel, Deganya A, 27–28 May 1964, Y. Palmoni. USNM type 68202. Allotype female, same locality, 20 May 1965. Paratypes, 2♂ 10♀. Same locality, 9 June 1964 (1♂ 7♀), 2 Sept. 1963 (1♀), 6 July 1964 (1♀), 7 Oct. 1964 (1♀), 27–28 May 1964 (1♂).

The locality is on the western shore of the Sea of Galilee near the emergence of the Jordan River, 200 to 209 meters below sea level, and the insects were attracted to lights.

THE CHRYSOGASTER (ORTHONEVRA) PICTIPENNIS GROUP IN NORTH AMERICA
(DIPTERA: SYRPHIDAE)

YALE S. SEDMAN, *Western Illinois University, Macomb, Illinois*[1]

In the most recent review of the North American species of the genus *Chrysogaster* Meigen by Shannon (1916), the genus was subdivided into four easily distinguished "groups". Sedman (1964) has reviewed a portion of Group One of Shannon which includes the North American members of the genus belonging to the subgenus *Orthonevra* Macquart which exhibit sinuous eye markings.

The remainder of Group One is composed of species with a single horizontal eye stripe. There are four North American species included here, two described herein as new.

Numerous individuals and institutions have aided me in this study. I would like to thank Dr. W. W. Wirth, of the United States National Museum, for his careful notes about the type of *C.* (*O.*) *pulchella* Williston, and Mr. K. Weisman, of Western Illinois University, for his efforts in preparing the illustrations used in this work.

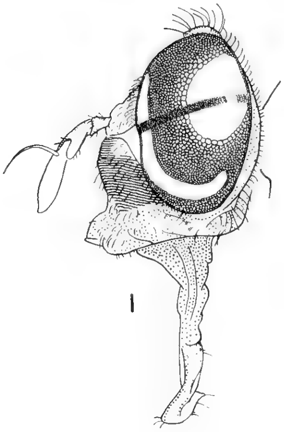
The following description will serve as a general guide to the characteristics of the *pictipennis* group. It should be kept in mind that this group, like the *bellula* group, exhibits variable reflections of purple, blue and green. These reflections may seem very distinctive, but must be used with care.

GENERAL MORPHOLOGY OF THE **pictipennis** GROUP

Head. Face black, with variable reflections; the silvery pollinose facial side spots present at about the level of antennae and eye stripe, triangular in shape; epistoma usually projecting beyond the facial bulge; roughened areas of face variable in extent, deeper laterally, forming rugae, reduced to weak striae medially; lower ⅓ of face shining black or blue; cheeks shining black, often purplish; antennae elongate, first segment short, second segment variable, third segment usually 3× as long as first; antennae brown or black, third segment usually lighter below; transverse eye stripe often obscure and variable in width; pile sparse and white, limited to eye margins on male front, sometimes black on ocellar triangle and upper occiput.

Thorax. Scutum with four opaque purple stripes contrasting with background which may be shining or opaque; pile short and pale; pleura black, polished, with white pile where present; wings almost evenly covered with microtrichia; squamae white to yellow; halteres yellow to brown; legs black with purplish reflections, yellow at apex of femora, and at least yellow or deep red on base and apex of tibiae, and basitarsus of fore tarsi as well as basal two tarsal segments

[1] This study was supported by a National Science Foundation Grant (GB-1336) and the Western Illinois University Research Council.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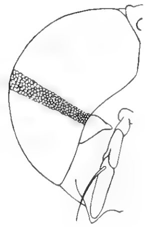
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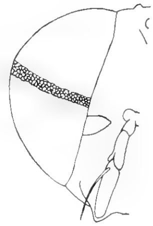
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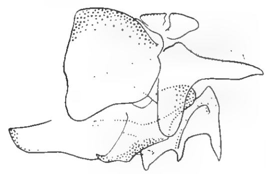
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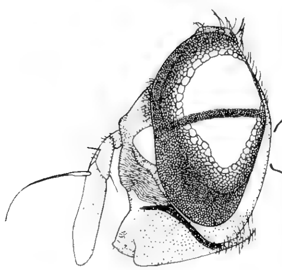
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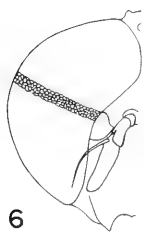
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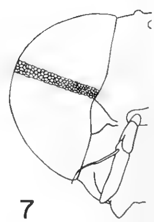
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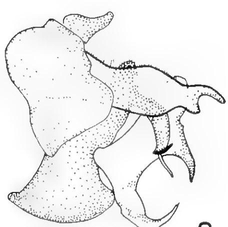
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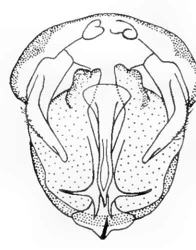
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of posterior tarsi; scutellum subquadrate, similar to posterior ½ of scutum in color and pilosity.

Abdomen. Dorsal opaque surface dilute blue, lateral shining margins black with purple and aeneous markings; distinct purple bands usually present apically on segments two, three, and four; venter shining black with blue or aeneous reflections; pile short and dark on opaque areas, white to golden pile on shining areas. Male genitalia distinctive with well developed ejaculatory hood. Female genitalia well developed.

Length. Overall length, exclusive of antennae, of males 4.5–6 mm., females 5–7 mm.

The following key will separate the species of this group known to occur in North America.

Key to Species of the **pictipennis** Group

1. Wings hyaline or clouded, but darkened areas not isolated along crossveins ... 2
   Wings with cross veins clouded ... 3
2. All tibiae black medially; scutal pile white; face with dense white pile ... **pictipennis** (Loew)
   All tibiae reddish; scutal pile brown; face with sparse pile laterally ... **weemsi**, n. sp.
3. Scutum opaque except laterally; purple scutal stripes contrast with dilute blue background; facial pollinose spots small, not reaching ½ distance to base of antennae; vertical pile sparse and partly black; front tibiae black medially ... **pulchella** Williston
   Scutum shining, the four opaque purple stripes contrast with black or deep blue background; facial pollinose spots large, almost reaching to base of antennae; vertical pile entirely white; front tibiae red or yellow, never black medially ... **anniae**, n. sp.

Chrysogaster (**Orthonevra**) **pictipennis** (Loew)

Orthoneura pictipennis Loew, 1863, Berlin. Ent. Zeitschr. VII: 306.

Rather than give a detailed description of this species, a list of differences and comparisons with its closest relative is presented. *C.* (*O.*) *pictipennis* is a very distinctive species and a variety of characteristics distinguish it from the only species with which it may be confused, *weemsi*, n. sp. Difficulties may be encountered, however, since the range of variation of several morphological features in *pictipennis* may result in doubts about the identity of the species.

The most satisfactory characteristic for separation of *pictipennis* from *weemsi* is the general configuration of the male genitalia (fig.

←

Figs. 1–4, *Chrysogaster* (*Orthonevra*) *pictipennis* Loew. Fig. 1, Male head; fig. 2, Male face; fig. 3, Female face; fig. 4, Male genitalia. Figs. 5–9, *C.* (*O.*) *weemsi*, n. sp. Fig. 5, Male head; fig. 6, Male face; fig. 7, Female face; fig. 8, Male genitalia, lateral view; fig. 9, Male genitalia, anterior view.

4). The nonbifurcation of the styli in *pictipennis,* as well as the ventral projection of both the ejaculatory hood and ejaculatory duct in *pictipennis,* are diagnostic features of the genitalia.

The color of the tibiae is quite distinctive and can be employed with confidence even with most teneral individuals. In *pictipennis,* the medial two-thirds of the distal surface of the tibiae is black and the basitarsus may show this same feature (the black may give the often encountered purple reflections), while in *weemsi,* the red tibiae may be darkened medially, never exhibit black or purple markings.

A characteristic with considerable utility, despite great variation, is the color of the ocellar and upper occipital pile. In specimens of *pictipennis* from the northern United States, southern Canada and west-central United States, this pile is definitely white, while in the southeastern United States, this pile is black as found in *weemsi.* The relative length of the second and third antennal segments (figs. 1, 5), exhibits a similar tendency toward clinal variation. In the northern and western range of *pictipennis,* there is a reduction in length of the second antennal segment resulting in a 1.5 : 1 ratio in extreme individuals. In the southeastern states, these segments are subequal in length and result in a ratio approximating 1.1 : 1.

The greatest difficulties in identification of this species arise when dealing with the females. Teneral females may be distinguished by the configuration of the fifth abdominal segment. In *pictipennis,* the apical margin is more deeply excavated than in *weemsi.* The female genital capsule (ninth segment) is broader and more highly sclerotized in *pictipennis.*

A number of other differences of varying utility and biological importance are worthy of mention. The front in *pictipennis* males is shining but everywhere roughened, and the central depression is very shallow. The front is not elevated above the level of the eyes and appears somewhat recessed relative to the eyes. In *weemsi,* the front is smoother, entirely shining lateral to the antennae, and is elevated so that it appears to bulge away from the eyes.

The shape of the pollinose side spots of the face is a consistent feature separating the two species. The illustrations (figs. 2, 3, 6, 7) make the differences clear.

The second antennal segment bears a variable number of black setae dorsally. As with several other characteristics, these setae seem to indicate a clinal variation. In northern areas, the number of black setae is reduced, while in the southeastern United States these setae are prominent and are present dorsally and ventrally.

The face of *pictipennis* is more extensively and more deeply rugose than that of *weemsi.* The central facial area is devoid of rugae leaving weak transverse striae in *weemsi.* The rugae cover all the central facial area in *pictipennis* except for a transverse band above the epistomal area. The epistoma is marked with weak striae in *pictipennis* while it is polished and smooth in *weemsi.* The facial pile in *pictipennis* is longer and denser than that of *weemsi.*

Finally, *pictipennis* is a more robust species although the smallest individuals are in the size range of *weemsi.*

I have examined over 100 specimens of this rather common species from the United States and Canada. These specimens include records in the United States from Colorado, Florida, Illinois, Kansas, Maine, Massachusetts, Michigan, Minnesota, Nebraska, New York, Ohio, Pennsylvania, and Wisconsin. The distribution in Canada covers Alberta, Nova Scotia, Ontario, Quebec, and Saskatchewan. The general pattern of distribution for this species is generally skewed to the east in its southern range and gradually extended westward in its northern range.

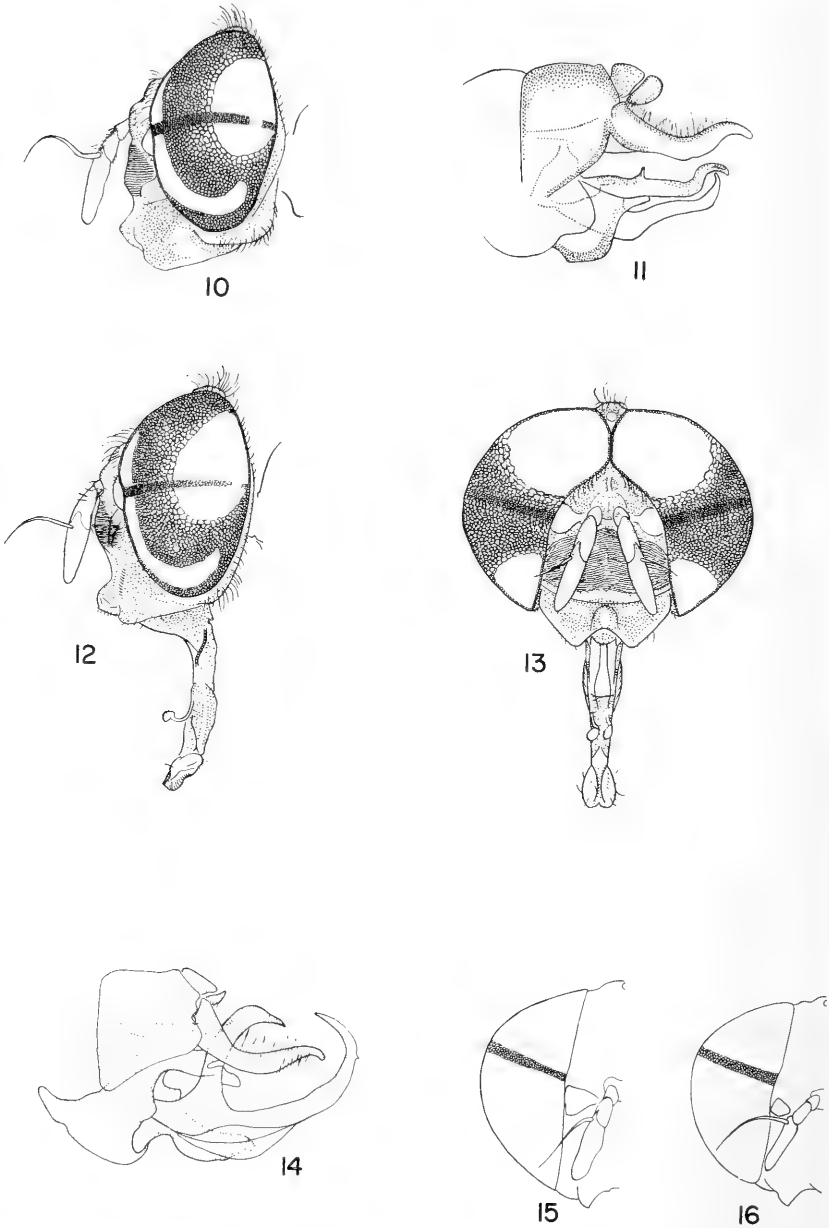
C. (*O.*) *pictipennis* raises many biological questions which are not answered by my general observations. An attempt to determine the degree of relationship between the more northern and the southeastern populations through a quantitative analysis of differences might help us in our understanding of the species.

Length. Male 5–6 mm., female 5–6.5 mm.

C. (O.) weemsi, n. sp.

Male. Face shining black with bluish reflections; pollinose side spots distinctly triangular, the sides subequal in length (figs. 6, 7), approximately as long as the second antennal segment; facial pile short, sparse, and white; facial striae weekly developed and occupying less than ½ the length of face; epistoma projecting just beyond the limit of the weak facial bulge (fig. 5). Cheeks steel-blue with sparse white pile. Antennae dark brown above, lighter below; the third segment light brown to yellow on basal ½ or less; third segment 2× the length of the second, the second segment is 2× the length of the first; the brown arista slightly longer than the third segment; the first and second segments bear short black setae above, and fine white setae below. Front polished black above antennae, with a central depression; white pile present along the eye margins; front very slightly elevated above eyes in lateral view. Ocellar triangle and upper occiput with black pile.

Scutum blue with four purple stripes; surface densely punctured; medial purple stripes linear, extending ⅔ the length of the scutum, lateral stripes broader, more diffuse, and extending to the level of the scutellum; pile brown, very short, sometimes lighter on posterior ¼, whitish and longer on notopleuron. Scutellum similar to scutum in color, pile yellowish to white. Pleural area polished blue. Legs black except yellowish-red tibiae and reddish-yellow basal two tarsal segments, and brown apex of third tarsal segment; pile white on dorsal and lateral surfaces of femora, hind femora black setose ventrally. Wings with dark markings on apical and posterior crossveins; sometimes indistinctly darkened on anterior



Figs. 10–11, *C.* (*O.*) *pulchella* Will. Fig. 10, Male head; fig. 11, Male genitalia. Figs. 12–14, *C.* (*O.*) *anniae*, n. sp. Fig. 12, Male head, lateral view; fig. 13, male head, anterior view; fig. 14, Male genitalia. Figs. 15–16, Female faces; fig. 15, *C.* (*O.*) *anniae*, n. sp.; fig. 16, *C.* (*O.*) *pulchella* Will.

crossvein; microtrichia evenly distributed; small medial dark cloud in first posterior cell; some or all of the crossveins with stumps of veins projecting basad. Halteres pale yellow to orange. Color of squamae variable, from pure white to yellow and brown.

Abdomen with opaque surface light blue, marked with diffuse darkened areas apically as well as broad but indistinct linear vittae on segments two and three; pile of tergum short brown and appressed; sides of abdomen and venter shining, the apices of second and third tergites usually purple and continuous with the dark areas of tergum; all pile on shining areas white. Cerci weakly lobed. Styli with distinctive bifurcation on apical ⅕. Superior lobe produced ventrally, branching into two narrow spine-like structures (figs. 8, 9); ejaculatory hood very well developed dorsally with lateral swellings; ejaculatory duct directed toward apex of ejaculatory hood (fig. 8).

Female. Front rugose with indistinct longitudinal furrow. Upper ¼ of front with some black pile. Ocellar triangle and upper occiput black pilose. Basitarsi and second tarsal segments light reddish. Apex of fifth abdominal tergite transverse, weakly indented medially.

Length. Male 5 mm., female 5–6 mm.

Holotype, male, Cranberry Glades, West Virginia, 5 June 1953, H. V. Weems, Jr. Allotype, female, same data. The types are being deposited in the personal collection of Dr. Weems.

Paratypes. CONNECTICUT: Lynne, 13 May 1918, C. T. Greene, 1 female. FLORIDA: Alachua, 8 February 1955, on *Prunus angustifolia*, H. V. Weems, Jr., 1 male; 3 February 1955, on *P. angustifolia*, H. V. Weems, Jr., 1 male. Gadsden, 17 March 1958, on *P. angustifolia*, H. V. Weems, Jr., 1 male, 1 female. Gainesville, 19 March 1961, at *Viburnum rufidulum*, H. V. Weems, Jr., 1 male. NORTH CAROLINA: Southern Pines, 29 March 1910, A. H. Manee, 1 male; 22 April 1910, A. H. Manee, 1 male. NEW HAMPSHIRE: Mt. Monadnock, 11 April 1932, A. L. Melander, 1 male. NEW YORK: Babylon, Long Island, 11 May 1935, Blanton and Borders, 1 male; 9 June 1935, Blanton and Borders, 1 female; 24 May 1934, Blanton and Borders, 1 female. OHIO: Cranberry Bog, 8 June 1952, H. V. Weems, Jr., 2 males. WEST VIRGINIA: Cranberry Glades, 5 June 1952, H. V. Weems, Jr., 13 males, 5 females; 6 June 1952, H. V. Weems, Jr., 9 males; 5 June 1953, H. V. Weems, Jr., 22 males. ONTARIO (CANADA): Ottawa, 29 May 1925, C. H. Curran, 1 male.

This species bears superficial resemblance to *pictipennis* due to the clouded crossveins, the wide face, and the large pollinose facial side spots. These two species are easily separated by differences in the male genitalia, antennae, color of the tibiae, and development of the apical margin of the fifth tergite in the female. This species is limited in its distribution to eastern North America.

Chrysogaster (Orthonevra) pulchella Williston

Chrysogaster pulchella Williston, 1887, Bull. USNM 31: 35.

Male. Face shining black; facial side spots triangular, small, not extending ¼ across narrowest width of face, their upper margin at or just below lower limit of transverse eye stripe; facial pile very short, sparse, and pale, absent medially; weak ridges below side spots reduced to striae medially; shining epistoma projecting beyond weak facial bulge in profile (fig. 10). Cheeks shining black with dense, long white pile. Antennae yellowish on first and second segments distally, proximally the first segment blackish, the second segment orange; third segment orange at base ventrally, darker dorsally; first and second segments black setose apically, with pale setae below; third segment longer than second, ratio varies from 2:1 to 1.5:1; first segment short, less than ½ the length of second. Front shining with a central depression formed by the bulging sides of the front. Ocellar triangle shining, with black pile; pile of upper occiput black.

Scutum with four purple stripes; anterior half of scutum dull blue, posterior half diffused shining bronze, purple, and/or golden; medial purple stripes with linear borders, but posteriorly fused or obscured by shining bronze reflections; lateral stripes broader, more diffuse, but often distinct to the margin of scutellum; pile short, sub-appressed, pale yellow or white. Pleurae with sparse white pile; with variable reflections although ground color black. Legs black except for narrowly yellow apex of femora and tibiae, broader basal area of tibiae, all basitarsi, and at least basal ½ of second tarsal segment; pile pale below on posterior femora which bear coarse black setae. Wings hyaline, or rarely, broadly infuscated; microtrichia of wings evenly distributed except in the basal areas of the first and second basal and anal cells which are partially denuded. Halteres pale yellow. Squamae white.

Abdomen with opaque dorsum blackish to dilute blue, with appressed inconspicuous dark pile; pile white on lateral shining areas; side with variable reflections but often with apical purple markings on second, third, and fourth segments; pile white on shining venter except for central area of yellowish pile on third sternite. Genitalia (fig. 11) with cerci distinctly lobed; both superior and inferior lobes poorly developed; axial system with ejaculatory apex and ejaculatory opening in close juxtaposition; the opening of the ejaculatory duct is directed dorsally.

Female. Similar to male with the following differences: front with distinct longitudinal groove and two to four variable lateral rugae; frontal pile pale below, darkened dorsally, distinctly black pilose on ocellar triangle and upper occiput; facial side spots small (fig. 16), generally below level of eye stripe, often separated from level of eye stripe by width of stripe; apical margin of fifth abdominal segment moderately developed, evenly concave; genital capsule (ninth segment) well developed but not ½ as wide as broadest width of fifth segment.

Length. Male 5–6 mm., female 5–6.5 mm.

I have examined over 300 specimens of this species. Considerable variation occurs in this species but its recognition should not be difficult. The geographic distribution is unusual in this genus. Unlike members of the *bellula* group, and most species of the *pictipennis* group, *pulchella* ranges broadly from east to west; however, I have no records for this species from southern United States. *C.* (*O.*) *pulchella* is well represented in collections from New England and north-central United States, and is represented by a small number of individuals from South Dakota, Colorado, Utah, Idaho, Oregon and Washington. The distribution in Canada mirrors that of the United States and includes numerous representatives from the provinces of Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia.

C. (O.) anniae, n. sp.

Male. Head. Face black with sparse white pile on slopes; side spots large, extending to antennae in some individuals, margin along eyes subequal in length to length of second antennal segment; face (fig. 13) with lateral weak rugae, not covering more than ½ length of face; weak striae over middle of face; epistoma shining with short sparse pile; face weakly concave below facial bulge, epistoma projecting (fig. 12) to level of facial bulge. Cheeks black with abundant long white pile. Antennae dark brown, lighter below on third segment; second segment with black setae above, pale setae below; third segment twice as long as second, second segment twice as long as first; arista longer than third segment. Front shining black with shallow depression, bulging in profile; pile white, longer and denser than facial pile. Ocellar triangle and upper occiput white pilose, black behind eyes.

Thorax. Scutum shining blue with median two stripes dull bronze or purple, lateral pair shining on posterior ½ or more; pile pale yellow or almost white; scutellum bluish with short pale pile. Pleurae black with aeneous reflections and white pile. Legs black, reddish with brownish stains on distal margins of tibiae, reddish yellow on basal two tarsal segments, brownish on apical three tarsal segments; pile pale except below posterior femora. Wings hyaline or infuscated; microtrichia evenly distributed over wing surface. Halteres pale yellow. Squamae white.

Abdomen. Dorsum of abdomen dark blue with brown, appressed pile; lateral shining margins bright blue with apices purple on segments two, three, and four; venter shining with white apressed pile. Genitalia (fig. 14) asymmetrical, right inferior lobe absent; ejaculatory hood and duct juxtaposed and well developed.

Female. Similar to male with the following differences: antennae with third segment orange below on basal ⅘; epistoma weakly projecting, face weakly produced; pollinose side spots (fig. 15) large, extending to antennal prominence in some individuals; apex of fourth abdominal tergite produced medially into a blunt tubercle; female genital capsule (ninth segment) very well developed, more than ½ maximum width of fifth tergite.

Length. Male 5.5–6 mm., female 5.5–6.5 mm.

This species is easily identified. It is unfortunate that in an earlier paper (Sedman, 1959), dealing with the male genitalia of the genus, that the genitalia of *anniae* were illustrated and identified as those of *pulchella*.

C. (*O*). *anniae* is a larger species than *pulchella.* The abdomen in *anniae* is more broadly polished laterally and the posterior purple markings are often lacking.

Holotype, male, Aylmer, Quebec, 23 V 1923, C. H. Curran. Allotype, female, Aylmer, Quebec, 28 V 1923, C. H. Curran. Both types are being deposited in the Canadian National Museum.

Paratypes. CONNECTICUT: Lynne, 5 May 1918, C. T. Greene, *Amelanchier canadensis*, 1 male; 6 May 1918, C. T. Greene, 1 female; 13 May 1918, C. T. Greene, 1 female. MASSACHUSETTS: Petersham, 9 June 1932, A. L. Melander, 1 female. MICHIGAN: Mecosta Co., 17 June 1950, R. R. Dreisbach, 1 female. Midland Co., 4 May 1943, R. R. Dreisbach, 1 female. Oscolola Co., 21 May 1939, R. R. Dreisbach, 1 male. Van Buren Co., 19 May 1959, R. and K. Dreisbach, 1 female. SOUTH DAKOTA: Custer, 19 July 1924, C. L. Fluke, 1 female. WISCONSIN: Madison, 27 April 1941, C. L. Fluke, 1 male. Tenderfoot Lake, Vilas Co., July 1912, W. S. Marshall, 1 female. MANITOBA (CANADA): 5 miles s. w. Shilo, 5 June 1958, J. F. McAlpine, 1 female. ONTARIO (CANADA): Fenolon Falls, 27 May 1927, F. P. Ide, 2 males. Guelph, 29 April 1913, C. H. Curran, 1 male. Mer Bleue, 3 June 1938, A. R. Brooks, 1 female; 10 May 1938, O. Peck, 1 male. Orillia, 30 May 1920, C. H. Curran, 1 male. Ottawa, 1 female; 1 June 1951, J. F. McAlpine, 1 male. Simcoe, 29 May 1939, G. E. Shewell, 1 female. QUEBEC (CANADA): Aylmer, 23 May 1923, C. H. Curran, 2 males; 16 May 1924, C. H. Curran, 1 female; 3 June 1924, C. H. Curran, 1 female; 23 May 1923, R. Ozburn, 1 male. Beachgrove, 17 May 1961, B. Poole, 1 male. Gatineau Park, 8 June 1954, J. F. McAlpine, 1 female. Kingsmere, 12 May 1958, J. G. Chillcott, 1 male. Queen's Park, 31 May 1928, G. A. Fisk, 1 male.

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NEW SYNONYMY AND NEW ASSIGNMENTS IN WESTERN HEMISPHERE STENOMIDAE

(LEPIDOPTERA: GELECHIOIDEA)[1]

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Through the courtesy of Dr. Klaus Sattler, the author has had the opportunity to study the type specimens of Venezuelan Stenomidae described by Amsel (Bol. Ent. Venezolana, 10: 296–307, 1956) which are deposited in the Zoologische Sammlung Des Bayerischen Staates, Munich, Germany. Of the ten species of Stenomidae described in Amsel's paper, nine were found to be synonyms of species previously described from the Neotropics by other authors. The remaining species, *Antaeotricha venezuelensis* Amsel, appears to be valid and is associated with the correct genus. Although extensive revisionary studies are presently being conducted on the family, it seems desirable to publish these new synonymies before extensive use of the invalid names occurs in the literature.

Genus **Anadasmus** Walsingham

Anadasmus Walsingham. 1897. Proc. Zool. Soc. London: 100.

Anadasmus porinodes (Meyrick)

Stenoma porinodes Meyrick. 1915. Exotic Microlepidoptera 1: 454.
Stenoma clarkei Amsel. 1956. Bol. Ent. Venezolana 10:297. **New Synonymy.**

Type localities.—Chanchamayo, Peru (*porinodes*); Maracay, Venezuela (*clarkei*).

Remarks.—Comparison of the types clearly demonstrates that Amsel's *clarkei* is identical with Meyrick's *porinodes.* In addition to the type localities, this species is also known from Brazil, British Guiana and French Guiana.

Genus **Antaeotricha** Zeller

Antaeotricha Zeller. 1854. Linn. Ent. 9: 390.

Antaeotricha glaciata Meyrick

Antaeotricha glaciata Meyrick. 1909. Trans. Ent. Soc. London: 30.
Antaeotricha forsteri Amsel. 1956. Bol. Ent. Venezolana 10:303. **New Synonymy.**

Type localities.—Songo, Bolivia (*glaciata*); ?Maracay, Venezuela (*forsteri*).

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[1] This study was partially supported by a National Science Foundation Grant, GB-1800.

Remarks.—I have compared Amsel's type with that of Meyrick's and found the two identical in both genitalic characters and maculation. This species is also known from Brazil.

Antaeotricha illepida Meyrick

Antaeotricha illepida Meyrick. 1916. Exotic Microlepidoptera 1: 495.
Antaeotricha martini Amsel. 1956. Bol. Ent. Venezolana 10:304. **New Synonymy.**

Type localities.—Godebert, R. Maroni, French Guiana (*illepida*); Maracay, Venezuela (*martini*).

Remarks.—The two agree in every respect, including genitalia, and must be considered synonymous. Additional distribution records for this species are lacking.

Antaeotricha stenobathra Meyrick

Antaeotricha stenobathra Meyrick. 1932. Exotic Microlepidoptera 4: 289.
Stenoma vogli Amsel. 1956. Bol. Ent. Venezolana 10:300. **New Synonymy.**

Type localities.—Trinidad (*stenobathra*); ?Maracay, Venezuela (*vogli*).

Remarks.—Amsel's species, *vogli*, was described from a single specimen which agrees in all respects with Meyrick's type of *stenobathra*. In addition to the type localities, this species is also known from several localities in Panama.

Genus **Gonioterma** Walsingham

Gonioterma Walsingham. 1897. Proc. Zool. Soc. London: 101.

Gonioterma compressa (Walsingham) **New Combination**

Stenoma compressa Walsingham. 1913. *in* Godman and Salvin, Biologia Centrali-Americana 42 (Lepidoptera—Heterocera, vol. 4): 171.
Stenoma cacoeciella Amsel. 1954. Bol. Ent. Venezolana 10:301. **New Synonymy.**

Type localities.—Teapa, Tabasco, Mexico (*compressa*); Maracay, Venezuela (*cacoeciella*).

Remarks.—In his original description, Amsel indicates that the type series of *cacoeciella* consists of one male holotype, one allotype, and four female paratypes. I have examined the holotype, allotype and two of the four paratypes. The holotype is unquestionably synonymous with Walsingham's *compressa*; however, the allotype and paratypes are not congeneric with the holotype but rather belong to the genus *Cerconota* Meyrick! The remaining two paratypes which have not been examined are very likely also misplaced since they are the same sex and, according to Amsel, bear the same locality data.

Examination of the genitalia of *compressa* indicates its proper placement in the genus *Gonioterma* rather than *Stenoma*.

This species is also known from several localities in Panama.

Genus **Lethata** Duckworth

Lethata Duckworth. 1964. Proc. U. S. Nat. Mus. 116:98.

Lethata anophthalma (Meyrick), **New Combination**

Stenoma anophthalma Meyrick. 1931. Exotic Microlepidoptera 4:36.
Stenoma badiella Amsel. 1956. Bol. Ent. Venezolana 10:298. **New Synonymy.**
Lethata maculata Duckworth. 1964. Proc. U. S. Nat. Mus. 116:106. **New Synonymy.**

Type localities.—Fiebrig, Paraguay (*anophthalma*); Caracas, Los Venados, Venezuela (*badiella*); Nova Teutonia, Brazil, 300–500 m. (*maculata*).

Remarks.—I have recently had the opportunity to examine Meyrick's stenomid types in the Naturhistorisches Museum, Vienna and have discovered that both *badiella* Amsel and *maculata* Duckworth are identical with Meyrick's *anophthalma*. Also, *anophthalma* belongs in the genus *Lethata* rather than *Stenoma*. This is a very widespread species and, in addition to the type localities, is also known from Colombia, Surinam, Bolivia, Argentina, and French Guiana.

Lethata bovinella (Busck)

Stenoma bovinella Busck. 1914. Proc. U. S. Nat. Mus. 47: 50.
Stenoma curiata Meyrick. 1928. Trans. Ent. Soc. London 76: 515.
Stenoma indistincta Amsel. 1956. Bol. Ent. Venezolana 10:299. **New Synonymy.**

Type localities.—Paraíso, Canal Zone, Panama (*bovinella*); Taboga Island, Panama, 200–1000 ft. (*curiata*); Maracay, Venezuela (*indistincta*).

Remarks.—This species is also known from Colombia. The two type specimens agree completely.

Genus **Timocratica** Meyrick

Timocratica Meyrick. 1912. Trans. Ent. Soc. London: 706.

Timocratica xanthosoma (Dognin)

Stenoma xanthosoma Dognin. 1913. Ann. Ent. Soc. Belg. 57:416.
Stenoma sacra Meyrick. 1918. Exotic Microlepidoptera 2: 209.
Timocratica amseli Duckworth. 1962. Proc. Ent. Soc. Wash. 64: 113 (New Name for *albella* Amsel, preoccupied). **New Synonymy.**

Type localities.—St. Laurent du Maroni, French Guiana (*xanthosoma*); R. Maroni, French Guiana (*sacra*); Caracas, Los Venados, Venezuela (*amseli*).

Remarks.—In an earlier paper (Proc. Ent. Soc. Wash. 64: 113, 1962), I proposed the new name *amseli* for this species for which Amsel had used a preoccupied name. Having now examined the type, I find it synonymous with Dognin's *xanthosoma*. This species is also known from Guatemala, Panama and Colombia.

Family XYLORYCTIDAE
Genus **Durrantia** Busck

Durrantia Busck. 1908. Proc. U. S. Nat. Mus. 35: 197.

Durrantia acompsa Walsingham

Durrantia acompsa Walsingham. 1912. *in* Godman and Salvin, Biologia Centrali-Americana 42 (Lepidoptera—Heterocera, vol. 4): 115.
Stenoma monotona Amsel. 1956. Bol. Ent. Venezolana 10: 300. **New Synonymy.**

Type localities.—Tabernilla, Canal Zone, Panama (*acompsa*); Maracay, Venezuela (*monotona*).

Remarks.—Although Amsel described *monotona* in Stenomidae, examination of the type reveals its correct placement in Xyloryctidae as a synonym of *D. acompsa* Walsingham. The genus *Durrantia* is difficult to recognize without examination of the genitalia and has been frequently associated with the Stenomidae on venation and palpal characters. A study is presently being conducted on the genus in an attempt to determine its proper family placement and generic limits.

This species is also known from several localities in Mexico.

ON THE IDENTITY OF CULEX (MELANOCONION) PORTESI SENEVET & ABONNENC 1941
(DIPTERA, CULICIDAE)[1]

THOMAS H. G. AITKEN[2] and PEDRO GALINDO[3]

In 1941 Senevet and Abonnenc described as new a single male mosquito from French Guiana, giving it the name of *Culex* (*Melanoconion*) *portesi*. The type (no. 61,227Ab2) was deposited in the collection of the Parasitology Laboratory, Faculty of Medicine of Algiers, Pasteur Institute of Algeria. In 1945 Floch and Abonnenc described *Culex* (*Melanoconion*) *cayennensis* from a male (no. 286) collected at Cayenne, 17 January 1941. These authors list four paratypes (all males) as follows: (1) no. 285, Cayenne, 17-I-1940, (2) no number, Cayenne, 26-II-1940, (3) no. 561, Bief (Comté), 28-III-1941 and (4)

[1] The studies and observations upon which this paper is based were conducted with the support and under the auspices of the Governments of the West Indian Territories, the Government of British Guiana, the Department of Technical Co-operation of the United Kingdom Government and The Rockefeller Foundation.

[2] Trinidad Regional Virus Laboratory, P.O. Box 164, Port-of-Spain, Trinidad, W.I.

[3] Gorgas Memorial Laboratory, Apartado 6991, Panama, R. de P.

no number, Bief (Comté), 26-III-1941. All specimens were deposited in the collection of the Pasteur Institute of Guiana and Inini Territory.[4] Subsequently in 1947, Floch and Abonnenc synonymized *cayennensis* with *portesi*, pointing out that they had been unaware of the earlier description [which appeared during the war when communications were poor]. Lane (1951) synonymized these two names under *Culex* (*Melanoconion*) *vomerifer* Komp, a species previously known only from Panama.

In the course of arbovirus field investigations in the West Indian island of Trinidad, a species of *Melanoconion* was encountered which was not readily identifiable and was given the temporary field designation of *Culex* sp. No. 9 (Note: females could be recognized by the thoracic color patterns in fresh specimens). A few females were originally taken in human bait collections (January 1958) at Rio Grande Forest in the northeastern part of the island. Subsequently the species was found to be very abundant in Bush Bush Forest, an island in the Nariva Swamp on the east coast. A few collections have also been made in the Arena Forest, Fort Read and along the "Long Stretch" near Guaico. Attention was drawn to this mosquito when night trapping operations, involving the use of white mice as bait, demonstrated that it was a dominant species in the Bush Bush collections. Furthermore, it soon became evident that this species was a frequent carrier of several viruses commonly encountered in Bush Bush Forest (Aitken, *et al.*, 1963, 1964; Galindo, 1963, 1964; Worth, 1963, 1964).

When males of *Culex* sp. No. 9 first became available, it was thought the species was new but closely related to *Culex vomerifer*. Subsequently attention was drawn to the synonyms of *vomerifer*, namely *portesi* and *cayennensis*. Correspondence with Professor Georges Senevet elicited the information that the type of *Culex portesi* could not be found. It was then decided to collect fresh specimens in French Guiana and study the collections at the Pasteur Institute in Cayenne. Dr. Hervé Floch, Director of the Institute, wrote that only males of *portesi* and *cayennensis* had been collected (close to Cayenne), and they were rare; both of these "species" were known from the same general area. The type locality for both species may be considered to be Montagne Tigre and Cabassou, two forested granitic domes surrounded by swamps and low-lying areas about 2–3 miles southeast of Cayenne. One of the authors (THGA) and two assistants spent from 27 January to 9 February 1965 in Cayenne collecting mosquitoes in the type locality as well as elsewhere. Utilizing chick- and mouse-baited portable traps (Worth and Jonkers, 1962) and a small battery-operated light trap (Sudia and Chamberlain 1962), many nocturnally-active

[4] Specimen No. 285 is now in the U.S. National Museum (A. Stone *in litt.*).

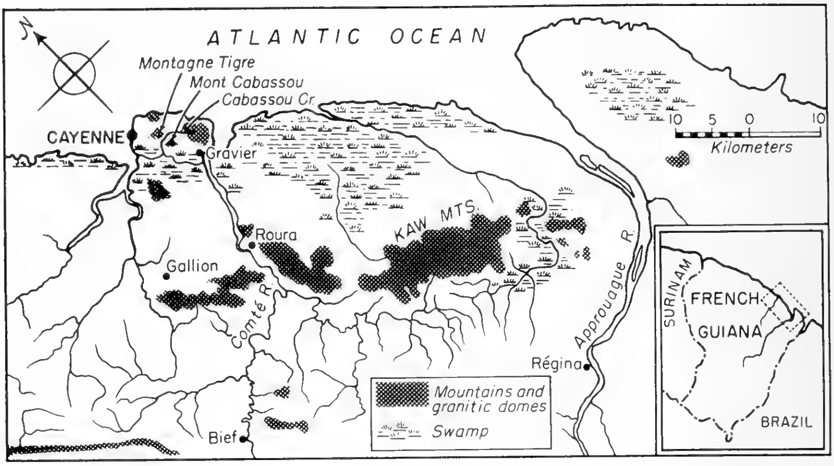


Fig. 1. Collection localities in French Guiana.

adult mosquitoes were collected, and dominant among these was the desired species.

Thus it has been possible to study fresh topotypic material of the *portesi-cayennensis* concept as well as to examine specimens in the Pasteur Institute's entomological collection. The latter consisted of 13 slides of male terminalia (a few with the associated adult) labelled *Culex portesi* and five slides labelled *Culex cayennensis.* The type of *cayennensis* was not found. Pasteur Institute specimens examined were as follows (see Fig. 1 for localities):

Culex portesi

1. Approuague, XII-1944
2. Gallion, 5-I-1948
3. Gallion, 7-I-1948
4. Gallion, 7-I-1948
5. Montagne Tigre, 24-III-1954, P. Fauran coll. et det.
6. Gravier, 10-III-1955
7. Montagne Tigre, 27-X-1956, P. Fauran coll. et det.
8. Gallion, 2-II-1957
9. Comté, 4-II-1957, E. Verrin
10. No. 419, Roura, 15-X-1959, P. Fauran coll. et det.
11. Gallion, 28-IX-1960 (en sous-bois), P. Fauran coll. et det.
12. No. 484, Montagne Tigre, 13-X-1960, P. Fauran coll. et det.
13. Gallion, 20-X-1960 (en sous-bois), P. Fauran coll. et det.

Culex cayennensis

1. Cayenne, 26-II-1940 Paratype
2. Bief (Comté), 26-III-1941 Paratype

Fig. 2. *Culex* (*Melanoconion*) *portesi* S. & A. Male terminalia–basistyle and dististyle. (Ex Pool LPA, Petit Bush Bush Swamp, Trinidad, W.I., 6–13/VI/62—1, T. H. G. Aitken, Coll.)

3. No. 561, Bief (Comté), 28-III-1941 Paratype (actually *Culex vomerifer*)
4. Approuague, 7-II-1944
5. Approuague (Régina), 10-II-1945

Study of the above material together with topotypic specimens collected in January–February 1965 confirms that *Culex portesi* and *Culex cayennensis* are the same species; *portesi*, being the older name, takes precedence. Specimens of *Culex* sp. No. 9 from Trinidad are the same as those from French Guiana, hence should be called *Culex portesi*. A reappraisal of the descriptions as well as study of fresh material indicates that *Culex portesi* and *Culex vomerifer* are distinct species. A

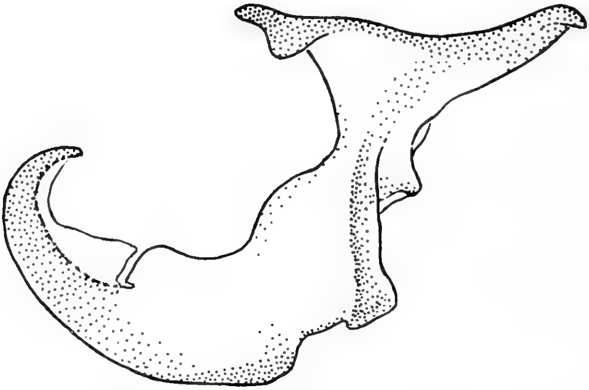


Fig. 3. *Culex* (*Melanoconion*) *portesi* S. & A. Male terminalia–phallosome. (Ex Pool LPA, Petit Bush Bush Swamp, Trinidad, W.I., 6–13/VI/62—1, T. H. G. Aitken, Coll.)

redescription of *Culex portesi*, based on specimens from French Guiana (Cabassou, 31 Jan.–1 Feb. 1965, T. H. G. Aitken, A. Guerra and R. Martinez) together with revised synonymy follows:

Culex (*Melanoconion*) *portesi* Senevet & Abonnenc

Culex (*Melanoconion*) *portesi* Senevet & Abonnenc, 1941, *19*:41
Culex (*Melanoconion*) *cayennensis* Floch & Abonnenc, 1945, *112*:4
Culex (*Melanoconion*) *cayennensis* Floch & Abonnenc, 1947, *146*:6 (syn.)
Culex species No. 9, Trinidad Regional Virus Laboratory Annual Reports, 1958+
Culex (*Melanoconion*) sp. No. 9, Aitken, Jonkers & Worth, 1963, *11*:74
Culex n. sp. (sp. No. 9, Trinidad), Galindo, 1963, *11*:84
Culex sp. No. 9, Worth, 1963, *11*:112
Culex (*Melanoconion*) species, Aitken, Jonkers & Worth, 1964, *3*:156
Culex n. sp. (Trinidad), Galindo, 1964, *3*:159
Culex sp. No. 9, Worth, 1964, *3*:167
Culex species No. 9, Jonkers, Spence & Aitken, 1965, *26*:759
Culex No. 9 of Trinidad, Toda and Shope, 1965, *208*:304

MALE—Head: Antennae densely long black plumose, shorter than proboscis and palpi. Proboscis and palpi dark, clothed with irridescent black scales. Proboscis longer than fore femora. Palpi exceeding length of proboscis by slightly less than the length of the last two segments. Occiput with narrow appressed pale scales and black erect forked scales dorsally and with broad appressed pale scales laterally.

Thorax: Mesonotum dark brown, almost blackish; scales black; posterior dorsocentral, supra-alar and scutellar bristles black, very long. Scutellum blackish, with sparse black scales and long black setae confined to the lobes. Pleura with propleuron, sternopleuron (excluding prealar knob), meron, mesepimeron, metameron, metapleuron, lateral margins of postnotum, coxae and trochanters *pale*,

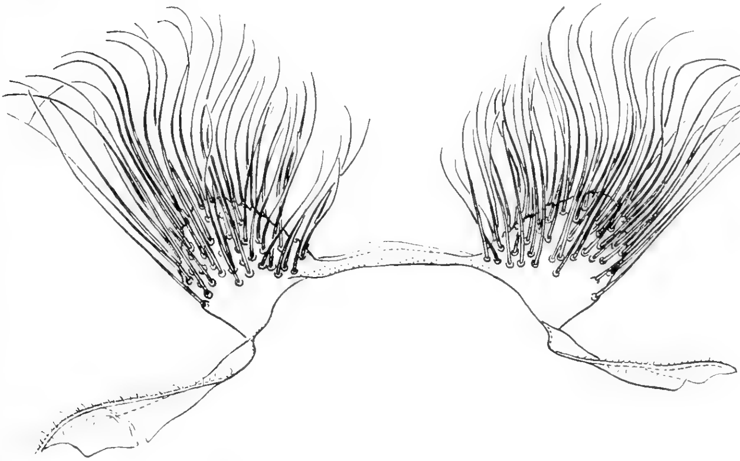


Fig. 4. *Culex* (*Melanoconion*) *portesi* S. & A. Male terminalia–ninth tergite. (Ex Pool LPA, Petit Bush Bush Swamp, Trinidad, W.I., 6–13/VI/62—1, T. H. G. Aitken, Coll.)

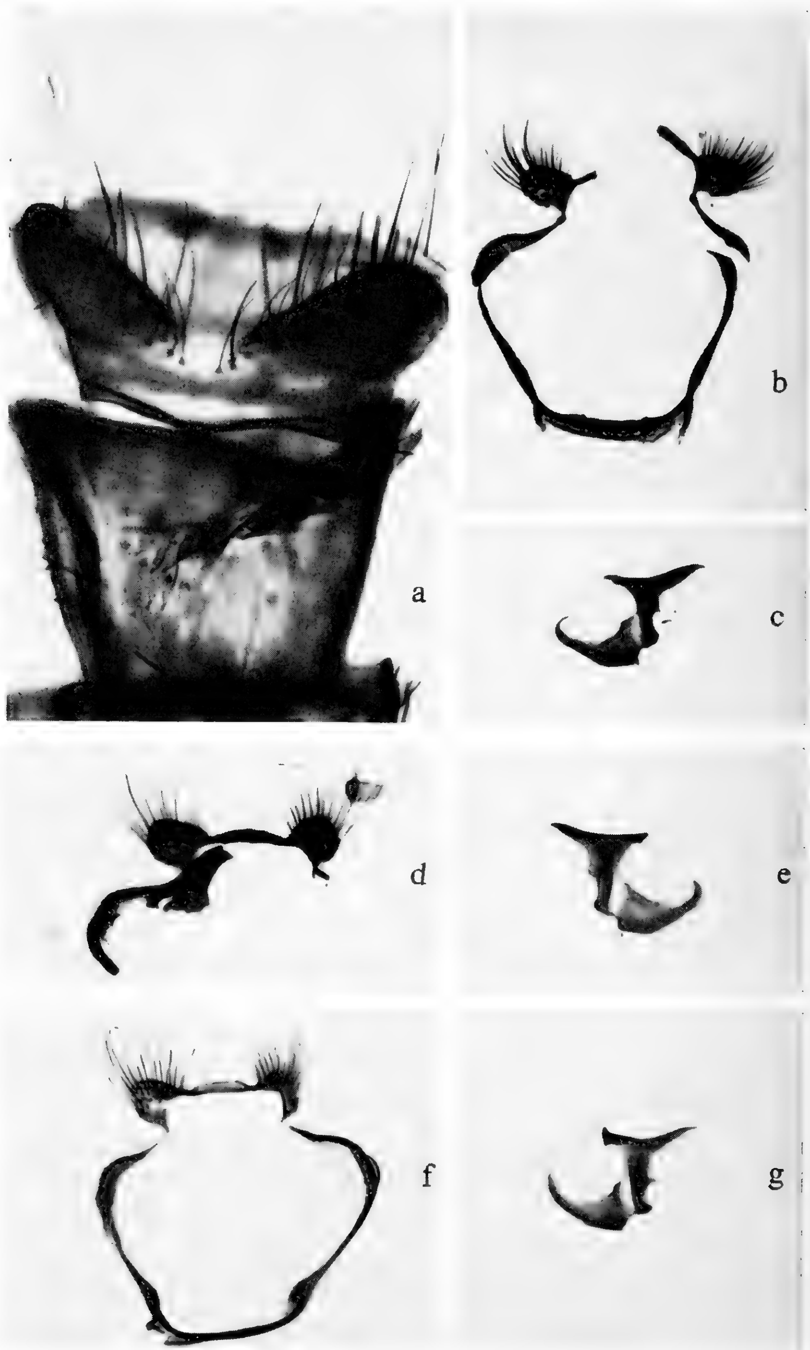
straw color, contrasting sharply with *blackish* color of mesonotum, anterior and posterior (dorsal portion) pronotum, paratergite, postspiracular area, prealar knob of sternopleuron, scutellum and postnotum (mesially); a line of dark setae along posterior margin of sternopleuron with a small patch of pale scales midway; a conspicuous dark seta on mesepimeron. Haltere stem pale, knob dark. Wings dark scaled. Legs (other than coxae and trochanters) dark, somewhat paler scaled on inner aspects of femora.

Abdomen: Tergites black-scaled with basal white bands (¼–⅓ length of tergite) on tergites II to VII; sternites similar. Basistyles pale. Size, circa 2.9 mm. (thorax–abdomen).

Terminalia: As figured (Figs. 2–4). Dististyle with a membranous, pointed spur before middle. Outer arm of subapical lobe columnar, with the usual six appendages seen in most species of *Melanoconion*, plus a broad, clear leaf with pigmented lower border. Main body (inner plate) of phallosome T-shaped (skript T). Lobes of ninth tergite prominent, rounded, set moderately apart from each other and clothed with numerous (50+), long, curved setae (the lateral ones longer). Eighth tergite with deep "V"-shaped cleft narrowing anteriorly, involving almost entire length of tergite and bearing long setae along its margins.

FEMALE—Similar to male. *Head*: Antenna subequal to proboscis, sparsely short setose. Palpi about twice length of clypeus, dark scaled. Proboscis slightly longer than fore femora. *Thorax*: Sternopleuron scale patch slightly more conspicuous. *Abdomen*: Pale scales of tergites limited to lateral margins. Size, circa 2.7 mm. (thorax–abdomen).

Taxonomic discussion—On the basis of male terminalia characters, *Culex portesi* is most closely related to *Culex* (*Melanoconion*) *vomer-*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ifer Komp (1932). Similarities include the shape of the dististyle including the membranous, pointed spur before the middle, the shape of the basistyle and its appendages, the T-shape of the main body of the phallosome and the V-shaped cleft in the distal margin of the 8th tergite. Differentiation is possible by the lobes of the 9th tergite which in *portesi* are large (longer than broad) and clothed with numerous, long (longer than the lobe), curved setae, whereas in *vomerifer* the lobes are small and inconspicuous (wider than long) and clothed with about 6–9 short, curved setae (the lateral ones longer). The rich pilosity of the 9th tergite has been quite well illustrated in the original descriptions of *Culex portesi* and *Culex cayennensis* but appears to have been overlooked by Lane (1951). Rozeboom and Komp (1950) incorrectly describe and figure the lobes of the 9th tergite of *portesi* as conical rather than rounded. Moreover their figure of the phallosome (borrowed from Floch and Abonnenc's illustration of *cayennensis*) as well as its description in the key (dichotomy 62) is incorrect as the original describers did not dissect out properly the phallosome so that it could be viewed in a lateral position.

Photographs of male terminalia of *Culex portesi* from French Guiana, Trinidad and Belém, Brazil are presented in Figures 5 and 6 for comparison with *Culex vomerifer* from Panama and Trinidad. It is noteworthy that one of the paratypes of *Culex cayennensis* [specimen No. 561, Bief (Comté), 28-III-1941] is actually *Culex vomerifer* (Figure 6), the 9th tergite lobes showing it to be referable to this species rather than to *cayennensis*. Thus we have indisputable evidence establishing the presence of both *portesi* and *vomerifer* in French Guiana.

Adults of these two species are readily separated by the markings on the pleura (Fig. 7). In *portesi* the sternopleuron (ventrally) and mesepimeron are pale-colored with no dark markings, whereas in *vomerifer* there are conspicuous dark spots on both these sclerites. Moreover the postnotum in *vomerifer* is more extensively dark, the propleuron is dark and there is a spot on the fore coxa.

Breeding habits—In Trinidad the larvae of *Culex portesi* have been found mainly in ground water of densely shaded swamp forests, in holes beneath or between the roots of heavily buttressed trees, amongst dead leaves along swamp margins or in shallow, leaf-choked forest ground pools.

←

Fig. 5. Male terminalia preparations of *Culex portesi*. (a–c) Cabassou, Fr. Guiana, 31 Jan. 1965, (a) showing "V"-shaped cleft of 8th segment, (b) 9th segment with lobes, (c) phallosome (inner plate), (d–e) Trinidad Virus Lab. colony, 14 May 1965, (d) 9th segment lobes, (e) phallosome, (f–g) Belém, Brazil, March 1965, (f) 9th segment lobes, (g) phallosome.

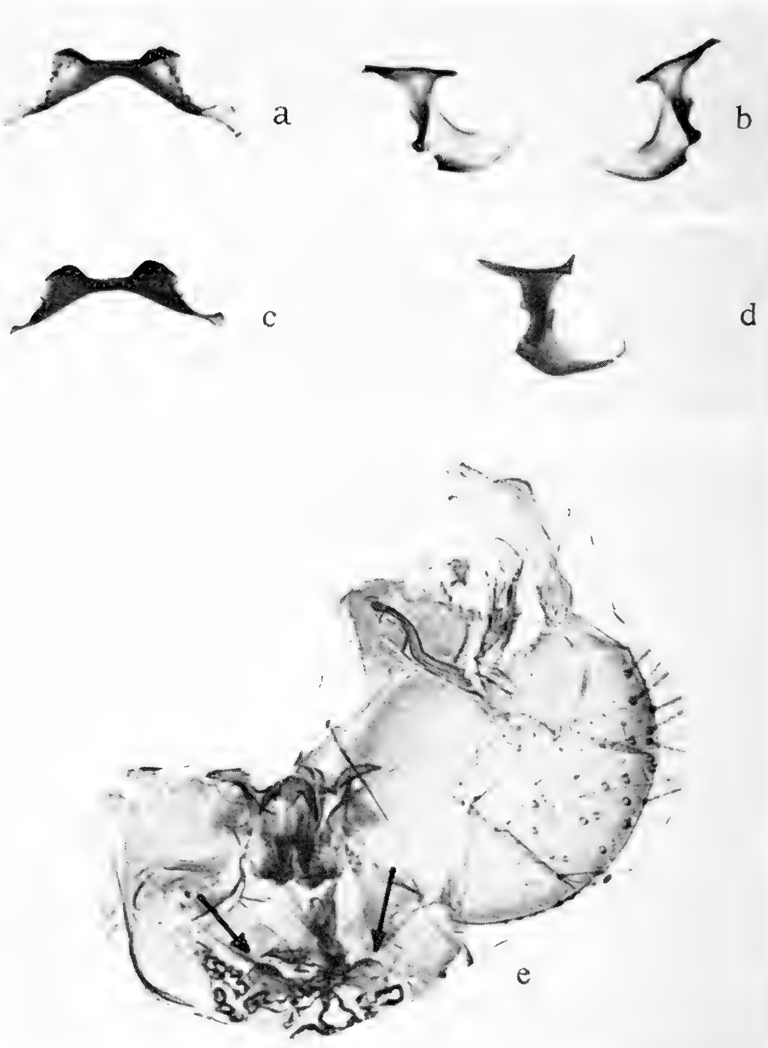

Fig. 6. Male terminalia preparations of *Culex vomerifer*. (a–b) Gorgas Memorial Lab. colony, Panama, 6 May 1965 (a) 9th tergite lobes, (b) phallosome (left and right inner plates), (c–d) Vega de Oropouche, Trinidad, 2 Dec. 1958, (c) 9th tergite lobes, (d) phallosome, (e) Paratype preparation of *Culex "cayennensis"* (*vomerifer*), Bief (Comté), Fr. Guiana, No. 561, 28 March 1941, right basistyle, phallosome, 9th tergite lobes (*arrows*).

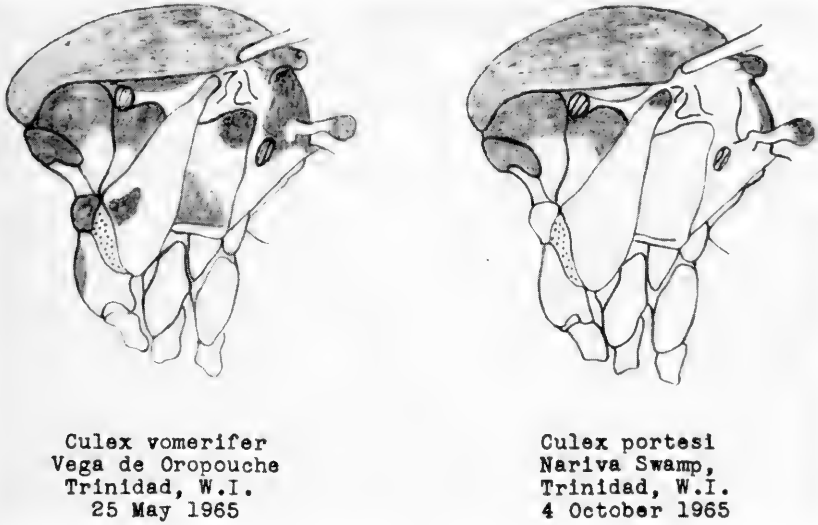

Fig. 7. Lateral view of thorax, showing markings.

Distribution—*Culex portesi* is a South American species occurring in greatest numbers along the northeastern coast of South America and Trinidad; specimens have been definitely identified from Trinidad, French Guiana and Belém (Instituto Agronomico do Norte Forest, March 1965, R. Shope), Brazil. *Culex vomerifer* is a mesoamerican species reaching highest densities along the Atlantic coast of Panama and Costa Rica[5] but extending its range southeastward to Trinidad and the Guianas.

The writers are deeply grateful to Dr. Hervé Floch and his staff for the facilities and cooperation extended the investigators in French Guiana as well as for the loan of *Culex cayennensis* paratypes. Likewise thanks are extended Messrs. Ambrose Guerra and Raymond Martinez of the Trinidad Laboratory for their entomological assistance in French Guiana and Mr. Eustorgio Mendez of Gorgas Memorial Laboratory for the male genitalia drawings.

Summary

Culex (*Melanoconion*) *portesi* Senevet and Abonnenc, originally described from French Guiana, is shown to be distinct from *Culex* (*Melanoconion*) *vomerifer* Komp with which it had been synonymized by Lane in 1951. *Culex portesi* is redescribed from fresh material collected in the type locality. Revised synonymy is presented. *Culex portesi* is presently known to occur in Trinidad, W.I., French Guiana

and Belém, Brazil, whereas *Culex vomerifer* is definitely known from French Guiana, Trinidad, Panama and Costa Rica.

[5] Wachope, Limón Province, Costa Rica, 6/VIII/51, P. Galindo and H. Trapido, coll.

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NOTES ON SOME HEBRIDAE FROM THE UNITED STATES WITH THE DESCRIPTION OF A NEW SPECIES (HEMIPTERA)

JOHN T. POLHEMUS[1] *and* HAROLD C. CHAPMAN[2]

The present paper includes notes on several species of *Hebrus* and a description of a new species. All material is contained in the collections of the authors.

Hebrus piercei Porter

This species, known heretofore from New Mexico, Arizona and Texas has now been found in Colorado and Nevada. These insects were found in the gravel along the runoff streamlet of Poncha Hot Springs, Colorado, where the water was still warm, and on an overhanging bank of a hot spring runoff at Warm Springs, Nevada. The male paramere agrees rather well with that depicted by Porter (1952A).

NEVADA: 17♂♂, 15♀♀, Warm Springs, Nye Co., C.L. 268, II-20-1964, J. T. Polhemus.

COLORADO: 3♂♂, 4♀♀, Poncha Springs, C.L. 151, VIII-19-1962, J. T. Polhemus.

Hebrus amnicus Drake and Chapman

This hebrid, originally collected in Georgia and heretofore known only from there, has now been found in Indiana. The male parameres agree well with the figure given by Drake and Chapman (1958).

INDIANA: 5♂♂, 5♀♀, Monroe Co., II-23-1961, J. C. Schaffner. Under stone-out of water near stream.

Hebrus hubbardi Porter

So far as is known, *Hebrus hubbardi* Porter was represented only by the type series of five specimens until the authors made the captures listed below. The male parameres vary slightly from the figure given by Porter (1952B), and have been re-figured (fig. 2). The shape of the parameres match well with Porter's figure, and all other characters match his description. Apparently the paramere figured by Porter is a left paramere, as on the right paramere figured there are about eight short hairs on the far side. The setae on the parameres of our specimens differ in length from those depicted by Porter although the placement in similar. The paramere figured is from a specimen taken at the type location, Palm Springs, Calif.

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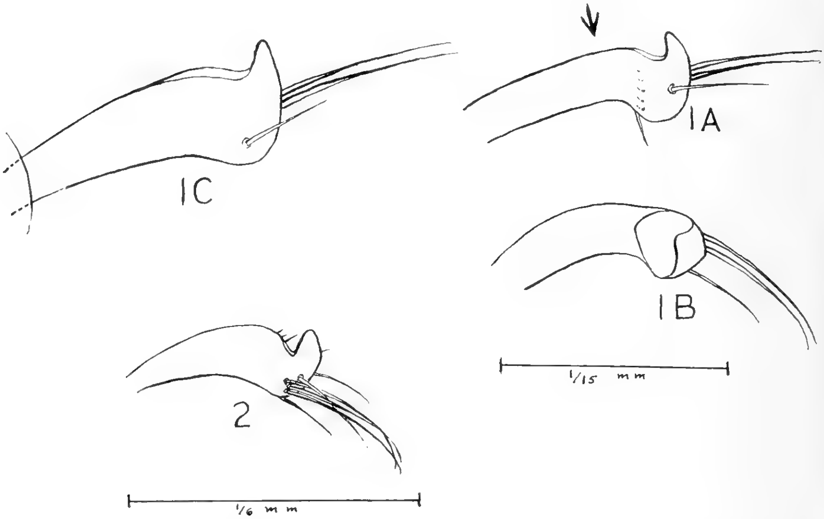

Right Male parameres. Fig. 1: *Hebrus obscura* n. sp. A. paratype, Forestdale, Arizona; B. Same, top view; C. atypical paramere, paratype, Palm Springs, Calif. Fig. 2: *Hebrus hubbardi* Porter, specimen from Palm Springs, California.

ARIZONA: 1♀, Aravaipa Canyon, Graham Co., Col. Loc. 315, X-8-1964, J. T. Polhemus.
CALIFORNIA: 11♂♂, 8♀♀, Banner, San Diego Co., XII-4-1963, H. C. Chapman, banks of slowly moving stream in wooded area; 1♂, 4♀♀, Palm Springs, Riverside Co., XII-3-1963, H. C. Chapman, at oasis.

Hebrus obscura, n. sp.

BRACHYPTEROUS FORM: Male: Small, dark, with head, pronotum and scutellum fuscous; dorsal surface of abdomen piceous, becoming blackish brown on connexiva, with broad shining area medially on segments 5, 6 and 7; body beneath light fuscous to fuscous, shining black on abdomen, thickly clothed with short grayish hairs; buccula, legs and antenna testaceous; eyes roughly faceted; small, reddish brown. Head, pronotum, connexivum, and wings along sides with very fine, recumbent golden hairs; legs and antenna clothed with short pale hairs, and scattered longer hairs on distal three antennal segments. Rostrum long, testaceous, extending onto base of abdomen; sulcus deep, not interrupted between hind coxae. Antennae moderately long; Segments I and II stout; III, IV and V slender; Measurements—I, 10; II, 7; III, 12; IV, 7; V, 12 (60 units equal one millimeter). Head with median sulcus on vertex; ocelli small. Pronotum about twice as wide across humeral angles than median length (36:19); strongly constricted between the lobes, with three large pits in the shallow transverse sulcus between the lobes; anterior lobe much narrower (28:36) and shorter (8:11) than posterior lobe, with a row of fairly large pits encircling the pronotum just behind the collar; hind lobe sharply narrowed anteriorly in front of humeral angles, the humeral angles slightly raised and impressed within; central portion of posterior lobe broadly raised, with coarse, dark, shallow depressions medially, these depressions extending toward the humeri posteriorly. Scutellum with the large deeply impressed basal portion divided by a median carina, edges raised, apex broadly truncate, bifid, more than twice as broad as long (19:8). Hemelytra short, not more than three times as long as scutellum; clavus with small light area on basal portion, white on some specimens; remainder of hemelytra brownish, membrane becoming lighter at apex. Genital capsule of male rather small; parameres very tiny (fig. 1).

Length, 1.47 mm; width 0.60 mm.

Female: Very similar to male, except slightly larger; dorsal surface of abdomen lighter than in male, being orange brown over the medial area of segments 2, 3 and 4; darkest on segment 4.

Length: 1.53 mm; width, 0.63 mm.

Material: Holotype (♂), and Allotype (♀), Forestdale, Arizona, IV-15-1965, J. T. Polhemus.

Paratypes as follows: 11♂♂, 7♀♀, Forestdale, Arizona, C.L. 316, IV-15-1965, J. T. Polhemus; 10♂♂, 9♀♀, Palm Springs, California, XII-4-1963, H. C. Chapman; 2♀♀, Banner, California, XII-3-1963, H. C. Chapman; 19♂♂, 12♀♀, Aravaipa, Arizona, C.L. 315, X-8-1964, J. T. Polhemus.

The Palm Springs, California, specimens were taken at a canyon oasis, while the Banner, California, material was collected along the banks of a slow moving stream in a wooded area. In Arizona, the Forestdale specimens were taken along a tiny spring fed stream, mostly by tearing apart a rotten piece of wood at the water's edge, and they were found in Aravaipa Canyon in the moss and damp earth on a shaded vertical cliff where water was continually seeping.

The holotype and allotype will be sent to the U.S. National Museum; paratypes will be distributed to various collections. This hebrid can be separated from its congeners by its small size and the male parameres. The macropterous form is unknown.

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AN ORIENTAL SPECIES OF HOMONEURA WULP APPARENTLY INTRODUCED INTO SOUTHEASTERN UNITED STATES
(DIPTERA: LAUXANIIDAE)

G. E. SHEWELL, *Entomology Research Institute, Ottawa, Canada.*

A common oriental lauxaniid fly *Homoneura unguiculata* (Kertész) has recently been taken at several localities in Florida and South Carolina. Originally described from Formosa, it occurs also in Ceylon, Canton, Okinawa, and Hawaii. The earliest known North American record is of a female from Elfers, Florida, 14 April 1952, collected by J. R. Vockeroth. Subsequent collections are: 1♂, McCormick, S.C., 11 June 1957, 3♂♂, Aiken, S.C., 13 June 1957, all taken by J. R. Vockeroth; 1♂, Seneca, S.C., 20 August 1957, L. A. Kelton; 1♂, Archbold Biological Station, Highlands Co., Fla., 31 January 1965, S. W. Frost. In 1957 a Canadian field party based at Highlands, N.C., made large collections of Diptera including many Lauxaniidae between May 3rd and August 31st mostly at elevations over 2500 feet. It is noteworthy that, despite such intensive collecting in a small area, *H. unguiculata* was taken only on the few excursions to elevations below 1000 feet. What little is known of the habits of Lauxaniidae indicates that they breed in decaying plant material.

Homoneura unguiculata (Kert.)

Lauxania (*Minettia*) *unguiculata* Kertész, 1913. Ann. hist.-nat. Mus. Nat. Hung. 11: 100, fig. 3.

Homoneura (*Homoneura*) *unguiculata*, Malloch, 1929. Proc. U.S. Nat. Mus. 74, art. 6, p. 51, fig. 91.

Length about 3.5 mm. Pale brownish-yellow, shining, sparsely whitish-pollinose laterally and below. Frons about half width of head, in profile rounded into facial plane, dull yellow; ocellar triangle brown; vertex and narrow fronto–orbital plates shining. Face almost flat, bare, subshining; clypeus narrow; parafacial about one third as wide as face, seen from above conspicuously niveous. Cheek and lower occiput whitish-pollinose, former about one fourth height of eye. Occiput with conspicuous niveous cervical patch. Third antennal segment oval, scarcely twice as long as broad, gradually darkened on apical half; arista brown, plumose, longest hairs about three fourths as long as width of third antennal segment. Palpus yellow. Thorax with three strong, evenly-spaced postsutural dorsocentrals; prescutellar acrosticals present; acrostical hairs short, fine, in six regular rows. Wing unmarked, yellowish-tinged; penultimate section of fourth vein two thirds length of ultimate section. Ctenidium of anterior femur inconspicuous, sometimes absent; mid-tibia with one long ventral and a shorter posteroventral spur. Abdomen shining, thinly whitish-pollinose; hypopygium small, second segment bearing ventrally on either side a small recurved unguiform process. Aedeagus with a large membranous eversible sac normally contracted and concealed within a bifid cylindrical trough that forms its hind margin, apex of trough bicuspid and curved posteriorly; a small flattened ovate sclerite attached to anterior surface of sac near base.

The species differs from nearctic *Homoneura* mainly in the plumosity of the arista, in the six rows of acrostical hairs, and in the structure of the aedeagus. In most nearctic species, the arista is bare to short-pubescent. *H. philadelphica* (Macq.), the only nearctic species in which the plumosity of the arista approaches in length that of *unguiculata,* has the wing spotted. Nearctic species have two to four rows of usually sparse acrostical hairs, the inner two rows being often bristle-like. A few species with distinctly brown-marked wings have four rows of rather numerous hairs. The aedeagus is unlike that of any nearctic *Homoneura* known to me.

TEN NEW CHRYSOMELID BEETLES FROM THE WEST INDIES AND KEY WEST

Doris H. Blake, *Department of Entomology, Smithsonian Institution, Washington, D.C.*

In this paper are described eight new species and two new subspecies of Chrysomelid beetles. Five of these are from Jamaica, mostly collected by Dr. T. H. Farr. The rest are with one exception from other West Indian islands, some collected by Dr. P. J. Darlington, Jr., and one, a new species of *Exoceras,* was collected on Dominica by Dr. O. S. Flint. The two subspecies are of Cassids (one of which was taken on Key West, Florida), with which relatives from other West Indian islands are compared.

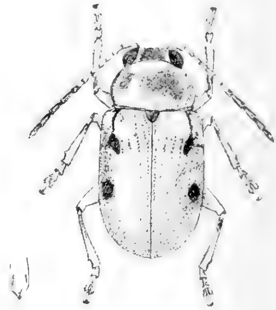
Chalcosicya farri, n. sp.
(Fig. 6)

About 2.5 mm. in length, ovate, shining, strongly punctate with scattered short, white, closely appressed hairs; bronzy black with reddish brown antennae; tibiae and tarsi darker reddish brown, all femora toothed.

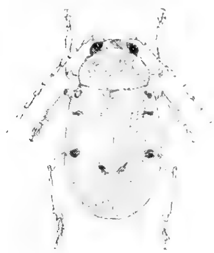
Head with rounded occiput and a short median depression in middle of front; surface finely punctate and alutaceous with short white hairs; mouthparts reddish brown. Antennae extending below humeri, reddish brown, 7th joint long, outer joints a bit wider than joints 3 to 6. Prothorax widest at base, moderately convex, rather alutaceous but somewhat shiny, with fine and not dense punctation, and with short white hairs. Scutellum rounded, shining, black. Elytra convex with small humeri and a small basal callosity having a depression below; punctation coarser than on prothorax, but on basal callosities not so coarse and becoming finer towards apex and at apex somewhat ridged; short white hairs more abundant along sides and at apex and in depression below basal callosities.

1 Metachroma longipunctata, n.sp.

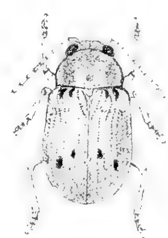
2 Exoceras flinti n.sp.



3 Metachroma maniocae n.sp.



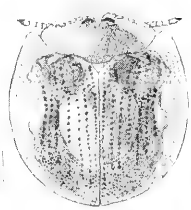
4 Metachroma [illegible] n.sp.



5. Metachroma ashtonae n.sp.

6. Chalcosicya farri n.sp.

7. Metriona praeusta (Boh.)



8. Metriona 4-signata jamaicensis n.ssp.

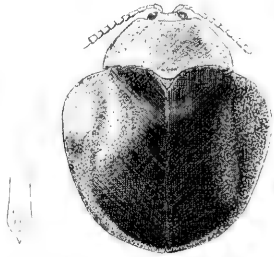
9. M. 4-signata (Boh.)

10. Eurypepla calochroma (Blake)

11. Eurypepla jamaicensis (L.)

12. E. calochroma floridensis n.ssp.

13. Stoiba fuscicornis n.sp.



14. Stoiba swartzi (Thunb.)

db

15. Stoiba rufa n.sp.

Body beneath with rather scanty white pubescence; all femora with small tooth, tibiae curved, tibiae and tarsi reddish brown. Length 2.5–2.7 mm.; width 1.5 mm.

Type USNM No. 68194. One paratype in Institute of Jamaica.

Type locality.—Clydesdale to Morces Gap, St. Andrew Parish, Jamaica, collected 22 July 1958, T. H. Farr. One paratype taken at Morces Gap, St. Andrew Parish, 8 August 1959, T. H. Farr.

Remarks.—This is the first species of the genus to be collected in Jamaica. It is about the same size and shape as *C. rotunda* Blake from Pico Turquino, Sierra Maestra, Cuba, but differs from that small species in having shorter pubescence and in having all femora toothed as in most of the genus. *C. nana* (Suffrian), another small species, also from Cuba, has denser and longer white pubescence.

Metachroma ashtonae, new species
(Fig. 5)

About 2.5 mm. in length, oblong oval, shining, yellow brown with a faint reddish brown M-shaped marking on prothorax and two small spots at base and two small spots below the middle of each elytron, prothorax finely and moderately densely punctate, elytra with distinct striate punctation becoming fainter near apex, a well-marked transverse depression below basal callosities.

Head with interocular space barely half width of head, the usual groove about eyes and a median transverse groove separating lower from upper front, a median line down occiput; finely punctate above and more coarsely punctate in lower front. Antennae and mouthparts yellowish. Antennae extending below humeri, basal joint swollen, outer joints a little thicker. Prothorax with rounded lateral sides and small tooth at basal and apical angles, disc not very convex, somewhat alutaceous and densely and distinctly punctate; a faint M-shaped deeper brown marking. Scutellum reddish brown. Elytra yellowish brown with two elongate basal spots, the one in humeral sulcus wider than median basal spot; below middle two more dark spots, the higher one nearer suture; striate punctation deep and distinct to below middle, then becoming finer and shallower, below humeri on side the intervals between striate punctures somewhat costate; a distinct transverse depression from below humeri nearly to suture. Body beneath yellowish brown, anterior and posterior femora somewhat swollen and without tooth, middle and hind tibiae emarginate near apex. Length 2.6 mm.; width 1.7 mm.

Type, female, USNM. No. 68199.

Type locality.—Christiana, Manchester Parish, Jamaica, W.I., collected by T. H. Farr, 4 Nov. 1959.

Remarks.—This tiny species is only a little larger than *M. elachistum* Blake from Cuba. Unlike that species it is a paler yellow brown with indeterminate brownish shadings on the prothorax and more distinct darker spots on the elytra. I take pleasure in naming it for Mary

Ashton, a dedicated biology teacher of Jamaica's dark children for some years.

Metachroma maniocae, n. sp.
(Fig. 3)

About 3.5 mm. in length, oblong oval, shining, pronotum very finely punctate, elytra with small striate punctures becoming faint over basal callosities, towards apex and on sides, yellow brown, head with a broad dark plaga, pronotum usually with a more or less definite dark transverse area, elytra with dark streak down intrahumeral sulcus ending in a rounded dark spot, often connected with a marginal dark streak, another spot below this on side; antennae with apical joints dark.

Head with interocular space half width of head, a broad median dark area stretching down occiput to frontal tubercles, upper head shining and with scattered punctures, lower front more alutaceous, with denser and coarser punctures, antennae extending below humeri, basal joints pale, outer ones thicker and darker. Prothorax with widely curving sides, moderately convex, polished and with very fine, not dense, punctation, pale yellow brown with a broad dark fascia. Scutellum dark. Elytra with small striate punctures fading out over basal callosities, sides and apex, surface very shiny, pale yellow with a narrow dark streak down intrahumeral sulcus, ending in a broad spot, often connected with a marginal dark area, below this on the side another spot, this one sometimes faint or even lacking. Body beneath sometimes dark reddish brown, in paler specimens yellowish brown, legs with a slight darkening at base of tibiae, tibiae of middle and hind legs emarginate near apex. Length 3.5–3.8 mm.; width 1.9–2 mm.

Type, male and 12 paratypes, USNM No. 68198.

Type locality.—Cuba.

Other localities.—Soledad, Cienfuegos, Cuba, collected by P. J. Darlington, Jr., May 1936, and by George Salt, May 1925; Jovellanos, Matanzas Prov., Cuba, E. V. Echemendia, 10 May 1941, attacking manihot.

Remarks.—There is little variation in the markings of the specimens examined, but some darker ones have larger elytral dark spots, and in one pale specimen, the lower dark spot was missing.

Metachroma longicorne, n. sp.
(Fig. 4)

Approximately 3 mm. in length, ovate, polished yellow brown, pronotum with a dark fascia, elytra with four small spots on each, a spot on humerus, one below this on side in tranverse depression, a third spot on side halfway down, and a fourth below this and near suture; elytra with striate punctation only in transverse depression and near suture.

Head with interocular space half width of head, occiput deep reddish brown, polished, finely punctate, lower part of front paler brown, alutaceous and obsoletely punctate. Antennae slender, extending to middle of elytra, pale yellow brown. Prothorax approximately twice as wide as long with rounded sides and small tooth at apical and basal angles, surface lustrous, finely and not densely punctate, yellowish brown with deeper brown verging on piceous transverse markings. Scutellum yellowish brown. Elytra broader than prothorax with small but well-marked humeri and transverse depression below basal callosities in which striate punctation is visible, otherwise, except along suture punctation very indistinct; surface polished, yellow brown with four small piceous spots on each elytron, one on humerus, one below in basal depression, another along side at middle and a fourth near suture in apical half. Body beneath and legs yellowish brown, middle and hind tibiae with the usual emargination near apex. Length 2.8 mm.; width 1.6 mm.

Type, female, Museum of Comparative Zoology No. 31195.

Type locality.—Soledad, Cienfuegos, Cuba, collected 22 Nov. 1936 by P. J. Darlington, Jr.

Remarks.—The pattern of the elytral spotting and unusually long antennae distinguish this from other small yellow brown species.

Metachroma longipunctatum, n. sp.
(Fig. 1)

About 3 mm. in length, oblong oval, shining, head and prothorax deep reddish brown, elytra, legs and antennae paler yellowish brown, pronotum somewhat rugose with elongate punctures, elytra with transverse depression below basal callosities, and clearly marked and rather coarse striate punctures.

Head with interocular space approximately half width of head, a median depression and the usual groove about eyes, alutaceous, not at all shiny, dark reddish brown. Antennae yellow brown, extending below humeri, outer joints a little wider. Prothorax rather flat, with well-rounded sides and tooth at basal angle, shiny, deep reddish brown, with distinctly elongate punctures; surface becoming somewhat rugose in basal part. Scutellum reddish brown. Elytra shining, yellowish brown, paler than prothorax, punctures distinct and striate, larger in transverse groove below basal callosities, becoming fainter towards apex. Body beneath reddish brown, legs paler, femora not toothed, middle and hind tibiae as usual emarginate near apex. Length 2.3 mm.; width 1.1 mm.

Type, male, Museum of Comparative Zoology No. 31196.

Type locality.—La Visite and vicinity, La Salle Range, 5–7000 ft. alt., Haiti, 16–23 Sept. 1934, P. J. Darlington, Jr.

Remarks.—This is one of the smaller species of *Metachroma*, comparable in size with *M. elachistum*, Blake from Cuba. The conspicuously elongate punctures on the pronotum distinguish it from other small West Indian species.

Exoceras flinti, n. sp.
(Fig. 2)

Between 3 and 3.5 mm. in length, elongate oblong, a basal sulcus across pronotum, elytral punctation striate, at base well-developed basal callosities, with a transverse depression below, apex pinched in; yellow brown, shining, last 5 joints of antennae usually darker brown.

Head long, with pronouncedly swollen frontal tubercles and no carina down the long flat lower face, eyes small. Antennae not extending much below the humeri, basal joints shining yellow brown, apical five darker, wider and pubescent. Prothorax with slightly curved sides, oblique angles anteriorly, and deep basal sulcus across entire pronotum; polished yellow brown, impunctate. Scutellum yellow brown. Elytra at apex pinched in, humeri well developed and a basal callosity on each elytron over which striate punctures not very strong, becoming more distinct in basal depression below, but fading towards apex; shining yellow brown. Body beneath entirely yellow brown except claw joint which is deeper brown, claws large, a spur at end of hind tibiae, hind femora enlarged. Length 3–3.5 mm.; width 1.5–1.9 mm.

Type, male, and 6 paratypes, USNM. No. 68323.

Type locality.—Freshwater Lake, Dominica, April 14, 1964, collected by O. S. Flint.

Remarks.—This is the largest species of *Exoceras* found up to now in the West Indies, approaching in size the Central American species, *E. facialis* Jacoby. It lacks the frontal development in the form of two appendages in the lower front of that species, and has much shorter antennae. The characteristic long face, long first antennal joint, basal sulcus across the pronotum and striate elytra all place it in the genus *Exoceras*. The narrowed apex to the elytra is another unusual character for the species. Dr. O. S. Flint states that he collected these beetles by sweeping vegetation that was composed mainly of ferns, and particularly climbing fern.

Stoiba rufa, n. sp.
(Fig. 15)

About 8 mm. in length, rotund, not very shiny, elytra alutaceous and finely punctate, reddish brown with pale yellow antennae and yellow brown head and underparts.

Head yellowish brown with interocular space half the width of head, a deep cut median line down between frontal tubercles which are alutaceous; lower front short, mouthparts declivous. Antennae pale yellow, not extending to humeri, joints three and four long and equal, fifth joint shorter and wider, sixth joint still shorter and succeeding joints no longer but gradually widening to apex. Prothorax reddish brown, curving widely from behind eyes to base, basal margin deeply sinuate over scutellum; disc not very convex with a depression in middle at base, and with a wide margin too thick to be transparent hyaline and with coarse punctures along it. Scutellum dark brown. Elytra reddish brown, alutaceous, not shiny, with distinct but not coarse punctures, moderately convex, with a well-rounded hump below scutellum, explanate margin on sides too thick to be hyaline, widest somewhat below humeri and before middle. Body beneath yellowish brown, legs short, claws simple. Length 7.5–8 mm.; width 6.5 mm.

Type, USNM. No. 68195, 2 paratypes, one of which in the Institute of Jamaica, Kingston, Jamaica.

Type locality.—14½ miles east of Kingston, Jamaica, Morant Bay Road, St. Thomas Parish, 6 Sept. 1964, T. H. Farr.

Other localities.—Lighthouse, Portland Ridge, 2 Dec. 1949, R. P. Bengry, Corn Puss Gap, St. Thomas Parish, Aug. 1941, C. B. Lewis.

Remarks.—This is closely related to *Stoiba swartzi* (Thunb.), the only other species of *Stoiba* heretofore described from Jamaica. S. *swartzi* has deep purple blue or even deep reddish blue elytra, and has a broader appearance and all the specimens that I have seen are larger. S. *rufa* is less rotund, of a narrower appearance and in coloring the elytra are reddish, with at times a faint purple lustre. *Stoiba swartzi* has been collected at Cinchona, Dolphin Head, and Windsor Estate, all localities in the middle or northern part of Jamaica, whereas S. *rufa* has been collected mostly along the southern coastal area. T. H. Farr has collected it twice on the Morant Bay Road, once on 6 Sept. 1964, and once on the 21 July 1963.

Stoiba fuscicornis, n. sp.

(Fig. 13)

About 8 mm. in length, rotund, pronotum somewhat shiny, with a few coarse punctures about sides, elytra alutaceous, not at all shiny, with moderately dense punctation, not so dense on explanate sides, leathery brown, with head, pronotum and undersurface a little lighter yellowish brown, antennae dark.

Head with interocular space half width of head, punctate on occiput about eyes, a dark depressed median line, very short lower front with mouthparts declivous. Antennae not extending to humeri, dark yellowish brown, joints 3 and 4 relatively long, 5th joint short and wide, succeeding joints becoming gradually wider but not longer. Prothorax with sides widely explanate and curving out from behind eyes and broadening to basal margin which is deeply sinuate over scutellum; surface somewhat shiny in some specimens, dull alutaceous in others, yellowish brown with an indefinite slightly darker brown area about sides and in middle, a depression over scutellum, coarse punctures on explanate sides and finer ones on disc. Scutellum brown. Elytra darker and more leathery brown than pronotum and not at all shiny, alutaceous with coarse, dense, often dark punctures, on the explanate margin becoming large rounded transparent spots, disc moderately convex behind scutellum in a rounded hump; humeri well marked. Body beneath yellowish brown, tibiae and tarsi with piceous shadings, claws simple, large. Length 8–8.5 mm.; width 7.2–8 mm.

Type, male, USNM. Type No. 68196, and 9 paratypes, of which 5 are in the Institute of Jamaica, Kingston, Jamaica.

Type locality.—Jamaica, collected in August 1941, by L. V. Burns.

Remarks.—The dull alutaceous leathery brown elytra, together with the dark yellowish brown antennae distinguish this from S. *swartzi* and S. *rufa* which are more shining and which have the pale yellow antennae found usually in species of *Stoiba*.

Metriona quadrisignata jamaicensis, n. ssp.
(Figs. 7, 8, 9.)

Between 4 and 5 mm. in length, rotund, shining, prothorax in life golden with violet tints, elytra golden green, punctures deep blue and on sides slightly deeper and more bluish, explanate margin golden, in dried specimens beetle yellow brown, elytra with a milky overlying piceous marking from near base along side, widening behind the middle, this faint dark marking sometimes nearly vanishing, antennae yellow with tip of apical joint brown; elytra moderately convex with wide explanate margin and with remotely spaced striate punctures.

Head covered by explanate margin but somewhat visible from above through this hyaline margin; eyes large, elongate and closely set, lower front short and declivous, entirely pale. Antennae extending to humeri, apical five joints wider than basal, about as wide as long, tip of apical joint dark. Prothorax with wide explanate margin slightly curved over front in a wide arc, disc only slightly convex, basal margin sinuate over scutellum, in life golden with lavender tints, in dried specimens yellowish brown. Scutellum yellowish brown. Elytra with wide explanate margin protruding forward along side of pronotum, disc roundly humped behind scutellum and with prominent humeri; surface not very coarsely or densely striate punctate, punctures appearing dark blue in fresh specimens on a brassy or golden green surface, explanate margin golden green, the dark elytra markings along side not so apparent when alive but becoming darker in dried specimens. Body beneath yellow brown, legs short, claws large, simple. Length 4–4.8 mm.; width 4.2 mm.

Type. USNM. Type No. 68197, and one paratype.

Type locality.—Portland Cottage, Clarendon Parish, on *Jaquemontia pentantha*, T. H. Farr, collector.

Other localities.—Lucea, Hanover Parish, 15 July 1959, Grand Cayman, Cayman Is., 24 Feb. 1962, C. B. Lewis, P. Rice.

Remarks.—Dr. Farr writes that the beetle when alive is "bright greenish blue and orange, the pronotum, scutellum and explanate areas golden. In certain lights the beetle appears brassy green in colour, in others grayish blue with a pearl like lustre."

This is undoubtedly the Jamaican race of *Metriona quadrisignata* (Boh.) which as the name indicates is a 4-spotted beetle whose habitat Boheman gave as Cuba and St. Domingo. Two pages beyond his description of *quadrisignata* (Boheman, Monographia Cassidarum, vol. 11, 1855, p. 152) Boheman described *Coptocycla praeusta* from St. Domingo as having a single large posterior olivaceous spot on each elytron. In the U.S. National Museum collection are beetles corresponding to *quadrisignata* from Cuba and there is one from St. Domingo with similar markings. There are also from St. Domingo some with a single large apical spot on each elytron as in *praeusta* and in the same series are a few with spots coalescing as in the specimens from Jamaica. In general these St. Domingo specimens are smaller than the typical *quadrisignata.* There are 4-spotted specimens also from Puerto Rico. It would appear that this is a species with variable markings occurring all through the greater Antilles, that in Cuba and Puerto Rico it is usually 4-spotted, in Hispaniola 2-spotted, and in Jamaica I have seen only specimens with the spots coalescing. In a single specimen from Grand Cayman island the spots are very obscure, almost invisible, and correspond with Boheman's variety *a* in which the spots are "obsolete."

Metriona quadrisignata is not to be confused with another species having similar elytral spotting, *M. bisbinotata* (Boh.) of which I have seen specimens only from Cuba. The position of the elytral spots is a little different, the spot in the anterior half of the elytron being below the humerus and transverse in shape in a depression extending nearly to the margin, while the spot in the posterior half of the elytron is situated nearer the margin on the side.

Eurypepla calochroma floridensis, n. ssp.
(Figs. 10, 11, 12.)

The brief Linnaean description of *Cassida jamaicensis* Linnaeus, (Systema Naturae, ed. 10, 1758, 1, p. 364) is of a beetle "luteo-aenea, elytris immaculatis, excavato-punctatis." Thus it is definitely stated that the beetle is not spotted. Specimens corresponding to this immaculate cassid in the U.S. National Museum collection have been collected not only on Jamaica, but also on Puerto Rico and St. Domingo. Boheman, who placed this Linnaean species in the genus *Eurypepla* (Boheman, Monographia Cassidarum, vol. 2, 1854, p. 237) described another species, *E. vitrea*, from Cuba, which he stated was much smaller (6½ mm. as contrasted with the 11 mm. of *jamaicensis*) with the prothorax "obsoletely fusco-variegato." I have not seen any specimen like this from Cuba in any collection. On the next page, p. 238, Boheman described a third species, *E. brevilineata*, from Campeche, Yucatan, Mexico, in which there is a small dark median line on the pronotum. The length of this one he gave as 10 mm. Champion in the Biologia Centrali Americana has illustrated this and stated that he has seen several specimens. Recently I described a species of *Eurypepla* (American Museum Novitates, No. 2217, 1965, p. 12) wrongly ascribing it to the genus *Psalidonota*, from Andros Island, Bahama, and giving it the specific name *calochroma*, in which the pronotum has a large round dark median spot, and also a dark spot on each elytron below the middle near the hyaline margin. Specimens of this species are in the U.S. National Museum collection from Fresh Creek, and also Harbor Island, Bahama. Still another race has been collected at Key West, Florida, on *Cordia*, in which the pronotum is marked by a small median basal spot and often traces of a still smaller brown spot on either side. H. S. Barber in his paper on the North American Tortoise Beetles

(Proc. Ent. Soc. Wash., vol. 18, pp. 113–127. 1916) mentioned the occurrence of this on Key West, and identified the beetle as *Eurypepla jamaicensis* (L.).

As in the case of *Metriona quadrisignata* (Boh.) from Cuba with its close relatives having slightly different elytral spotting in St. Domingo and Jamaica, I believe with this difference in spotting of the pronotum and elytra there is at least a subspecific difference for this Key West, Florida race for which I am proposing the subspecific name *Eurypepla calochroma floridensis.* As in the Bahaman species, *E. calochroma* (Blake), the prothorax is slightly more convex in the middle and the hyaline margin about the front not so rounded as in *E. jamaicensis* (L.). In addition, on the pronotum there is a tiny median basal spot and usually a fainter lateral spot on each side, and also a dark spot in the middle of each elytron, to distinguish it from *E. jamaicensis* as well as typical *E. calochroma.*

Type, and 5 paratypes, USNM. No. 68324, taken on Geiger tree, 16 April 1945.

Type locality.—Key West, Florida.

It has also been collected by E. A. Back on avocado and an unknown tree on Key West, on 15 June 1941, and it has been collected on the tip of the mainland at Homestead, Florida.

VARIATION IN TWO SPECIES OF AMBLYOMMA
(Metastigmata: Ixodidae)[1]

Nixon Wilson, *B. P. Bishop Museum, Honolulu, Hawaii 96819*

The following examples of unrecorded variation in two species of *Amblyomma* were observed when identifying some ticks at the Bishop Museum.

Amblyomma tuberculatum Marx

One nymph from a lot of three had two spurs on coxa III. The internal spur was smaller than the external spur but nevertheless distinctly evident. It was not as well developed on one coxa where it took the form of a salient ridge joined with the internal margin of the external spur. Coxa II of another nymph had the internal spur represented as a salient ridge. Mr. G. M. Kohls (letter, 28 Oct. 1965) informs me that among about 25 nymphs of this species in the collection

[1] This investigation was supported, in part, by Public Health Service research grant AI-01723 from the National Institute of Allergy and Infectious Disease, National Institutes of Health.

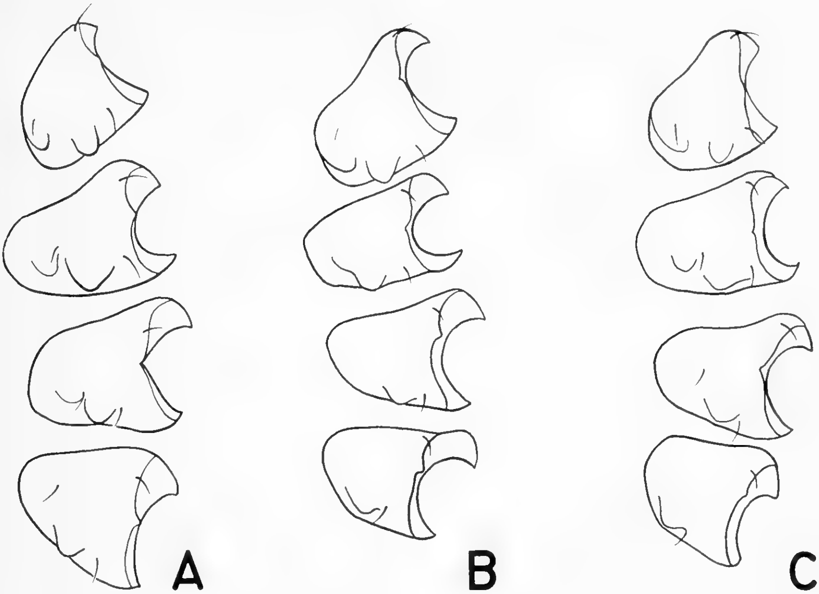


Fig. 1. *Amblyomma tuberculatum* Marx. Nymphs showing variation in coxal spurs. A. extra internal spur on coxa III; B. ridge-like internal spur on coxa II joined with external spur; C. usual spur pattern.

of the Rocky Mountain Laboratory only one has a trace of an internal spur on coxa III and a few have the internal spur on coxa II absent. According to Cooley and Kohls (1944) the normal number of spurs on coxae I–IV in the nymph is 2, 2, 1, 1, respectively. It appears that in the case of coxae II–III there is considerable variation in number and degree of development of spurs.

The three nymphs were collected from *Gopherus polyphemus* at Wakulla Springs, Wakulla Co., Florida, 15 May 1964 by J. Rudloe and are in the collection of the American Museum of Natural History.

Amblyomma geoemydae (Cantor)

A greatly engorged nymph of this species was unusual in that it lacked eyes. The area of the scutum where the eyes should have been was devoid of punctations and a reddish-brown color similar to the remainder of the inornate portion of the scutum. In all other respects this specimen resembled typical nymphs of *A. geoemydae*. The presence of eyes has been one of the important characters for separating the genus *Amblyomma* from *Aponomma*.

The present specimen was attached to the papilla at the base of a newly developing feather of a bird. This is an unusual site of attachment for a tick and an unusual host for *A. geoemydae* which is considered a reptile tick.

The nymph was collected from *Megalaima mystacophanos* at Narathiwat, Thailand, 4 Sept. 1964 (HO 969) and is deposited in the Bishop Museum.

Reference

Cooley, R. A., *and* **G. M. Kohls.** 1944. The genus *Amblyomma* (Ixodidae) in the United States. J. Parasit. 30(2): 77–111.

A NEW GENUS AND TWO NEW SPECIES OF ISCHNOCERA OCCURRING ON FROGMOUTHS (PODARGIDAE)
(Mallophaga)

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Roger D. Price, *Department of Entomology, Fisheries, and Wildlife, University of Minnesota, St. Paul*

Through the courtesy of Dr. J. Linsley Gressitt, Bernice P. Bishop Museum and Dr. Theresa Clay, British Museum (Natural History), we were able to study the specimens which are herewith described and illustrated.

Podargoecus, n. gen.

This genus belongs to the subfamily Philopterinae of the family Philopteridae of the suborder Ischnocera. Judging from the shape of the head and abdomen the genus is closest to some species of *Strigiphilus*; however, the male genitalia of individuals within the two genera differ greatly. *Podargoecus* may be distinguished from other genera in the subfamily by the following combination of characters:

Head large and wide. Hyaline margin of forehead prominent. Wide dorsal anterior plate with a concave anterior margin, convex lateral margins, prominent posteriorly pointing curved projection at each lateroposterior angle, and a prominent median projection on the posterior margin. Short narrow premarginal carinae. Antennae filiform and similar in both sexes. Dorsal and ventral submarginal setae long.

Thorax and legs typical of the subfamily.

Abdomen short and rounded, with tergal plates II–VIII separated medially in both sexes. Tergal plates of segments II–IV or II–V each with a posteriorly pointing projection on the margin posterior to the spiracle. One row of long setae on each tergite and sternite, except for terminal segments. Terminal segment rounded in the male and bilobed in the female. Posterior margin of vulva broadly convex.

Male genitalia characteristic, with large thick curved paramera.

Type-species: *Podargoecus papuensis*, n. sp.

This genus is established for the two new species described below, and apparently is found only on hosts of the avian genus *Podargus* (Podargidae, Caprimulgiformes).

Podargoecus papuensis, n. sp.

Male: General external morphology and chaetotaxy as illustrated in figure 1. Head length greater than width. Dorsal anterior plate as wide as long. Tergal plates of abdominal segments II, III and IV each with a posteriorly pointing projection on the margin posterior to the spriracle. Tergal plates of abdominal segments III–VIII separated medially by only a short space. Abdominal tergocentral setae are: II-8, III-8, IV-6, V-6, VI-6, VII-6 and VIII-4. Abdominal sternocentral setae are: II-2, III-4, IV-6, V-6, VI-8, VII-4 and VIII-2. Genitalia, less sac, as illustrated in figure 3.

Female: External morphology, except for terminal abdominal segments, similar to the male. Terminal abdominal segments as illustrated in figure 2.

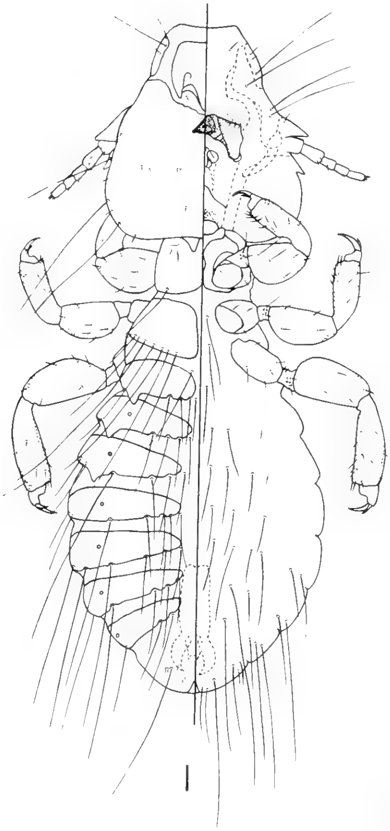
Measurements of mounted specimens:

	Male		Female	
	Length	Width	Length	Width
Head	0.70 mm	0.63	0.73	0.68
Prothorax	0.16	0.30	0.16	0.30
Pterothorax	0.16	0.45	0.16	0.44
Abdomen	1.05	0.79	1.23	0.88
Total	2.07		2.28	

Host: *Podargus papuensis* Quoy and Gaimard.

Type material: Holotype male, allotype female and 33 paratypes collected at Wau Creek, New Guinea on 22 March 1963 by P. Shanahan. Three paratypes collected at Kauli Creek, New Guinea on 26 September 1962 by H. Clissold. Eleven paratypes collected in New Guinea (no other locality data). Four paratypes collected at Port Darwin (no other locality data). Holotype, allotype and paratypes are in the Bernice P. Bishop Museum. Paratypes are in collections of the U. S. National Museum, British Museum (Natural History), the Universities of California, Kansas and Minnesota, and the senior author.

Discussion: Within the genus, this species is distinguished by the shape of the head and the dorsal anterior plate, chaetotaxy of the abdomen, and the shape of the abdominal tergal plates.



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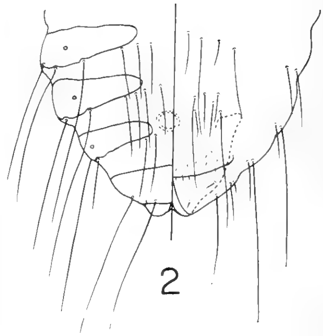

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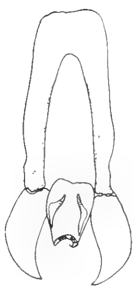

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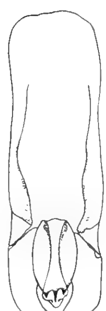

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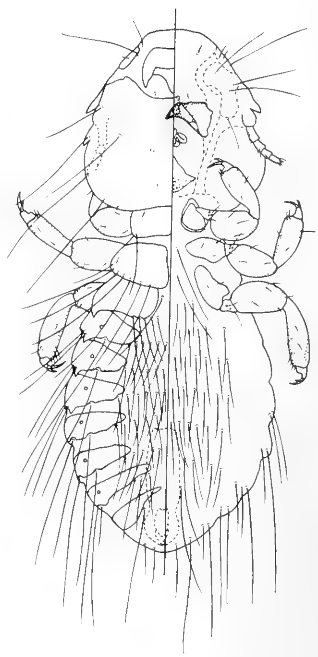

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Podargoecus strigoides, n. sp.

Male: General external morphology and chaetotaxy as illustrated in figure 5. Head width equal to length. Dorsal anterior plate much wider than long. Tergal plates of abdominal segments II-V each with a posteriorly pointing projection on the margin posterior to the spiracle. Tergal plates of abdominal segments III–VII widely separated medially. Abdominal tergocentral setae are: II-10, III-12, IV-12, V-12, VI-10, VII-10 and VIII-6. Abdominal sternocentral setae are: II-6, III-10, IV-12, V-12, VI-12, V11-8, and VIII-2. Genitalia, less sac, as illustrated in figure 4.

Measurements of mounted specimen:

	Male	
	Length	Width
Head	0.57 mm	0.57
Prothorax	0.09	0.25
Pterothorax	0.13	0.31
Abdomen	0.86	0.66
Total	1.65	

Host: *Podargus strigoides* (probably *victoriae* Mathews).

Type material: Holotype male (only specimen) collected in Victoria (no other locality data) is in the collection of the British Museum (Natural History).

Discussion: This species can be separated from the type species by the shape of the head and the dorsal anterior plate, chaetotaxy of the abdomen, and shape of the abdominal tergal plates.

Discussion

The two species described are the first to be recorded from the avian family Podargidae. There have been too few collections of Mallophaga from the remaining hosts of the order Caprimulgiformes to present a meaningful discussion on the possible phylogenetic affinities of the parasites in relation to those of the hosts. It is, however, worthwhile to note that modification of the heads in *Podargoecus* is found also in *Strigiphilus*, a genus found on hosts of Strigiformes. The general form of *Podargoecus* differs greatly from that of *Mulcticola* found on most hosts of Caprimulgiformes.

←

Figs. 1–3. *Podargoecus papuensis* n. sp. Fig. 1. Dorsal-ventral views of male; fig. 2. Dorsal-ventral views of terminal abdominal segments of female; fig. 3. Male genitalia.

Figs. 4–5. *Podargoecus strigoides* n. sp. Fig. 4. Male genitalia; fig. 5. Dorsal-ventral views of male.

SIX NEW ANOBIIDAE FROM NORTH AMERICA WITH KEYS
(COLEOPTERA)

RICHARD E. WHITE, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

The new species described are from various North American collections as cited. New or revised keys including the new species are presented for all affected genera except the large genus *Ernobius*. Thanks are due to P. H. Freytag of the Ohio State University (collection referred to as OSU), A. T. McClay of the University of California at Davis (UCD), P. J. Darlington of The Museum of Comparative Zoology at Harvard (MCZ), and V. M. Kirk formerly at Clemson College (CC) for loan of specimens used in this study; also my thanks are extended to P. J. Darlington for examining the type of *Euceratocerus hornii* Lec. The abbreviation USNM refers to the U.S. National Museum.

Genus **Utobium** Fall

Utobium griseum, n. sp.

(Fig. 5)

General: Elongate, cylindrical, body 2.4 times longer than wide; ground color black, surfaces very faintly shiny, abdomen dark reddish, legs dark reddish to distinctly reddish, antennae reddish brown, tarsi lightest; head with bristly grayish, black, and orange pubescence intermixed; dorsal surface with patches of fine appressed grayish pubescence and indistinct black pubescence, orange pubescence very sparse, just detectable, beginning on humeri and becoming obsolete posteriorly, also detectable at elytral suture near middle to apex; ventral surface with fine, appressed, grayish pubescence evenly distributed; head and dorsal surface finely, densely granulate, granulation densest on pronotal disk and base of elytra.

Head: Antennae of single specimen a little less than ⅓ length of body; first segment robust, a little longer than wide; 2nd segment shorter, cylindrical, 2 times longer than wide; 3rd segment slightly longer than 2nd, more slender, over 2 times longer than wide; 4th segment triangular, about as long as and with proportions of 2nd; 5th segment elongate, triangular, broad, nearly as long as 2nd and 3rd combined; 6th segment short, triangular, about as long as 2nd, a little longer than wide; 7th segment elongate, triangular, outer angle rounded, about as long as 5th, nearly 2 times longer than wide; 8th segment nearly identical with 6th; 9th, 10th, and 11th segments elongate, together as long as first 5 segments combined, 9th nearly 2 times longer than wide, outer margin arcuate, 10th triangular, 2 times longer than wide, 11th over 3 times longer than wide, widest near middle; last segment of maxillary palpus 1.5 times longer than wide, widest before middle, apex truncate; last segment of labial palpus triangular, as wide as long.

Dorsal surface: Pronotal disk with 3 transverse to oblique bands of grayish pubescence, these bands interrupted at middle; gray elytral pubescence in irregular patches, near elytral suture forming indistinct oblique bands; irregular large punctures evident on elytra, most distinct near sides.

Length: 7.4 mm.

This species is described from a single individual (holotype, sex unknown) collected at Mt. Lassen, California on 2 July 1963 by D. J. and J. N. Knull; it is in The Ohio State University collection. Following is a key for the separation of the 3 known species of *Utobium*.

KEY TO SPECIES OF **Utobium**

1. Ground color of dorsal surface black throughout; pubescence of dorsal surface predominantly grayish, orange pubescence just detectable at humeri and near elytral suture .... **griseum** n. sp.
   Ground color of dorsal surface mixed orange and dark reddish to wholly dark reddish brown; dorsal surface usually with abundant orange pubescence in addition to gray pubescence 2
2. Elytral pubescence predominantly gray, orange pubescence much less extensive; ground color of elytra nearly uniformly light reddish to dark reddish brown, lighter areas at suture and apex evident to obsolete .... **elegans** (Horn)
   Elytral pubescence about equally gray and orange to predominantly orange; ground color of elytra light orange to reddish orange with usually distinctly darker reddish areas near base and before middle to near apex .... **marmoratum** Fisher

Genus **Ernobius** Thomson
Ernobius hirsutus, n. sp.
(Fig. 1)

General: Body elongate, 2.3 to 2.5 times longer than wide; pronotum nearly as wide as elytra at base; body and appendages reddish orange, head and pronotum a little darker, apex of elytra usually a little lighter than remainder; pubescence yellowish, moderate in density, that of dorsal surface and head distinctly bristling in part; head and pronotum finely, densely punctate, margins of each puncture raised, thus imparting a finely roughened appearance to surface; elytra distinctly more shiny than pronotum, rather densely punctate, margins of each puncture not raised.

Head: Eyes of ♂ separated by 1.6 to 1.8 times their vertical diameter, those of ♀ smaller, separated by 2.0 to 2.2 times their vertical diameter. Antennae 11 segmented, those of ♀ less than half as long as body, those of ♂ ⅔ length of body; 2nd segment (both sexes) short, broad, about as wide as long; 3rd segment elongate, about 2 times longer than wide; 4th and 5th very similar to 3rd, each but slightly shorter than 3rd, segments 6, 7, and 8 similar, as wide as (7) or wider than (6, 8) long, 8th distinctly wider than long; terminal 3 segments of ♀ about ⅓ longer than all preceding; terminal 3 segments of ♂ nearly 3 times longer than all preceding; 9th and 10th segments of ♀ similar, vaguely triangular, outer angle broadly rounded, both about 3 times longer than wide, 11th segment about 4 times longer than wide; 9th and 10th segments of ♂ similar, 9th nearly 4 times longer than wide; ♂ 11th 6.5 to 8 times longer than wide. Last segment of labial palpus nearly triangular, not quite 2 times longer than wide, outer margin oblique. Last segment of maxillary palpus triangular, 2 times longer than wide, outer margin strongly oblique.

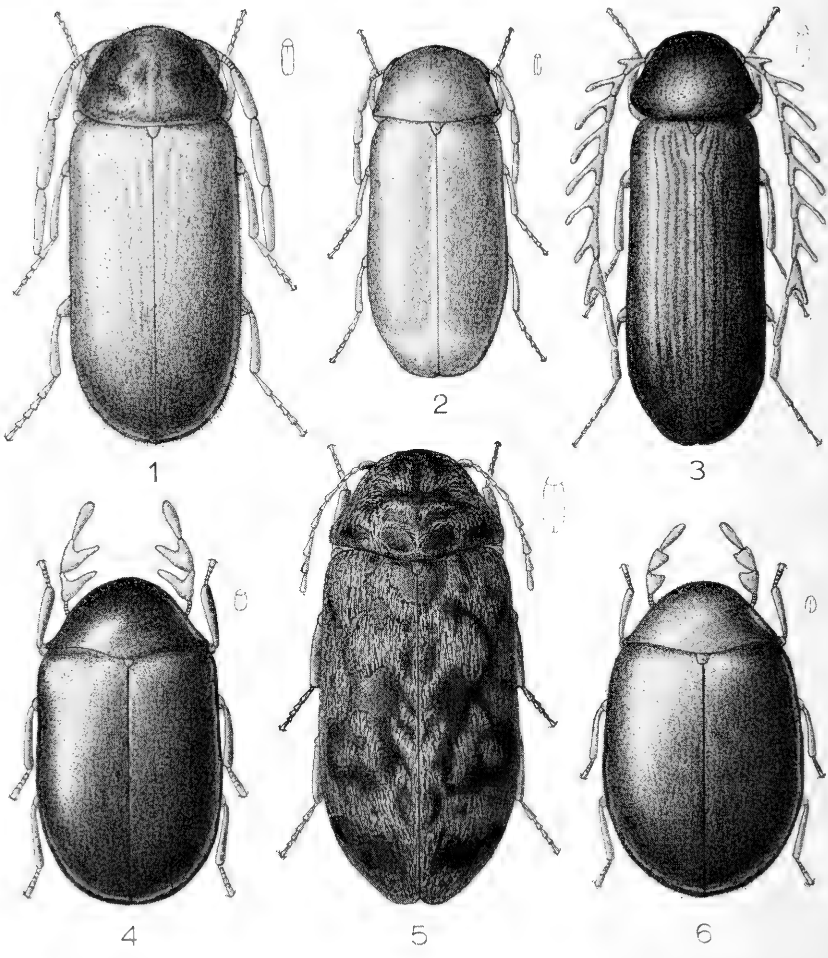

Fig. 1, *Ernobius hirsutus* n. sp., ♂ paratype; Fig. 2, *Ernobius parvus* n. sp., ♂ paratype; Fig. 3, *Euceratocerus grandis* n. sp., ♂ paratype; Fig. 4, *Dorcatoma moderata* n. sp., ♂ holotype; Fig. 5, *Utobium griseum* n. sp., holotype; Fig. 6, *Eutylistus grossus* n. sp., holotype. Small figures equal actual size.

Dorsal surface: Pronotum sharply margined laterally, margins rather broadly explanate and nearly straight from dorsal view, converging anteriorly; pronotal surfaces undulate; elytra with vague indications of grooves, most distinct near suture and at sides.

Ventral surface: Finely, densely punctate.

Length: 3.9 to 5.0 mm.

The description is from 7 individuals (4♂♂, 3♀♀); the data are as follows: ♂ holotype, Greenwood Lake, New Jersey, June 5, 1927, A.

Nicolay (type number 68431 in USNM); 1 ♂ paratype as before, taken on May 12, 1912, one ♂ paratype on May 30, 1943, 1 ♀ paratype on June 5, 1927; 1 ♀ paratype "P. Lawn, L. I.," May-12-12, Shoemaker collection, 1 ♂ paratype, Wyandanch L. I., May-27-1917, F. M. Schott, Pitch Pine; 1 ♀ paratype, West Point, N. Y., May 18, 1913, W. Robinson. All the above type specimens are in the USNM collection.

This species is immediately distinguishable from all other species of *Ernobius* occurring east of the Rocky Mountains in that the pubescence of the dorsal surface is distinctly bristly while the pubescence of the other species is appressed. It appears to be similar to *luteipennis* Lec. and in addition to the above character differs in being nearly unicolorous, *luteipennis* being reddish orange with the pronotal disk and ventral surface blackish. The name *hirsutus* refers to the bristly pubescence of the dorsal surface.

Ernobius parvus, n. sp.
(Fig. 2)

General: Body elongate, 2.3 to 2.6 times longer than wide; pronotum nearly as wide as elytra at base; body and appendages reddish orange to rather dark reddish, suture and side margins usually lighter, elytral apex yellowish; pubescence yellowish, appressed, very fine, short; head and pronotum finely, not densely granulate, slightly denser on pronotum, granules indistinctly of 2 sizes; elytra distinctly more shiny than pronotum, narrowly granulate at base, rather finely, not densely punctate, anterior margin of each puncture just noticeably raised.

Head: Eyes of ♂ separated by 1.5 to 1.6 times their vertical diameter, those of ♀ separated by 1.3 to 1.5 times their vertical diameter. Antennae 11 segmented, those of ♀ less than half as long as body, those of ♂ over half as long as body, 2nd segment (both sexes) short, broad, a little longer than wide; 3rd segment elongate, nearly 3 times longer than wide, as long as next 2 combined; 4th segment as wide as long; 5th a little longer than wide; segments 6, 7, and 8 similar, each a little wider than long; terminal 3 segments of female nearly 2 times as long as all preceding; terminal 3 segments of ♂ 2 times longer than all preceding; 9th and 10th segments of ♀ similar, each about 4 times longer than wide; ♀ 11th segment 4 to 5 times longer than wide; 9th and 10th segments of ♂ similar, each about 4 times longer than wide, 9th as long as previous 6 united; ♂ 11th segment 5 to 6 times longer than wide. Last segment of labial palpus elongate, outer angle oblique, widest near middle, about 2 times longer than wide. Last segment of maxillary palpus elongate, outer angle oblique, 2 to 3 times longer than wide.

Dorsal surface: Pronotum sharply margined laterally, narrowly explanate, lateral margin gradually arcuate from dorsal view; pronotum nearly evenly rounded to side, very vaguely undulate.

Ventral surface: Finely granulate-punctate.

Length: 2.2 to 3.1 mm.

Described from 7 individuals with the following data: Florence, S.C., July 30, 1962, V. M. Kirk, ♂ holotype (USNM No. 69140), allotype, 2 paratypes (1 ♂, 1 ♀); Poinsett State Park, S.C., June 1, 1962,

V. M. Kirk, 1 paratype (♂), and June 6, 1962, 1 paratype (♀); Myrtle Beach, S.C., June 4, 1960, V. M. Kirk (1 ♀). All in USNM.

This species runs in Fall's Key (1905, p. 140) to *granulatus* Lec, and appears most nearly related to it. The chief differences between the two concern the elytral sculpture. The elytra of *granulatus* are finely, densely punctate, and the anterior margin of each puncture is distinctly raised, thus imparting a finely granulate appearance to the elytra. The elytra must be examined under high power and in the correct light to confirm that they are punctate-granulate and not simply granulate. The elytra of *parvus* are more coarsely punctate, and the anterior margin of each puncture is very minutely raised. The elytra appear rather coarsely punctured, with the granulations being just visible under high power. Also the elytra of *parvus* are distinctly more shining than those of *granulatus*, and the length of *parvus is* 2.2 to 3.1 mm. as opposed to 2.3 to 4.3 mm. for *granulatus*. The specific name, *parvus*, meaning small, refers to the size of this species, its minimum length rivaling that of any other North American species of the genus.

Genus **Euceratocerus** LeConte

Euceratocerus grandis, n. sp.

(Fig. 3)

General: Very elongate, narrow, parallel-sided, body 2.9 to 3.2 times longer than wide; nearly always black with reddish faintly evident and appendages more distinctly reddish, sometimes predominantly dull reddish black (one specimen mostly dull reddish-brown with head and pronotum darker-teneral?), somewhat shining; pubescence grayish, very short, fine, moderate in density, appressed on elytra, faintly bristling on pronotum.

Head: Densely, finely granulate; front faintly to not protuberant; vertex very finely, sharply sulcate at midline; eyes of ♂ separated by 1.4 to 1.5 times their vertical diameter, those of ♀ separated by 1.5 to 2.0 times their vertical diameter, antennae of ♂ ¾ length of body, segments 3 to 10 inclusive produced laterally, strongly notched at apex, ramus of 3rd segment shorter than segment, rami of segments 4 to 8 inclusive each about as long as segment, that of 9th segment a little over ½ length of segment, that of 10th about ½ length of segment, 11th segment 7 to 8 times longer than wide; antennae of ♀ ½ length of body, segment 3 triangular, widest at middle, segments 4 to 9 serrate, last segment 3 to 4 times longer than wide; last segment of maxillary palpus elongate, tip pointed, widest near base, inner angle broadly rounded, about 3 times longer than wide; last segment of labial palpus very similar to that of maxillary palpus but slightly less elongate.

Dorsal surface: Pronotum as wide as elytra at base, lateral margins very finely, irregularly serrate, pronotal surface rather densely granulate, granules larger than those of head, most strongly developed on disk, inclined backward in this area; disk a little more prominent at middle posteriorly, median line faintly impressed on anterior slope; elytral striae very fine, lateral 2 most distinctly impressed, intervals nearly flat, surface very finely granulate.

Ventral surface: Tarsi elongate, slender, shorter than tibiae.
Length: 4.0 to 5.9 mm.

This description is from 22 individuals (16 ♂♂, 6 ♀♀) all taken in central and western Texas by D. J. and J. N. Knull. The male holotype was taken at Davis Mts., on June-14-58, the allotype bears the same data; both are in the Ohio State University collection. Fifteen paratypes are from the same locality; the data are as follows (males unless otherwise indicated): June-14-58 (1 in OSU), June-2-37 (1 ♂, 1 ♀ in OSU, 3 ♂♂ in USNM), June-23-64 (1 in OSU), June-2-51 (2 in OSU), June-9-54 (3 in OSU, 1 in USNM), July-11-55 (1 in OSU), July-3-55 (1 ♀ in USNM). Other paratypes are from the following localities: Jeff Davis Co., June-20-52 (1 ♀ in OSU, 1 ♀ in USNM); Gillespie Co., May-7-46 (1 ♀ in OSU); Chisos Mt., June-9-39 (1 ♂ in USNM); Llano Co., April-13-63 (1 ♂ in OSU).

I have previously misidentified this species as *E. hornii* Lec. and have so referred to it in 2 publications: in one (1960, p. 235) all characters referred to as being of *hornii* are actually of *grandis*; in the other (1962, p. 1 and 2) both the characters and the antennal figure presented as those of *hornii* are actually of *grandis*.

The specific name refers to the size of this species; it attains a much greater length than the other 2 members of the genus. The 3 known species of this genus and their sexes can be distinguished with the following key.

Key to Species of **Euceratocerus**

1. Antenna serrate to strongly serrate, shorter, 0.5 to 0.6 length of body, last segment 3 to 4 times longer than wide (females) 2
   Antenna pectinate, longer, not less than ¾ length of body, last segment 5 to 8 times longer than wide (males) 4

2(1). Antenna serrate, apical margin of intermediate segments faintly notched; length 4.0 to 5.9 mm .... **grandis** n. sp.
   Antenna strongly serrate, apical margin of intermediate segments distinctly notched; length 2.6 to 4.0 mm. 3

3(2). Pronotal disk with distinct anterior, longitudinal impression; light reddish brown; Ohio, Georgia, South Carolina .... **gibbifrons** White
   Pronotal disk lacking a distinct impression; dark reddish brown to nearly black; Texas .... **hornii** Lec.

4(1). Rami of 9th and 10th antennal segments not or slightly over ½ length of segment; length 4.0 to 5.9 mm .... **grandis** n. sp.
   Rami of 9th and 10th segments as long as or distinctly longer than segment; length 2.6 to 4.0 mm. 5

5(4). Rami of intermediate antennal segments about 3 times longer than segment; dark reddish brown to nearly black; Texas .... **hornii** Lec.
   Rami of intermediate antennal segments not over 1.5 times as long as segment; light reddish brown; Ohio, Georgia, South Carolina .... **gibbifrons** White

Genus **Dorcatoma** Herbst

Dorcatoma moderata, n. sp.

(Fig. 4)

General: Elongate-oval, 1.7 times longer than wide; dark reddish brown, body margins and appendages lighter, head and pronotum sometimes blackish; pubescence yellowish, very fine, moderate in density, appressed; head very finely, densely punctate, punctures separated on an average by about their diameter; pronotum finely, densely punctured, punctures separated on an average by about their diameter, these larger than those of head; metasternum and abdomen finely, densely punctured.

Head: Eyes of ♂ separated by about their vertical diameter, those of single ♀ separated by a little less than 1.5 times their vertical diameter; head adjacent to eye distinctly sulcate; 8th and 9th antennal segments of ♂ moderately produced laterally, moderately, not deeply emarginate apically, 8th segment a little wider than long, 9th nearly as wide as long, 10th about 3 times longer than wide, broadest near apex; 8th and 9th segments of ♀ with proportions much as those of ♂, somewhat emarginate apically, 10th segment about 3 times longer than wide, broadest near apex; last segment of labial palpus triangular, broadest apically, outer angle rounded, about 1.5 times longer than wide; last segment of maxillary palpus elongate triangular, outer margin but slightly oblique, over 2 times longer than wide.

Dorsal surface: Elytra at side with 2 distinct, deep striae from base to near apex, upper shorter, both punctate apically, a finer 3rd stria present above these from base to near middle of elytra.

Ventral surface: Metasternum at center with a deep, longitudinal, narrow slit, this becoming a simple groove at posterior ⅓; 5th abdominal segment of ♀ flat, that of ♂ rather convex, in both sexes deeply, rather roughly sulcate at apex.

Length: 3.0 to 3.4 mm.

The type series consists of 3 individuals taken at Aweme, Manitoba on June 26, 1920 by N. Criddle. They were bred from fungus and are from the P. J. Darlington collection. The holotype (♂) and the allotype are in MCZ, one ♂ paratype is in the USNM.

The name *moderata* refers to the 8th and 9th segments of the ♂ antenna; these are moderately produced in comparison with other members of the genus. The North American species of *Dorcatoma* known to me can be separated by means of the following key. The name *falli* has recently been proposed by myself (1965, p. 114) as a substitute for the name *dresdensis* (Herbst) which was erroneously applied by Fall (1905, p. 262).

Key to North American Species of **Dorcatoma**

1. Pubescence of upper surface erect; length 1.7 to 2.2 mm .... **setulosa** Lec.
   Pubescence of upper surface recumbent; length 2.3 to 3.4 mm. 2
2. Metasternal fovea large, circular .... **pallicornis** Lec.
   Metasternal fovea narrow, slit-like, often greatly reduced 3

3. Third (uppermost) elytral stria vaguely indicated only near middle of elytra; reddish black to (usually) black .... **falli** White
   Third stria distinct from base to near middle of elytra; reddish brown to dark reddish brown 4
4. Third elytral stria sharply impressed from base to level of 1st or 2nd abdominal segment; length 2.3 to 2.8 mm.; California to British Columbia .... **integra** (Fall)
   Third elytral stria less distinct, extending from base to level of hind coxa; length 3.0 to 3.4 mm.; Manitoba .... **moderata** n. sp.

Genus **Eutylistus** Fall
Eutylistus grossus, n. sp.
(Fig. 6)

General: Rather broadly oval, body 1.5 to 1.6 times longer than wide; elytra dark reddish brown, elytral margins, much of pronotum, head, 1st antennal segment, ventral surface and legs lighter in hue, antenna (except 1st segment) dull orange; pubescence yellowish, short, not dense, bristling; body surfaces rather distinctly shining, head very finely, rather densely punctured, pronotum finely, densely punctured, punctures a little larger than those of head, elytra with fine, rather dense punctures arranged in longitudinal bands, these separated by narrower, smooth, faintly impressed lines, metasternum and abdomen finely, densely punctured.

Head: Eyes separated by 1.6 times their vertical diameter (♀ ?); antenna 10-segmented, 8th and 9th segments rather transverse, somewhat emarginate apically, each about 1.5 times longer than wide, 10th segment straight, 3 times longer than wide (foregoing probably ♀ antenna); last segment of labial palpus rather triangular, tip pointed, apical margin notched, about 1.5 times longer than wide; last segment of maxillary palpus triangular, tip pointed, outer margin straight, about 2 times longer than wide.

Dorsal surface: Elytra with 2 lateral striae, lower one beginning before middle and continuing to apex just before suture, most strongly impressed beyond middle; upper stria beginning before middle and becoming obsolete within posterior 3rd of elytra, much shorter than lower stria.

Ventral surface: Metasternum at center with a longitudinal, slit-like fovea, continued posteriorly as a groove; metasternal lobe not at all constricted by tarsal grooves; abdominal sutures most distinct at sides, anteriorly arcuate at center, last one most strongly so.

Length: 2.2 to 2.8 mm.

This species is founded on 2 individuals, apparently both females, though this is by no means certain. Both were taken at Tanbark Flat, Los Angeles Co., California, the holotype on May-8-1950 by A. T. McClay (in UCD), and the single paratype on July-13-1952 by H. L. Mathis (in USNM); the latter individual lacks antennae.

The specific name refers to the size of this species; it attains a greater length than any other species of *Eutylistus* with the possible exception of *ulkei* Fall. *E. grossus* is most similar to *incomptus* (Lec.) and can be distinguished from it and the other members of the genus by means of the following key. Members of all species except *ulkei* have been seen in compiling this key.

Key to North American Species of **Eutylistus**

1. Lower of 2 (or 3) lateral elytral striae complete, distinctly impressed from base to apex 2
   Lower of 2 (or 3) lateral elytral striae incomplete, distinct only at apical half, absent or very obscure at basal half 4

2(1). Elytra with only 2 lateral striae; northeast U. S. to Florida .... **intermedius** (Lec.)
   Elytra with a short, upper, 3rd stria; Florida 3

3(2). Third elytral stria basal .... **granus** (Lec.)
   Third elytral stria median .... **levisternus** Fall

4(1). Elytral punctures dense, forming longitudinal bands separated by narrow smooth lines (fig. 6); eastern states, Texas, and California 5
   Elytral punctures not as above, sparse, forming more or less regular rows or punctures irregular; Texas and Florida 8

5(4). Elytra with a well-defined 3rd stria 6
   Elytra without a well-defined 3rd stria 7

6(5). Lateral striae coarse, 3rd stria more median in position; eastern states to Texas .... **tristriatus** (Lec.)
   Lateral striae finer, 3rd stria more posterior; California .... **ulkei** Fall

7(5). Reddish brown; length 2.2 to 2.8 mm.; California .... **grossus** n. sp.
   Reddish brown to mostly black; length 1.8 to 2.3 mm.; eastern states .... **incomptus** (Lec.)

8(4). Metasternal punctures large, distinct, forming a series before posterior margin; base of metasternal lobe narrowed by tarsal grooves .... **fallax** Fall
   Metasternal punctures very small, fine, not forming a series before posterior margin; base of metasternal lobe not narrowed by tarsal grooves .... **facilis** Fall

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A NEW SPECIES OF THE GENUS MARGARODES GUILDING FROM BUFFALOGRASS IN TEXAS

(COCCOIDEA, MARGARODIDAE)[1]

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The North American members of the genus *Margarodes* Guilding have been reviewed in a previous publication by the author (McDaniel, 1965). A recent collection of the grass species, *Buchloe dactyloides* (Buffalograss), was infested with *Antonina graminis* (Rhodesgrass scale) on the crown and *Margarodes* sp. on the roots. The *Margarodes* specimens are close relatives of *M. hiemalis* Cockerell. Although only one of the specimens is a mature adult and a portion of the abdomen was damaged during collecting, it is apparent that they constitute a new species because of the absence of setae and pores on the conspicuous boss at the apex of the body, the eight segmented antennae, and the presence of only three abdominal spiracles.

Margarodes dactyloides, n. sp.
(Fig. 1)

Adult female.—Body oval-shaped; derm not chitinized. Dorsum with two types of setae, the long hair-like forms and the small microsetae, arranged in rows across the entire dorsal region of the body. Dorsal surface minutely papillose as shown in Fig. 1. Ventrally: antennae 8-segmented; segment 1 being larger than any other segment, with small microsetae scattered over its surface; segment 2 narrow, with small microsetae similar to those on segment 1; segment 3 similar in shape to segment 2, macrosetae arranged near the margin of the anterior portion of segment; segment 4 short and broad, two times the length of segment 3, macrosetae arranged as in segment 3; segments 5 and 6 similar in size and shape with macrosetae at margins; segment 7 similar in shape to segments 5 and 6 only larger, narrowing at base, macrosetae arranged in a circle around the anterior portion of the segment; segment 8 spherical with three elongated setae in addition to regular macrosetae found on other segments. Legs I strongly modified for digging, claw heavily sclerotized, inner surface not pitted with tooth-like structures as in *M. hiemalis*; trochanter and coxa fused, there being on the inner surface an indented groove containing numerous long setae. Legs II and III smaller than legs I, modified for digging, claw without surface tooth-like structures, with same groove-like indentation and numerous long setae as found on legs I. Thoracic spiracles similar to those of *M. hiemalis*, opening circular without a flap-like extension; two internal disk pores present, absent in abdominal spiracles. Three pairs of abdominal spiracles, on segments 1, 2, and 3. Abdominal segments with two types of setae; those slender or extremely elongated, arranged in rows extending to center of body and entire length of body; and those short, spine-like, in center of body, scattered irregularly over

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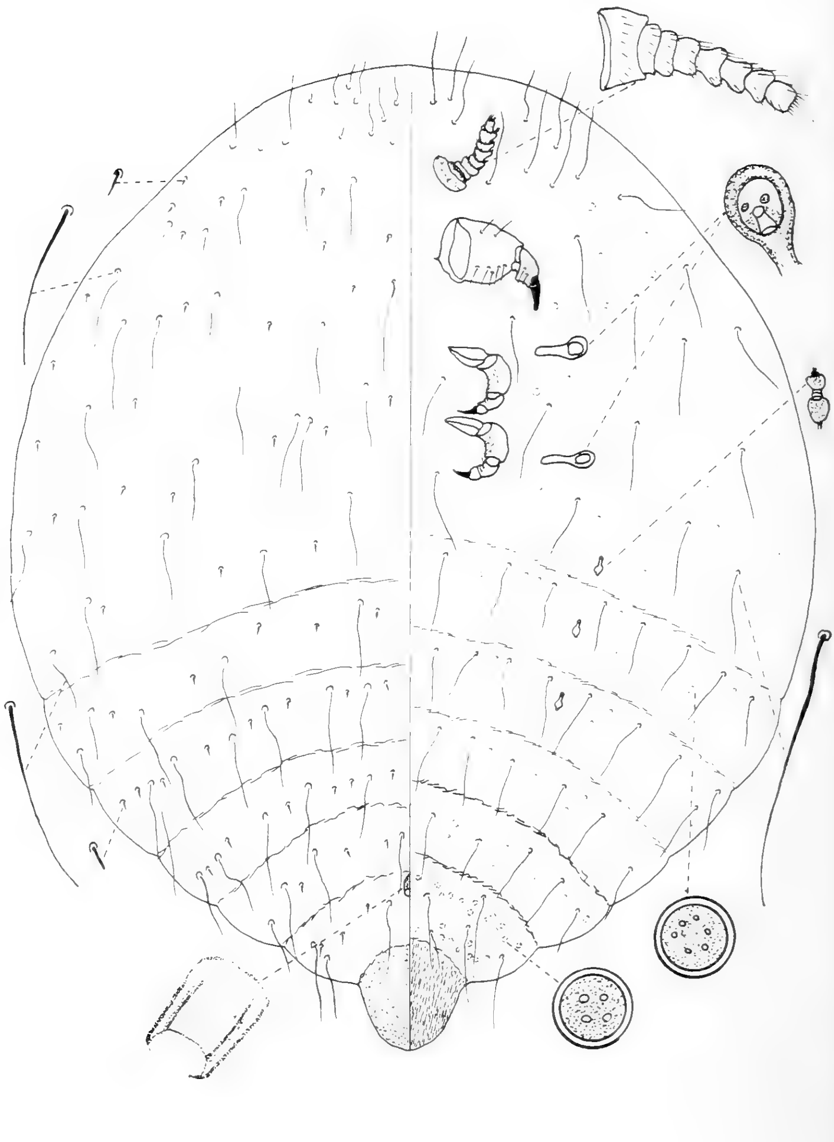

Margarodes dactyloides n. sp. Fig. 1, left side showing taxonomic characters of dorsal view of female holotype; right side, taxonomic characters of ventral view.

venter. Multilocular disk pores present on posterior abdominal segments, these with as few as 4 microloculi and as many as 10 microloculi within the pore. Abdomen with conspicuous stout boss broadly curved at apex and devoid of any hair-like setae and multilocular disk pores. Anal opening well-developed, anterior to boss and last abdominal segment, opening a circle with tube-like extension having transverse slit with internal lobe.

Male.—Not available.

Type.—The species described from a female holotype from *Buchloe dactyloides* (Nutt.) Engelm (Buffalograss), collected 4 miles north of Scotland on highway 281, Archer County, Texas, June 21, 1965 and deposited in the National Collection of Coccoidea, Washington, D. C. Paratypes, apparently immature forms, collected at type locality on same date as holotype deposited in the author's personal collection.

Remarks.—*Margarodes dactyloides* may be separated from all other species of *Margarodes* found in North America by the absence of acorn-shaped setae. *M. dactyloides* and *M. hiemalis* are characterized by a boss-like extension of the last abdominal segment. They are separated by the reduced number of abdominal spiracles, there being three in *M. dactyloides* and six in *M. hiemalis*; the number of segments in the antennae, 8 in *M. dactyloides* and 7 in *M. hiemalis*; the arrangement of the hair-like setae; and the types of multilocular disk pores. In the key constructed by Morrison (1928), *M. dactyloides* keys to *M. hiemalis*.

Key to Species of the Genus Margarodes Guilding found in North America

1. "Acorn-shaped" setae present on body; multilocular disk pores with microlocular ring containing macroloculi 3
   "Acorn-shaped" setae absent; multilocular disk pores never with microlocular ring, consisting of only microloculi or only macroloculi; apex of body with conspicuous stout boss broadly curved at apex 2
2. Abdomen containing 6 spiracles; antennae with 7 segments; tooth-like structures on claw .... **hiemalis** Cockerell
   Abdomen containing 3 spiracles; antennae with 8 segments; tooth-like structures on claws absent .... **dactyloides**, n. sp.
3. Multilocular disk pores with only 2 macroloculi within circle of microloculi; thoracic spiracle with 5 macropores enclosing 5 micropores .... **meridionalis** Morrison
   Multilocular disk pores with more than 2 macroloculi within circle of microloculi; thoracic spiracle with 6 macropores 4
4. "Acorn-shaped" setae not anterior to abdomen, those on last 3 ventral segments strongly constricted apically; multilocular disk pores of two types: those with 4macroloculi in center of ring of microloculi, and those with only microloculi present .... **rileyi** Giard

"Acorn-shaped" setae not restricted to abdominal segments, not constricted apically; multilocular disk pores of dorsum with 6 macroloculi within circle of microloculi .... **morrisoni** McDaniel

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THE NEARCTIC DORYCTINAE, III. THE GENUS CALLIHORMIUS ASHMEAD

(Hymenoptera: Braconidae)

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Ashmead (1900, p. 148) characterized the genus *Callihormius* only as he included it in his key to the Ichneumonoidea, placing it in his subfamily Spathiinae, tribe Hormiini. However, *Callihormius* belongs in the subfamily Doryctinae, tribe Doryctini, as I have defined it (Marsh, 1965). In the present study, I have interpreted the genus in a broader sense than has been done previously. For instance, one of the species described below, *stigmatus*, has a stigma in the male hind wing; my earlier diagnosis of the genus indicated that no stigma is present in the male (*ibid.*, p. 697). The presence or absence of a stigma in the hind wing has been given generic value, but I believe that, as more genera of the Doryctinae are critically studied, this character will not always be generically significant.

Callihormius contains five Nearctic species, four of which are described as new. The known hosts include larvae of beetles of the families Buprestidae and Cerambycidae.

Genus **Callihormius** Ashmead

Callihormius Ashmead, 1900, p. 148. Type-species: *Pambolus bifasciatus* Ashmead, 1892. Monob. and orig. desig.

Head transverse; first flagellar segment longer than second; notauli absent or very weakly indicated; scutellar disc sometimes greatly convex or swollen; fore tibia with a row of 5–10 spines on anterior edge; fore wing with three cubital cells; recurrent vein entering first cubital cell; subdiscoideus leaving first brachial cell well above its middle, first brachial cell open at apex; media somewhat sinuate; fore wing with two or three dark transverse bands; radiella, cubitella, and post-nervellus very weak or absent; one species with a stigma in hind wing of male; abdomen longitudinally rugose on at least first tergum and basal one-half of tergum (2 + 3).

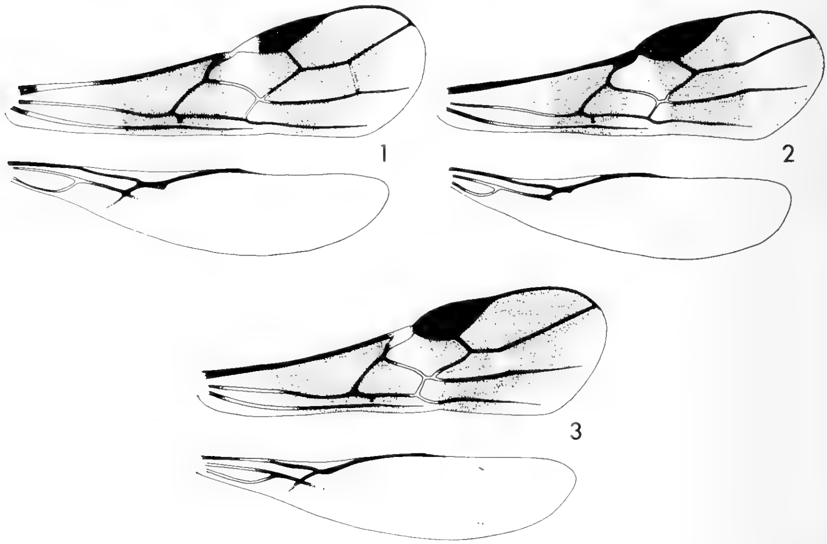
Key to Nearctic Species

1. Males 2
   Females 3
2. Hind wing with a large stigma (fig. 5) ..... **stigmatus** Marsh
   Hind wing without a stigma ..... **bifasciatus** (Ashmead)
3. Ovipositor at least nearly as long as abdomen, usually longer 4
   Ovipositor at most equal to one-half length of abdomen 5
4. First abdominal tergum longer than its apical width; mesonotum with a large, longitudinally rugose area in front of scutellar furrow (fig. 6); cubitus between recurrent vein and first intercubitus greater than one-half length of first segment of radius (fig. 4) ..... **stigmatus** Marsh
   First abdominal tergum shorter than its apical width; mesonotum lacking a rugose area or, rarely, with a small one in front of scutellar furrow; cubitus between recurrent vein and first intercubitus shorter than one-half length of first segment of radius (fig. 2) ..... **bifasciatus** (Ashmead)
5. Second segment of radius less than 1.5 times length of first (fig. 3); scutellum flat; abdominal terga sculptured beyond (2+3) ..... **werneri** Marsh
   Second segment at radius at least twice length of first; scutellum convex; abdominal terga smooth beyond (2 + 3) 6
6. Thorax dark brown; mesopleural disc granular; fore wing with two dark cross bands (fig. 1) ..... **bajaensis** Marsh
   Thorax light brown; mesopleural disc smooth; fore wing with three dark cross bands (fig. 7) ..... **texanus** Marsh

Callihormius bajaensis, n. sp.
(Fig. 1)

Female.—Length 4.5 mm. Dark brown except head and tarsi lighter brown and antennae honey yellow with apical segments dark brown. Vertex and frons granular, temples smooth, face rugulose; distance between lateral ocelli nearly one-half ocellocular distance; malar space about two-thirds eye height; antennae 26-segmented. Pronotum lengthened, dorsal length greater than scutellar disc; mesonotum granular; notauli very weakly indicated, with a small v-shaped foveolate area where they meet before scutellar furrow; scutellar furrow with 7 cross carinae; scutellar disc granular, convex, rounded; propodeum without definite carinae, rugose, sloping gradually to apex; propleuron and mesopleural disc granular; mesopleural furrow weakly foveolate, nearly equal in length to mesopleural width. Legs granular, fore legs weakly so. Wing venation as in fig. 1; cubitus beyond recurrent vein very short, recurrent entering extreme apex of first cubital cell. First abdominal tergum longer than its apical width, longitudinally rugose and granular, with a definite raised median area; spiracles prominent; tergum (2 + 3) longitudinally rugose and granular on basal two-thirds; remainder of abdominal terga smooth; ovipositor equal to one-half length of abdomen.

Male.—Unknown.



Figs. 1–3, fore and hind wings of *Callihormius* species, females: fig. 1, *bajaensis*; fig. 2, *bifasciatus*; fig. 3, *werneri*.

Holotype Female.—MEXICO: Baja California, 2.8 miles SSE of Todos Santos, December 25, 1958, H. B. Leech, by beating dead leaves of living *Yucca valida*. USNM type no. 68922.

Paratypes.—2 ♀♀, same data as for type. Deposited in U. S. National Museum.

This species is similar to *texanus* but is easily recognized by its darker color, wing maculation, and granular mesopleural disc. The number of antennal segments in the type series ranges from 23–27 and the size from 3–4.5 mm.

Distribution.—Known only from northern Baja California.

Host.—Unknown.

Callihormius bifasciatus (Ashmead)
(Fig. 2)

Pambolus bifasciatus Ashmead, 1892, p. 289. Lectotype in U. S. National Museum.

Female.—Length 3–4 mm. Thorax and abdomen beyond tergum (2 + 3) dark brown; head, legs, and abdominal terga 1 and (2 + 3) lighter brown; antennae yellowish-brown, apical segments dark brown. Head entirely granular, width greater than length or height; eyes large, malar space equal to one-half eye height; antennae 19 to 25-segmented; distance between lateral ocelli less than ocellocular distance. Mesonotum granular; notauli absent except for weak indications anteriorly; pronotum rugose, dorsal length equal to length of scutellar disc; propleuron finely granular; scutellar furrow with 8–10 cross carinae; scutellar disc finely granular, usually swollen, rarely somewhat flattened; rounded in transverse section when swollen; mesopleural disc granular; mesopleural furrow shallow, weakly foveolate, slightly longer than one-half mesopleural width; basilateral areas of propodeum smooth or finely granular; remainder of propodeum rugose. Fore wings with two dark cross bands; venation as in fig. 2. Length of first abdominal tergum less than apical width; first tergum longitudinally rugose, median area not distinctly raised; tergum (2 + 3) longitudinally rugose, with two or three transverse grooves; basal three-fourths of fourth and fifth terga longitudinally rugose, remainder of terga smooth or slightly granular; ovipositor usually as long as abdomen, sometimes slightly shorter.

Male.—Essentially as in female; length 2.5–4 mm; color sometimes darker.

Type Locality.—Morgantown, West Virginia.

Ashmead did not designate a type specimen in his original description. I have, therefore, chosen as the lectotype of *bifasciatus* a specimen from Ashmead's type series to which is attached a label with the number 3241 printed on it and another label in Ashmead's handwriting, "Pambolus bifasciatus Ashm." The above mentioned number refers to Ashmead's notes which state that this specimen was reared by A. D. Hopkins at Morgantown, West Virginia, from *Anthaxia viridicornis* (Say) in willow. I have attached a red lectotype label to the specimen and deposited it in the U. S. National Museum, type no. 68923.

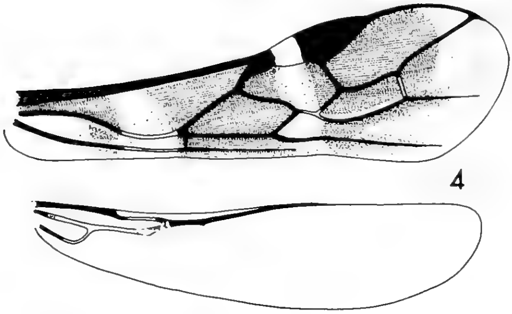
This species can be distinguished by the short first abdominal tergum and the transverse grooves on the tergum (2 + 3). On nearly all specimens that I have seen, the scutellar disc is convex. However, on a few specimens, including the lectotype, the scutellar disc is nearly flat.

Distribution.—California, Louisiana, North Carolina, Texas, Virginia, Washington, D. C., and West Virginia. The specimen from California agrees completely with the lectotype and other eastern specimens, indicating that the distribution of *bifasciatus* is probably throughout the entire United States.

Hosts.—Anthaxia viridicornis (Say) and *Xylotrechus quadrimaculatus* (Haldman).

Callihormius stigmatus, n. sp.
(Figs. 4, 5, 6)

Female.—Length 3.5 mm. Color brown except abdomen beyond first segment which is dark brown, nearly black. Head transverse; eyes large, malar space less than one-half eye height; vertex and face striate, rest of head granular; antennae 27-segmented; distance between lateral ocelli equal to ocellocular distance. Pronotum dorsally shorter than scutellar disc; mesonotum granular, with a wide, longitudinally rugose area in front of scutellar furrow (fig. 6); notauli absent except for very weak indications anteriorly; scutellar furrow with 8 cross carinae; scutellar disc strongly convex, triangular in transverse section; propodeum without a definite pattern of carinae, longitudinally rugose, lateral corners angulate; pro-



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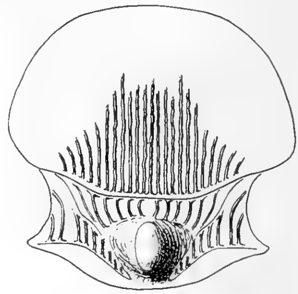

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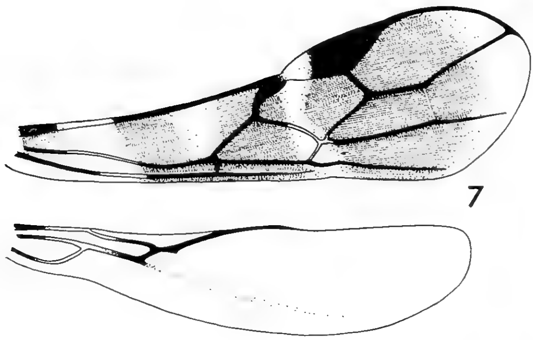

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Figs. 4, 5, 7, wings of *Callihormius* species: fig. 4, *stigmatus*, female, fore and hind wings; fig. 5, *stigmatus*, male, hind wing; fig. 7, *texanus*, female, fore and hind wings. Figs. 6, 8, Dorsal view of mesonotum: fig. 6, *stigmatus*; fig. 8, *texanus*.

pleuron finely rugose; mesopleural disc granular; mesopleural furrow weakly foveolate, slightly longer than one-half mesopleural width. Fore wing with three dark cross bands, venation as in fig. 4; recurrent vein and cubitus sinuate, cubitus between recurrent and first intercubitus greater than one-half first segment of radius. First abdominal tergum much longer than apical width, longitudinally rugose, with no raised median area, spiracles prominent, tergum (2 + 3) longitudinally rugose on basal three-fourths, with one weak sinuate tranverse groove; remainder of terga granular; ovipositor nearly as long as thorax and abdomen combined, curved upward.

Male.—Essentially as in female; hind wing and with a stigma (fig. 5).

Holotype Female.—FLORIDA: Homestead, July 19, 1918, G. E. Moznette, ex. buprestid in avocado. USNM type no. 68924.

Paratypes.—FLORIDA: 7 ♀♀, 1 ♂, same data as for type. LOUISIANA: Shreveport, 1 ♀, October, 1956. NEW JERSEY: Camden, 1 ♂, August 26, 1897. TEXAS: Foard County, 1 ♀, August 26, 1948, Stevens. Deposited in U. S. National Museum.

This species is quite distinct from others in the genus and can be recognized by the wing venation and convex scutellum. The male differs from other species in the presence of a stigma in the hind wing. There is no noticeable variation in the type series other than the number of antennal segments which ranged from 25 to 28. Besides the type series, I have seen two specimens from the Archbold Biological Station, Florida, which are entirely dark brown but are otherwise identical with the type.

Distribution.—The range of *stigmatus* is definitely throughout the southern gulf states but probably extends along the eastern coast, as indicated by the single specimen from New Jersey.

Host.—None recorded other than an unknown buprestid in avocado.

Callihormius texanus, n. sp.
(Figs. 7, 8)

Female.—Length 3.5 mm. Head, anterior portion of prothorax, legs, first abdominal tergum, and basal two-thirds of tergum (2 + 3) honey yellow, remainder of thorax brown, remainder of abdomen dark brown. Head transverse; vertex and frons granular, face finely rugulose, temples smooth; malar space slightly less than one-half eye height; antennae broken on type; distance between lateral ocelli less than ocellocular distance. Pronotum longer dorsally than scutellar disc; mesonotum granular; notauli very weakly indicated, with a small v-shaped foveolate area where they meet at scutellar furrow (fig. 8); scutellar furrow with 7 cross carinae; scutellar disc granular, convex; propodeum without definite carinae, rugose; mesopleural disc smooth; mesopleural furrow weakly foveolate, about three-fourths mesopleural width. Fore wings with three dark cross bands; venation as in fig. 7. First abdominal tergum nearly as wide at apex as long, longitudinally rugose, with a definitely raised median area; tergum (2 + 3) longitudinally rugose on basal two-thirds, with one sinuate, transverse groove; remainder of abdominal terga smooth; ovipositor less than one-third length of abdomen.

Male.—Unknown.

Holotype Female.—TEXAS: Double Bayou, August 26, 1918, E. L. Diven, on citrus borer. USNM type no. 68925.

This species, described from a single specimen, can be easily recognized by the maculation and venation of the wings, the short ovipositor, and the smooth mesopleural disc.

Distribution.—Known only from Texas.

Host.—Unknown.

Callihormius werneri, n. sp.
(Fig. 3)

Female.—Length 2.5 mm. Head, thorax, and first abdominal tergum red-brown, abdomen beyond first tergum dark brown, legs light brown, antennae honey yellow with last four flagellar segments black. Head strongly transverse; malar space equal to one-half eye height; vertex and frons finely granular, temples smooth, face finely rugulose; antennae 19-segmented; distance between lateral ocelli nearly equal to ocellocular distance. Thorax flattened dorsiventrally; notauli absent; pronotum dorsally longer than scutellar disc; mesonotum granular, with a wide, longitudinally rugose area in front of scutellar furrow; scutellar furrow with 8 cross carinae; scutellar disc flat, granular; propodeum nearly horizontal, coarsely punctate, carinae absent; mesopleural disc smooth; mesopleural furrow smooth, nearly as long as mesopleural width. Wing venation as in fig. 3; first segment of radius nearly equal to second. Length of first abdominal tergum equal to apical width; first tergum longitudinally rugose, median area not distinctly raised; tergum (2 + 3) longitudinally rugose, with one weak transverse groove; fourth and fifth terga granular, remainder of terga smooth; ovipositor less than one-half length of abdomen.

Male.—Unknown.

Holotype Female.—ARIZONA: Brown Canyon, Baboquivari Mountains, August 4, 1962, F. Werner, P. Johnson, U.V. 1t. trap. USNM type no. 68926.

Paratypes.—ARIZONA: 8 miles N. Vail, Pima Co., 1 ♀, August 30, 1962, F. Werner, W. L. Nutting, U.V. 1t. trap; Hk. Hwy. mi. 5, Santa Catalina Mountains, 1 ♀, August 11, 1961, Nutting, Werner.

This species can be recognized by its small size, wing venation, and flattened thorax. The color of the thorax and legs is occasionally lighter than in the type; also there may be as many as six dark segments at the tip of the antennae. The number of antennal segments ranges from 18 to 19.

Distribution.—Known only from Arizona.

Host.—Unknown.

This species is named for Floyd G. Werner, University of Arizona.

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TAXONOMIC CHANGES IN THE TENTHREDINIDAE
(Hymenoptera: Symphyta)

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During a recent visit to the Museum of Comparative Zoology at Harvard University and the Canadian National Collection at Ottawa, Canada, I was able to examine some sawfly types of species which were previously unplaced or unstudied. The purpose of this paper is to indicate several taxonomic changes which are necessary as a result of this study and which are not included in the Second Supplement (Burks, in press) of the Hymenoptera Catalog (Ross, 1951).

A future paper is planned which will deal with other species described by Edward Norton. Norton was one of the first workers on North American sawflies and described approximately 240 species between 1860 and 1872. Knowledge of his work is of utmost importance in any taxonomic paper dealing with Nearctic sawflies. Unfortunately, the disposition of his collection was rather haphazard. Most of it is at the Academy of Natural Sciences of Philadelphia. Some of his earlier work, however, was done in Boston, where parts of his collection eventually were placed in the Museum of Comparative Zoology or Boston University. Some specimens went to the Peabody Museum of Natural History, Yale University. Consequently, there is considerable confusion as to the location of his types. About 50 of them cannot be located; in some instances there are specimens designated as types of the same species at two different museums, and, in other cases, neotypes have been designated where type specimens actually exist. Further searching and study at the museums concerned will be needed to clarify this problem.

Allantus obesus Norton

The type is glued onto a piece of cardboard and has the end of the abdomen missing. The following labels are on the specimen: "174", "*Eriocampa obesa* Norton", and "M.C.Z. Type 26310." The identification label to the left of the specimen reads "*Sciapteryx obesus* Say"; "Say" is crossed out and "Norton" written in. This species was placed under the "Unplaced Species of Tenthredinidae" by Ross (1951). Examination of the type showed it to be the same as *Eriocampa juglandis* (Fitch).

Eriocampa juglandis (Fitch)

Tenthredo (*Allantus*) *obesus* Harris, 1835 (1834), *in* Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass. p. 583. *Nomen nudum.*

Selandria? juglandis Fitch, 1857 (1856), Trans. N.Y. State Agr. Soc. 16: 467, larva.

Allantus obesus Norton, 1860, Proc. Boston Nat. Hist. Soc. 7:260, ♂. **New synonymy.**

Allantus rufescens Norton

Ross (1951) placed this species in the genus *Strongylogaster.* Although most of the head and abdomen of the type have been eaten away, it definitely belongs in the genus *Tenthredo* and should be transferred to "Unplaced Species" at the end of that genus. There are two labels on the type, one reading "513, ♀, Maine", the other "M.C.Z. Type 26304."

Tenthredo rufescens (Norton). **New combination.**
Allantus rufescens Norton, 1860, Jour. Boston Soc. Nat. Hist. 7: 245, ♀.

Nematus flavipes Norton

Ross (1951) placed this species in *Amauronematus;* however, it should be transferred to *Nematus* (*Pteronidea*). The type bears two labels, one reading "357", the other "M.C.Z. Type 26321."

Nematus (*Pteronidea*) *flavipes* Norton. **New Combination.**
Nematus flavipes Norton, 1861, Proc. Boston Nat. Hist. Soc. 8: 159, ♀.

Nematus obscurus Norton

Nematus obscurus Norton, 1861, Proc. Boston Nat. Hist. Soc. 8: 160, ♀.

This was put in the "Unplaced Nematinae" by Ross (1951) but should be transferred to *Nematus* (*Pteronidea*). The type bears the data "247 ♀" and "M.C.Z. Type 26323."

Nematus pallicornis Norton

This species was placed under *Nematus* (*Pontania*) by Ross (1951); however, it is a *Pristiphora* and a synonym of *Pristiphora pallipes* Lepeletier. There are three cotypes at the Museum of Comparative Zoology each bearing the label "M.C.Z. Type 26324" and another label on each specimen, respectively "182", "183", and "183? ♀."

Pristiphora pallipes Lepeletier
Pristiphora pallipes Lepeletier, 1823, Monogr. Tenthred. p. 60, ♀.
Tenthredo (*Allantus*) *pallicornis* Harris, 1835 (1834) *in* Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass. p. 583. *Nomen nudum.*
Nematus pallicornis Norton, 1861, Proc. Boston Nat. Hist. Soc. 8: 160, ♀. **New synonymy.**

Nematus stigmatus Norton

This species was placed under the "Unplaced Nematinae" by Ross (1951). Although the type has the head missing and the remainder of the body riddled with holes, it definitely belongs in the genus *Pachy-*

nematus. There are two labels on the specimen, one reading "435 ♀", the other "Holotype No. ....." (no number is written in). This is located at the Museum of Comparative Zoology.

Pachynematus stigmatus (Norton). **New combination.**

Nematus stigmatus Norton, 1861, Proc. Boston Nat. Hist. Soc. 8: 161, ♀.

Selandria marginicollis Norton

This species was unplaced by Stannard (1949) in his revision of North American *Periclista* due to his inability to examine the type. The type is located at the Museum of Comparative Zoology and bears two labels, one reading "268", the other "M.C.Z. Type 26312." The specimen is in fair condition except for the end of the sheath and saw which appear to have been cut off. Examination showed that this is a *Periclista* and conspecific with *Mogerus caryicolus* Dyar.

Examination of the type of *Periclista xanthognatha* Rohwer at the U.S. National Museum (type no. 19045) proved this to be synonymous with *marginicollis* and *caryicolus.* Stannard (1949) had included it as a synonym of *Periclista inaequidens* (Norton).

The taxonomic changes are given below. Those synonyms of *Periclista caryicola* (Dyar) listed by Stannard (1949, 1951) are still valid but become synonyms of *marginicollis.*

Periclista marginicollis (Norton)

Tenthredo (*Allantus*) *marginicollis* Harris, 1835 (1834) *in* Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass., p. 583. *Nomen nudum.*

Selandria marginicollis Norton, 1861, Proc. Boston Soc. Nat. Hist. 8: 220, ♀.

Mogerus caryicolus Dyar, 1897, Jour. N.Y. Ent. Soc. 5: 193, ♂, ♀. **New synonymy.**

Periclista xanthognatha Rohwer, 1917, Proc. U.S. Nat. Mus. 53: 156, ♀. **New synonymy.** Transferred from *Periclista inaequidens* (Norton).

Harpiphorus varipictus Harrington

This species was placed in the genus *Macremphytus* by Ross (1951), but it belongs in the genus *Aglaostigma* and is conspecific with *Aglaostigma dentatum* Ross. The type is in the Canadian National Collection.

Aglaostigma varipictus (Harrington). **New combination.**

Harpiphorus varipictus Harrington, 1889, Can. Ent. 21: 96, ♀.

Aglaostigma dentatum Ross, 1943, Proc. Wash. Ent. Soc. 45: 82, ♂, ♀. **New synonymy.**

Taxonus rufipes Harrington

This type is in the Canadian National Collection. It was put under the "Unplaced Species of Tenthredinidae" by Ross (1951). Examination of this specimen showed it to be in the genus *Strongylogaster* and a synonym of *S. soriculatipes* Cresson.

Strongylogaster soriculatipes Cresson

Strongylogaster soriculatipes Cresson, 1880, Trans. Amer. Ent. Soc. 8: 20; ♀.
Taxonus rufipes Harrington, 1889, Can. Ent. 21: 97, ♂. **New synonymy.**

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TWO NEW SPECIES OF ARCTIIDAE FROM SOUTHERN ARIZONA
(Lepidotera, Arctiidae, Arctiinae)

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It is remarkable that two species as conspicuous as the ones described here could have remained undescribed until this late date. The first is a very distinctive species of *Arachnis* with male genitalia unlike those of any of the other species occurring north of the Mexican Border. The second species, known to collectors in southern Arizona for some time, is one of the truly unique arctiids of the American Fauna; the long, porrect palpi, recalling the Old World Hypsidae, although not unique, are the longest possessed by any of the few species with such palpi. Notwithstanding, it is closely allied to the group of genera typified by *Phaegoptera* and *Halysidota.*

I wish to acknowledge with sincere appreciation the assistance of Mr. David S. Fletcher of the British Museum (Natural History) of London in furnishing specimens of *Pitane fervens* Walker and *Epicrisias eschara* Dyar for study. Without these specimens, it would have been impossible to make meaningful comparisons in the description of *Apocrisias thaumasta.*

I express my gratitude to the American Philosophical Society for a grant (Grant No. 303—Johnson Fund) which made possible the collecting in southern Arizona during the summer of 1960. I also wish to gratefully acknowledge the Grace H. Griswold Fund of the Department of Entomology of Cornell University for defraying the costs of the illustrations.

The drawings are by Miss Linda Yu-ling Chu, and the photographs are by the author.

Arachnis nedyma, n. sp.

A distinctive species with pale pink, translucent hindwings with the dark markings obsolescent in the male, and in the female with the hindwings darker, but with the dark markings also somewhat reduced.

Description: Male. Head with face and palpi gray; a white transverse line at level of antennae; vertex gray, edged with black scales above the white line. Thorax gray with an admixture of white scales, with a dark median and dark lateral lines; patagia gray, margined with black and outwardly by white, a small black spot at lower outer angle; tegulae gray, edged with black and outwardly by a narrow border of white scales. Forewing essentially gray, with the veins marked by white scales and edged by black scales, with six black-bordered, white, rectangular spots on costa, representing the humeral spot and the inception of five transverse white lines ledged with black on inner and outer sides; two short, longitudinal, black bordered white streaks below humeral spot, one in the fold (1st A), the other on 3rd A (below 2nd A). The first transverse line acutely angled outwardly on vein Cu, then equally acutely angled inwardly to vein 2nd A, black filled and widened in the fold; the second parallel to the first, but with the angle widely filled by black, and black in the fold also; the third parallel to the course of the first two, with considerable white in the angle between veins M_2 and Cu_1, black below fold; the fourth essentially parallel to first three, somewhat more widely spaced above angulation between M_3 and Cu_1, black between M_2 and M_3 above angulation and between Cu_1 and fold; the fifth, the outermost line, irregularly and deeply undulate between veins above M_2, and weakly so below; terminal line grayish black; fringe dark gray with white spots at the ends of the veins; inner margin with a fine black line. Hindwing translucent, pale rose pink, darker toward base; a blackish discal spot and an irregular series of postmedial blackish spots; a blackish dot on 2nd A near angle; outer margin and fringe black between veins R and M_1, from slightly above vein M_3 to slightly below vein Cu_1, and at end of fold, otherwise fringe white. Abdomen dark rose-pink above, with a narrow mid-dorsal, gray-black line; valves of genitalia with yellowish hair-like scales; black lateral line; white below. Wings below with markings essentially as above, but with base of forewing pinkish white, and with a wide, transverse antemedial band on hindwing. Thorax below gray; fore leg with femur with basal two-thirds above red, apical third black; femora of mid and hind legs pink with apices broadly marked with black; fore and mid tibiae with central area gray, banded basally and apically with black, with base and apex pink; hind tibia with basal two-fifths and apical fifth pinkish gray, area between blackish; tarsi banded with black and pinkish white.

Female: With markings similar to male, except that the forewings tend to have more extensive black filling in the transverse lines, and the hindwings are more uniformly dark rose-pink with the postmedial spots of the male replaced by a

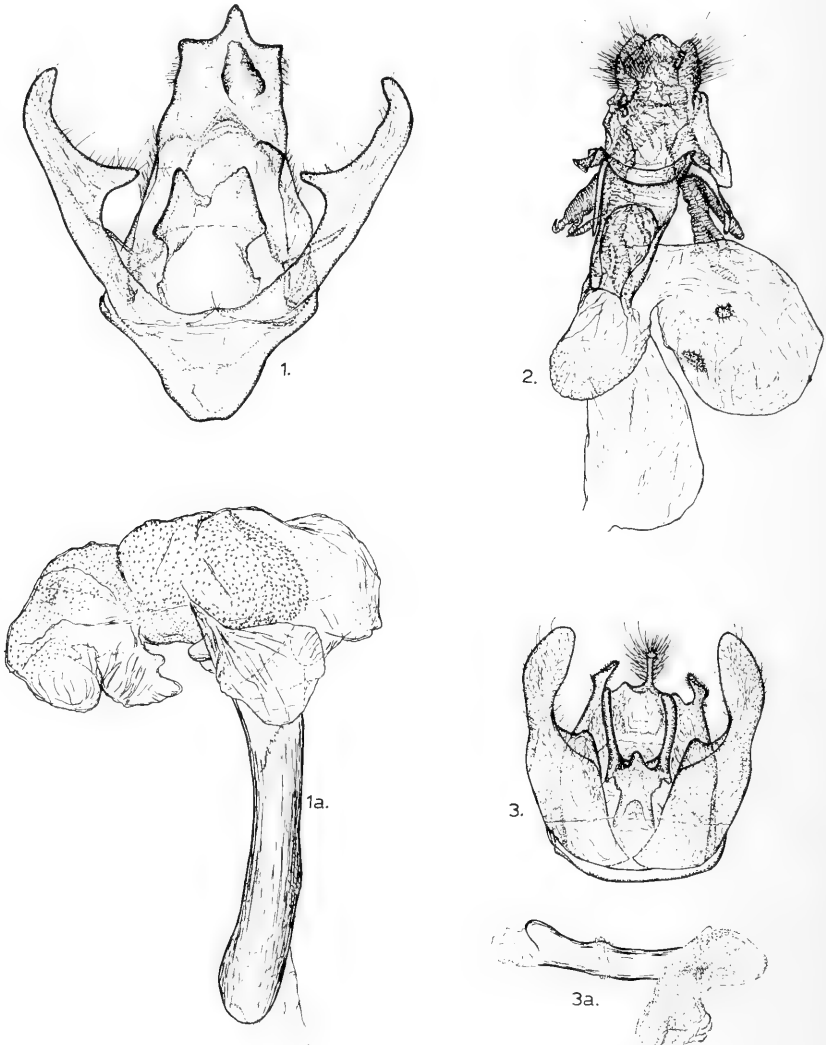

Fig. 1, *Arachnis nedyma* n. sp., male genitalia with aedoeagus removed, slide: J. G. Franclemont 4464, type; fig. 1a, *Arachnis nedyma* n. sp., aedoeagus, slide: J. G. Franclemont 4464, type; fig. 2, *Arachnis nedyma* n. sp., female genitalia, slide: J. G. Franclemont 4465, Madera Canyon 5600′, Santa Rita Mts., Santa Cruz Co., Arizona, 27 June, 1960; fig. 3, *Pitane fervens* Walker, male genitalia with aedoeagus removed, slide: J. G. Franclemont B-81, La Oroya, R. Inambari, Peru, Sept. 1904, 3100 ft., Dry Season (G. Ockenden), British Museum (Natural History) Collection; fig. 3a, *Pitane fervens* Walker, aedoeagus, slide: J. G. Franclemont B-81.

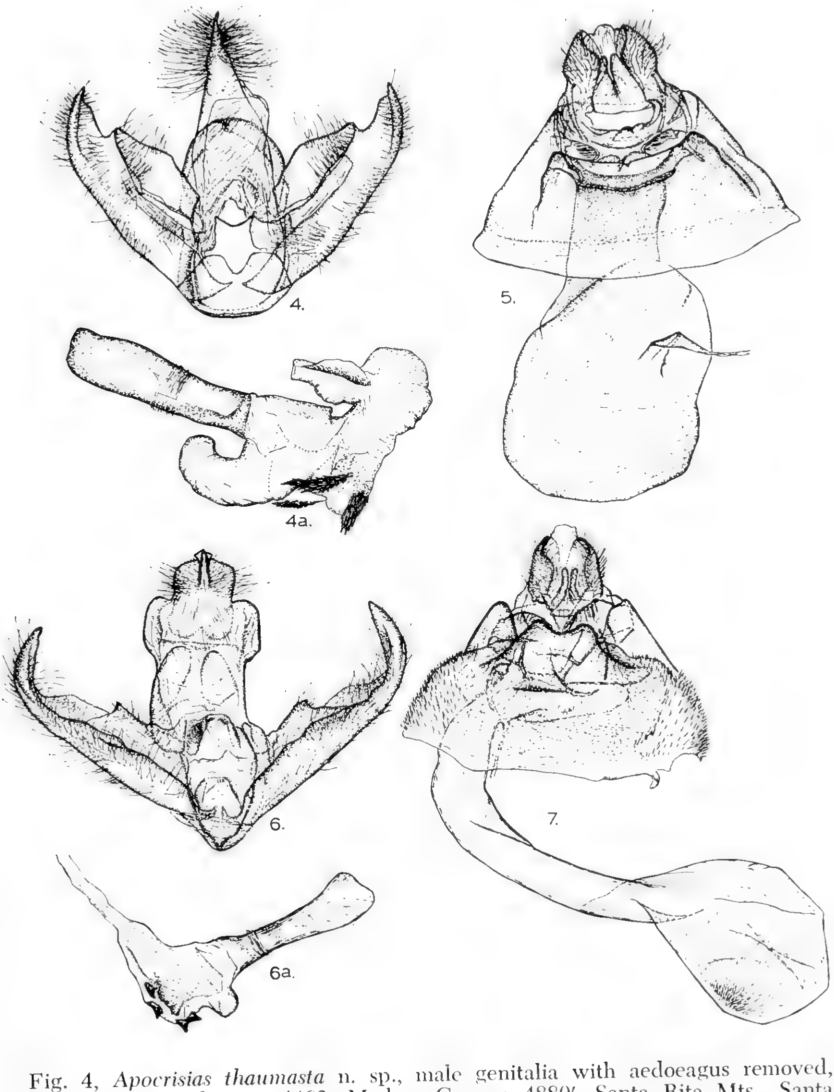

Fig. 4, *Apocrisias thaumasta* n. sp., male genitalia with aedoeagus removed, slide: J. G. Franclemont 4462, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 24 July 1960; fig. 4a, *Apocrisias thaumasta* n. sp., aedoeagus, slide: J. G. Franclemont 4462; fig. 5, *Apocrisias thaumasta* n. sp., female genitalia, slide: J. G. Franclemont 4463, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona; 24 June 1960; fig. 6, *Epicrisias eschara* Dyar, male genitalia with aedoeagus removed, slide: J. G. Franclemont B-82, Mexico, Zacualpan, vi. 17. British Museum (Natural History) Collection; fig. 6a, *Epicrisias eschara* Dyar, aedoeagus, slide: J. G. Franclemont B-82; fig. 7, *Epicrisias eschara* Dyar, female genitalia, slide: J. G. Franclemont B-83, 54.22, Mexico, vii. 21, R. Müller, British Museum (Natural History) Collection.

Fig. 8, *Arachnis nedyma* n. sp., paratype male, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona; 21 June 1960; fig. 9, *Arachnis nedyma* n. sp., paratype female, Madera Canyon 5600′, Santa Rita Mts., Santa Cruz Co., Arizona; 16 June 1960; fig. 10, *Apocrisias thaumasta* n. sp., TYPE, Madera Canyon 5600′, Santa Rita Mts., Santa Cruz Co., Arizona; 21 July 1960.

complete, somewhat irregular, broad blackish band. One specimen has the pink of the hindwings replaced by pale yellow.

Expanse: Males: 40–48 mm. Females: 46–56 mm.

Male genitalia as figured. Immediately distinguishable from the other species occurring north of the Mexican Border by the angulate lateral projections of the base of the uncus.

Female genitalia as figured.

The three plates in J. F. Gates Clarke's 1941 paper on the North American moths of the genus *Arachnis* in vol. 91 of the Proceedings of the United States National Museum may be consulted for figures of the genitalia of the other species.

TYPE: Male. Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona; 24 June 1960; J. G. Franclemont. Genitalia slide: J. G. Franclemont 4464. In Franclemont Collection.

PARATYPES: 12 Males. Madera Canyon 4880′ (2), Madera Canyon 5600′ (4), Santa Rita Mts., Santa Cruz Co., Arizona; 17 June–26 June 1960 (5), 28 June 1963 (1); J. G. Franclemont. In Franclemont Collection.

12 Females. Madera Canyon 4880′ (1), Madera Canyon 5600′ (11), Santa Rita Mts., Santa Cruz Co., Arizona; 16 June–28 June, 1960; J. G. Franclemont. In Franclemont Collection.

Apocrisias, n. gen.

Type: *Apocrisias thaumasta*, n. sp.

A distinctive genus of the Phaegopterini, related to *Halysidota* and *Hypocrisias*, but immediately distinguishable by the long, upcurved palpi with the third segment exceeding the vertex by its entire length. *Apocrisias* differs from *Pitane* Walker, 1854, and *Epicrisias* Dyar, 1912, both of which also have long palpi by the greater length of the palpi and the somewhat spatulate third segment. The genitalia of both sexes differ from those of *Epicrisias*; the tegumen of the male genitalia is less massive, and the uncus is very different in shape, see figures 4 and 6. The armature of the vesica of the aedoeagus consists of three groups of fine cornuti in *Apocrisias* and of four very stout, short cornuti in *Epicrisias*. In the female of *Apocrisias* the ductus bursae is short and broad, whereas it is long and narrow in *Epicrisias*; the many other differences may be seen by consulting figures 5 and 7. The male genitalia of *Pitane*, unlike either *Apocrisias* or *Epicrisias*, has the tegumen with a lateral lobe on each side, the transtilla with long lateral processes, and the vesica of the aedoeagus unarmed, although the surface is covered with minute spicules.

Description: Head clothed with hair-like scales; antennae narrowly pectinate in both sexes, pectinations of male antennae twice the length of those of female; palpi very long, the second segment reaching the vertex, the third segment as long as the second, exceeding the vertex by its entire length; first segment of palpus fringed below with moderately long hair-like scales, second segment fringed on outerside by short hair-like scales, third segment smoothly scaled, somewhat enlarged toward apex and with a sensory pit at apex; tongue well developed; eyes large, wider than front at level of antennae (5 : 4). Thorax clothed with long hair-like scales; legs with closely appressed scales, femora fringed on hind surfaces with long hair-like scales, tibial spurs short, subequal to third segment of tarsus. Forewing elongate, two and one-third times as long as wide; outer margin evenly curved; no accessory cell; R_1 arising from discal cell three-fourths way from base; R_2 from outer one-sixteenth; R_{3-5} stalked from upper angle of cell; R_5 from stem before R_2; M_1 from upper angle of cell; M_2 and M_3 from lower angle of cell. Hindwing with Sc well developed, reaching costa just beyond outer two-thirds; R and M_1 from upper angle of cell; M_2 and M_3 from lower angle of cell, often very shortly stalked. Abdomen above with long hair-like scales on basal two-thirds; caudal third closely scaled and with some short hair-like scales; below closely scaled.

Male and female genitalia as figured.

Apocrisias thaumasta, n. sp.

A moderately large arctiid with long, porrect palpi; the general color tawny and salmon with the dorsum of the abdomen scarlet.

Description: Sexes similar. First segment of palpus tawny with a few scarlet scales at distal end on outerside toward eye; second segment black with a few tawny scales and a patch of scarlet scales on outerside, anterior margin and innerside tawny; third segment black with a few tawny scales. Head with front and vertex tawny with a slight salmon cast. Thorax concolorous with head, each patagium with a central, black, punctiform spot, each tegula with two punctiform spots; hind part of thoracic disk with some long scarlet hairs. Forewing tawny and tawny-gray, the ground of the latter, the markings of the former; costa with five narrow, cream colored lines representing the inception of the vague tawny cross bands; basal and antemedial bands ill-defined; antemedial band obliquely curved inward from costa to inner margin; median band slightly outcurved, broad, interrupted at cell Cu; postmedial band slightly irregular, incurved toward median band, running parallel with it, or appearing to join it; subterminal band irregular, outcurved; all bands accompanied by series of vague, dark punctiform dots in the cells, but not on the veins; fringe dark tawny gray. Hindwing uniform salmon, some dark scales at apex; fringe yellowish on outer margin, salmon at inner angle and on inner margin. Abdomen scarlet above, with a crimson cast in some lights. Below with wings marked as above, but paler; the antemedial and median bands with the spots in the discal cell pale scarlet. Legs with femora scarlet on inner sides; mid femur with apex tawny black; hind femur with apical half tawny black on outer side; fore tibia tawny black with a broad, pale, tawny band; mid tibia tawny black with moderately narrow median and apical pale tawny bands; hind tibia tawny black with apical half pale tawny; tarsal segments of all legs tawny black with pale tawny apical bands. Abdomen pale tawny.

Expanse: 49–56 mm.

Male genitalia as figured.

Female genitalia as figured.

TYPE: Male. Madera Canyon 5600′, Santa Rita Mts., Santa Cruz Co., Arizona; 21 July 1960; J. G. Franclemont. In Franclemont Collection.

PARATYPES: 37 males, 13 females. Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona; 1 July–23 August 1959; J. G. Franclemont. In Franclemont Collection.

21 males, 9 females. Madera Canyon 5600′, Santa Rita Mts., Santa Cruz Co., Arizona; 30 June–29 July 1960; J. G. Franclemont. In Franclemont Collection.

10 males, 7 females. Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona; 3 July–1 September 1960; J. G. Franclemont. In Franclemont Collection.

Larva: A tussock caterpillar of the *Halysidota* type. Head pale, shining yellow, heavily spotted with light chestnut brown; the areas parallel to the epicranial suture without spotting. Body with most of the tufts composed of pale yellow hairs with some darker hairs intermingled; the darker hairs paler at their bases; verrucae I of mesothoracic segment with very long pale hairs forming pencils, verrucae II with very long dark hairs forming pencils; verrucae I, II, and III of metathoracic segment and of first and second abdominal segments with tufts of short, dense, dark brown hairs; verrucae V of all segments with moderately long, dense tufts of pale hairs; verrucae of eighth abdominal segment with a few very long dark hairs. Reared on *Quercus emoryi* Nutt.

Pupa: As in *Halysidota* and related genera; dark brown.

Epicrisias Dyar

Epicrisias Dyar, 1912, Proc. United States Natl. Mus., vol. 42, p. 55.
Type: *Epicrisias eschara* Dyar, 1912. Original designation and monobasic with a new species.

Epicrisias eschara Dyar

Epicrisias eschara Dyar, 1912, Proc. United States Natl. Mus., vol. 42, p. 55.
Type locality: "Zacualpan, Mexico."
Location of type: United States National Museum.

Epicrisias eschara Dyar; Hampson, 1920, Catalogue of the Lepidoptera Phalaenae in the British Museum, Suppl. vol. 2, p. 333, text fig. 86.

Epicrisias eschara Dyar; Gaede, 1922, *in* Seitz, Gross-schmetterlinge der Erde, vol. 6, p. 383, pl. 53, fig. f [3].

If this species should be taken north of the Mexican Border no difficulty should be encountered in identifying it. The Hampson figure gives a very good representation of the venation and general habitus of the moth. The venation is the same as that of *Apocrisias thaumasta*, but the moth is decidely slighter in build. The figure in the Seitz work conveys a fair approximation of the color of the moth. The differences in the genitalia of both sexes are discussed under *A. thaumasta*.

SEXUAL BEHAVIOR IN THE GENUS ANDROCHIRUS
(Coleoptera: Alleculidae)

J. M. Campbell, *Department of Entomology and Botany, Agricultural Experiment Station, University of Kentucky, Lexington*

Introduction—The genus *Androchirus* is a member of the beetle family Alleculidae or "comb-clawed bark beetles." It contains only two species: *Androchirus femoralis* (Olivier) from the southeastern United States, and *A. erythropus* (Kirby) from the northeastern United States. As far as is known, these species are allopatric in distribution.

Androchirus differs from the other genera of Alleculidae in having the male anterior tarsi very broadly expanded and curved and (except in the monotypic genus *Capnochroa*) the male eighth sternal lobes greatly enlarged and spoon-shaped. To determine the function of these structures, a study was made of the sexual behavior of the two species of the genus.

Although adults of *Androchirus* are seldom collected, larvae are easy to find. Thus I have collected approximately fifty larvae of *A. erythropus* and six of *A. femoralis*. The adults of *A. erythropus* used in the present study were reared from larvae collected in Busey Woods, near Urbana, Illinois; and those of *A. femoralis* from larvae taken 1 mile east of Lucedale, Mississippi.

Methods of Study—Adults were maintained in plastic cages measuring 6 cm. in height, 12 cm. in length, and 8 cm. in width. Each cage had a close-fitting plastic top in which a circular hole about 2 cm. in diameter had been bored and then covered with nylon cloth. A double thickness of paper towelling was cut so as to fit tightly the bottom of the cage. The adults were supplied with a mixture of brewer's yeast, ground Purina Dog Biscuit, and water. The cages were cleaned and the food and water were changed weekly. Under these conditions, adults remained alive for periods of as much as two months.

Adults were confined to individual cages, except during observation of their sexual behavior, to insure prompt mating when individuals of the two sexes were placed together.

Beetles were transferred to standard size petri dishes for all observations of sexual behavior. The bottom of each dish was covered with filter paper to provide secure footing for them. At times small twigs were provided in order to determine the effect on mating behavior of a different substratum. In no case, however, was the behavior appreciably modified by the substratum.

Sexual Behavior—There is no elaborate premating courtship among *Androchirus* beetles, and the behavior during mating is relatively simple when compared to that of some other groups of beetles, such as *Pyrota*, in the family Meloidae (Selander, 1964). The mating

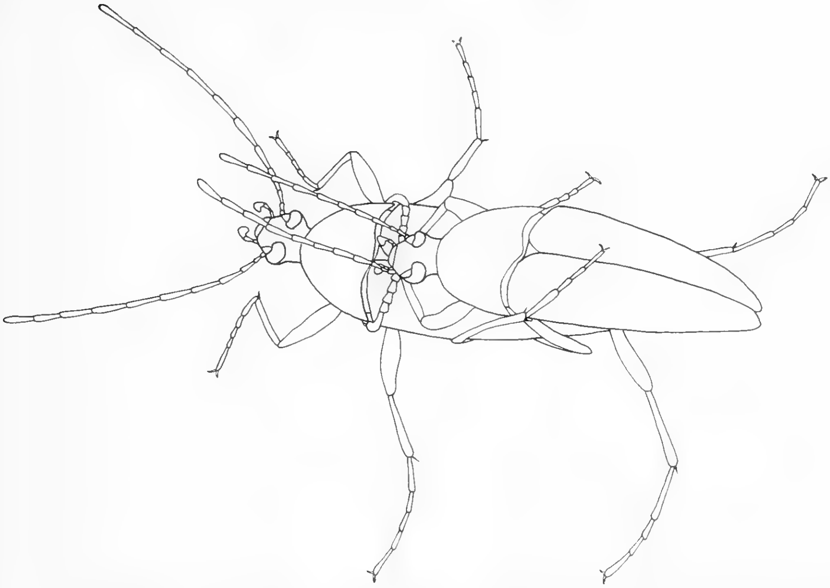

Fig. 1. Mating behavior in *Androchirus erythropus*. Position assumed by male during dorsal phase just after he has mounted female. Note the position of the male anterior tarsi.

behavior may be divided conveniently into two phases. The dorsal phase includes all activities from the initial contact of the sexes through genital coupling. The posterior phase includes those activities following coupling.

Mating of **Androchirus erythropus**

Dorsal Phase (Fig. 1). Mating behavior usually begins shortly after a responsive male and female are placed together in the observation chamber. Initially there is a minute or two of rather disoriented movement, then when the beetles have become calm, the female stands motionless and directs her posterior legs dorsad. The male then normally approaches her from the rear; if the initial contact is made from the front or sides, he will subsequently walk around behind her. The male then stands directly behind the female, facing the same direction, and almost touching her elytral apex with his head. After so orienting, he immediately stands erect at an angle of about 45° to 70° from the surface on his intermediate and posterior pairs of legs, with the anterior pair projecting forward and the eighth abdominal sternum evaginated preparatory to grasping the female. His body usually vibrates rapidly at this time. He then rapidly lunges forward and grasps her tightly at the sides of the elytra with his anterior tarsi (fig. 1). The intermediate legs are wrapped tightly around and under the female near the middle of the elytra, and the posterior legs project posteriad onto the surface. The apex of the male anterior tibiae are held close together along the basal half of the female elytral suture. His anterior tarsi project from the tibiae at approximately a 45° angle so that the modified curve of the tarsi fits evenly over the sides of the elytra and slightly under the thorax. The male holds his antennae parallel and anteriad above the female. Normally the pair remain in this position until coupling is completed, but occasionally the pair fall on their sides.

As soon as he has established a firm grasp on the female with his legs, he curves the apex of his abdomen under her abdomen so that his eighth sternal lobes touch the sides of her fifth visible sternum. These lobes are apparently used to brace and hold the apices of the abdomen together and to help guide the male genitalia to the female gonopore.

Since the apices of the abdomens are touching, it is not possible to observe the actual coupling process. The aedeagus of *Androchirus* is membranous and normally lies inside of the apical piece[1] which is armed with small dentiform setae that project posteriad. It seems probable that in coupling, the apical piece is inserted into the vagina and held in place by the dentiform setae. Following this insertion the aedeagus is presumably evaginated before actual transfer of the spermatophore. This genital coupling is maintained throughout mating.

Under normal conditions the dorsal phase is very short, lasting from 10 to 30 seconds.

Posterior Phase (Figs. 2 and 3). Upon completion of the dorsal phase, the male backs away from the female and in so doing pulls out her ovipositor to its complete length. Because of the length of the ovipositor, the male must stand behind the female so that his anterior legs are about even with her elytral apex. During the extrusion of the ovipositor the male genitalia remain firmly anchored in the apex of the ovipositor.

Once the ovipositor has been completely extruded, the pair assume a very distinct position (fig. 2). The female maintains the same position established preparatory to the dorsal phase. The male stands behind on his intermediate and posterior legs at an angle of about 45° to the surface so that his anterior legs and head are projecting over the rear of the female. If she attempts to move, he rapidly lunges forward and strikes her on the head, pronotum, or base of the elytra with his mouthparts and uses his anterior tarsi to temporarily hold her intermediate femora. At the same time he uses his anterior and intermediate tarsal claws to hold her intermediate tibiae (fig. 3). This

[1] The lateral lobes of alleculids are fused, and I refer to this structure as the apical piece.

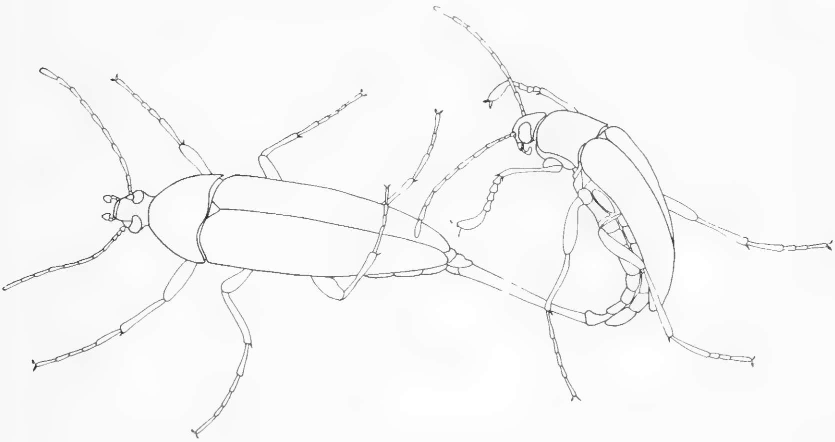

Fig. 2. Mating behavior in *Androchirus erythropus*. Position assumed by male in posterior phase when female is quiescent. Note the vertical position of the female posterior legs.

act momentarily stops any movement by the female but usually must be repeated many times before completion of copulation. As soon as the female becomes motionless the male again assumes his position behind her. When the male is standing behind the female, his anterior legs are often in contact with her posterior legs which apparently helps to maintain his balance and perhaps aids in restraining the female.

Following successful matings, the bursa copulatrix of the female contains one or two large, somewhat hardened, elongate spermatophores. Since distinct pumping movements are observed in the male abdomen during the posterior phase, it is presumed that the spermatophore is transferred at this time.

The posterior phase usually lasts from 5 to 10 minutes. Upon its completion the male allows the female to walk forward while he remains stationary and rears back on his intermediate and posterior legs. After pulling in this manner for a few seconds, he abruptly twists to one side, breaking contact.

Postmating Behavior. Following mating the male cleans his eighth sternal lobes and genitalia with his posterior tibiae. After cleaning, he retracts his terminalia. When exposed to a receptive female immediately following a successful mating, most males will normally attempt another mating immediately. Males have responded for six consecutive matings, each with a different female, although only the first two females of the series were successfully fertilized.

When contact with the male is broken, the female normally walks away from him and begins to clean and retract her ovipositor. Successful retraction of the ovipositor is one of the most critical mating

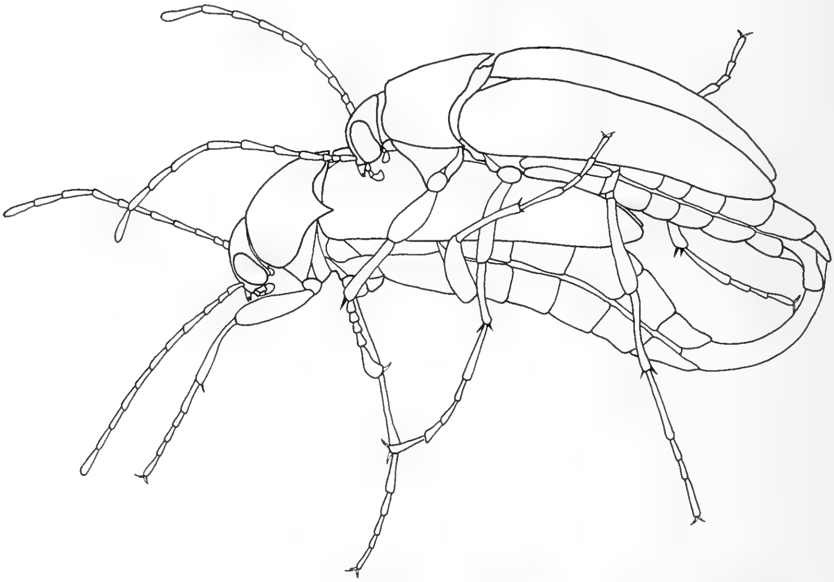

Fig. 3. Mating behavior in *Androchirus erythropus*. Position assumed during posterior phase showing male temporarily returning to dorsal position following forward movement by female. Note the male anterior and intermediate tarsal claws holding the female intermediate tibiae.

acts for the female. This act normally requires from 2 to 15 minutes, but occasionally requires an hour or more. During this time females normally avoid all contact with other individuals. The exact mechanism of this retraction is unknown. While it is going on a second mating is impossible, although the female remains attractive to males.

Mating of **Androchirus femoralis**

The mating behavior of *A. femoralis* is almost identical to that of *A. erythropus*. The only differences noted in the behavior of the female is that the posterior legs are held horizontal, instead of vertical. The male behavior differs slightly in the use of the anterior legs. During the dorsal phase the anterior tarsi project sharply from the tibiae at about a 30° angle so that the modified curve of the tarsi fits evenly over the sides of the elytra. During the posterior phase the male uses the apex of the anterior tibiae more than the anterior tarsi to prevent movement by the female.

Two observations were made on the mating behavior of *A. femoralis*.

Discussion—*Variation*. The descriptions given above apply to interactions between mutually responsive individuals of the two sexes. Females usually become receptive four or five days following their emergence from the pupa, but when confined in the presence of males they are usually forced to mate within one day after their emergence.

Many of the females that mated prematurely died, presumably because of their inability to retract the ovipositor following mating. For this reason, females were kept separated from males for at least one week following their emergence before being used in mating trials. Males become receptive about one day after their emergence and are receptive whenever they have been separated from a female for a day or more.

Females will not normally permit two matings the same day. However, females will mate, although somewhat reluctantly, two or more days following a successful mating. On one occasion a female which had previously mated attempted to mount a male and displayed the acts normal to the male in the dorsal phase, but no posterior phase was attempted.

Interspecific Mating—Several attempts were made to mate females of *A. erythropus* with males of *A. femoralis* and *vice versa.* On three occasions these matings were successful: two of these involved males of *A. femoralis* and one a male of *A. erythropus.* The overt behavior of the individuals involved in these interspecific matings was the same as that normally displayed by individuals of their sex and species in an intraspecific mating, although the duration of the matings was somewhat longer than in intraspecific matings. Thus three interspecific matings lasted from 12 to 15 minutes, as compared with a mean of about 6 minutes for intraspecific ones.

In most interspecific mating trials, the female attempted to avoid the male, but males responded readily to females of the other species. In the three completed matings the major factor leading to success seemed to be the ability of the male to catch and hold the female in spite of her attempted rejection.

Eggs and, subsequently, first instar larvae were obtained after two of the three matings.

Conclusions—As a result of this study it is apparent that the primary function of the modifications of the male anterior tarsi is to facilitate grasping the female while the sexes are coupling. In *A. erythropus* the tarsi were placed at 45° angles to the male tibiae and in *A. femoralis* at approximately a 30° angle. This difference is reflected to a certain degree in the shape of the anterior tarsi. In addition to their primary role in the dorsal phase, the anterior tarsi are also used to some degree in restraining the female during the posterior phase.

The enlarged lobes of the eighth sternum were actively used only during coupling in the dorsal phase. Their function seems to be to brace the apices of the male and female abdomen when they are in contact and probably to guide the male genitalia to the opening of the female gonopore. They also play an incidental role in protecting the delicate ovipositor during the posterior phase.

The act by the male of pulling the ovipositor from the female's body following the dorsal phase seems to be characteristic of many genera of alleculids having a very long ovipositor. The elongate ovipositor probably evolved as a mechanism for inserting eggs deeply into cracks in dead wood, under bark, etc., but it probably handicaps the female during mating for two reasons. First, it may restrict the transference of the spermatheca when in its normal telescoped position. Second, it is very delicate and subject to injury when exposed. Certain of the acts of mating described above probably evolved as a means of avoiding these difficulties.

The problem of a restricted transference of the spermatheca, if a real one, has been solved by the evolution of the male act of pulling the ovipositor out to its full length and holding it in a straight line during the transference. Thus, the spermatheca has a straight, unhindered passage from the male genitalia to the female bursa copulatrix, although the ovipositor is even more susceptible to damage in this position.

Three features of the mating behavior seem to be concerned, at least in part, with the protection of the delicate ovipositor while it is exposed during mating. First, immature females avoid contact with males, allowing time for the ovipositor to become completely hardened. Second, the male behavior during the posterior phase prevents movement by the female, thereby protecting the ovipositor from damage. Third, the male act of maintaining tension on the ovipositor during mating reduces the possibility of injury by dragging on the surface. As mentioned above, the eighth sternal lobes of the male are so modified that during the posterior phase the apex of the ovipositor is held from contact with the surface.

The fact that first instar larvae were obtained from interspecific matings indicates at least a partial genetic compatibility between the two species studied, but I have little doubt of the distinctness of these species. They may easily be separated on the basis of morphological characters. As previously noted, their mating behavior is very similar but some differences were noted in the position of the posterior legs of the female, and in the use of the anterior legs of the male. The attempts of the female to reject males of different species and the longer time required for completion of interspecific matings would also indicate that separate species are involved.

Acknowledgments—I would like to express appreciation to Dr. R. B. Selander for his assistance during the course of this study and for his critical reading of the manuscript. The illustrations were made with the assistance of my wife, Beverly Campbell.

Reference

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A NEARCTIC SPECIES OF IPHITRACHELUS, WITH A KEY TO THE KNOWN SPECIES
(HYMENOPTERA: PLATYGASTERIDAE)

D. L. JACKSON, *Department of Biology, The University of Akron, Akron, Ohio*[1,2]

Iphitrachelus Walker is a distinctive genus, previously known only from Europe where it has a wide distribution (Masner 1957, 1958). (*Iphitrachelus americanus* Ashmead 1891 has been shown by Muesebeck (1939) to be an *Allotropa* sp.) A single North American specimen in the USNM collection represents the first record of this genus outside the Palearctic region. Masner (1957) gave a revised generic diagnosis to which the following characters should be added: occiput with deep, median, conical depression close to the posterior margin; area between antennal sockets with deep, narrow groove; tooth-like projection, if present, formed from anterior margin of clypeus; antero-ventral margin of pronotum very broad, without obvious surface markings, but with deep, cylindrical impression close to fore-coxa; mesoplurae with deep, 3-lobed impression; propodeal membrane extending ventrally and continuous with membrane arising from ventral margin of metaplurae; tergite of first gastral segment with or without a pair of scale-like membranes.

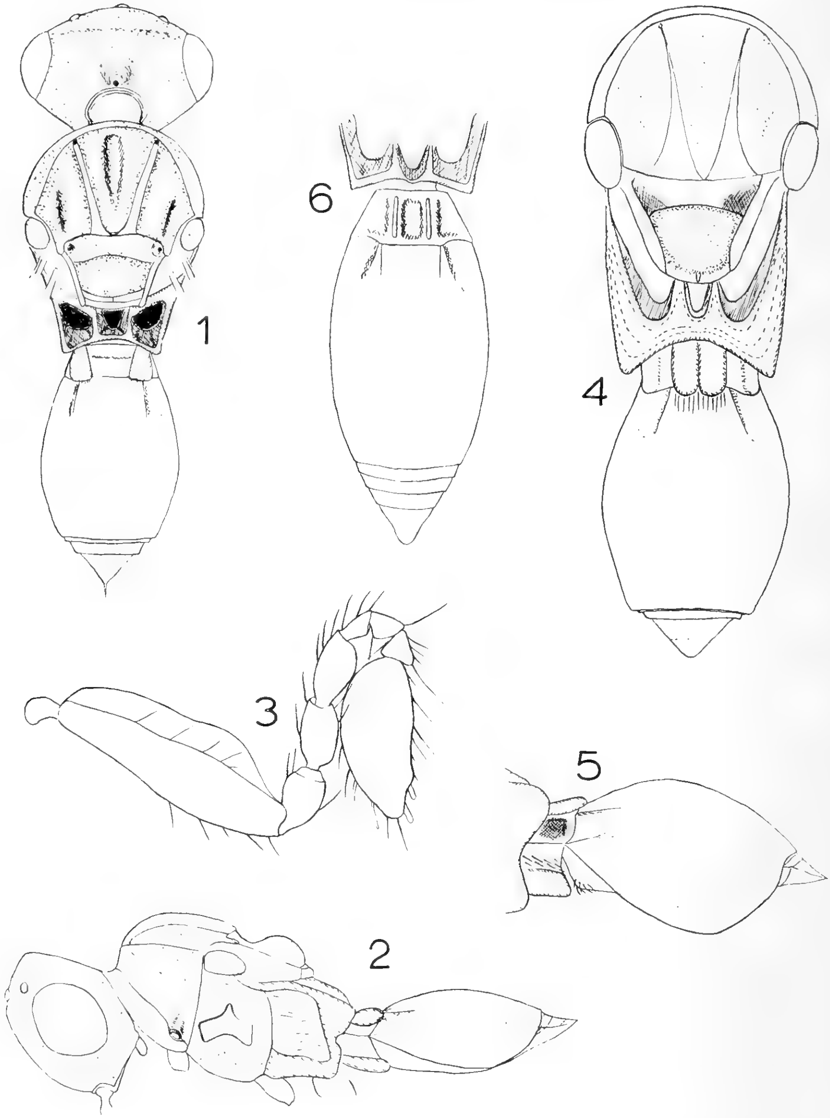
Iphitrachelus foutsi, n. sp.

Female.—Length 0.7 mm. Color, dark brown, all appendages yellow, propodeal and gastral membranes semitranslucent.

Head transverse; coarsely reticulate except clypeus which is smooth and polished; vertex and occiput meeting at acute angle, but carina absent; lateral ocelli only slightly closer to eye margin than to median ocellus. Antennae 8 segmented; surface of scape reticulate; upper lamella absent; lower lamella narrowing gradually distally, maximum width nearly one-half of width of body of segment. Segments 2-4 subequal, 4 without distal neck-like projection; 5-7 small, triangular; 8 forming a broad, massive club, ratio of width to length 9:20. All segments, including scape, with long, erect hairs.

Thorax slightly narrower than head. Prothorax with triangular area next to tegula coarsely reticulate and on same plane as mesopleura; remaining lateral area polished, sloping. Mesonotum coarsely reticulate; parapsidal furrows complete, deeply impressed, wide, but not remarkably expanded posteriorly; causing the sclerite to appear 3-lobed; each lobe with a median, longitudinal impression. Scutellum depressed and polished anteriorly; elevated, rounded and reticulate posteriorly; posterior margin depressed and polished. Metanotum narrow, polished. Mesoplurae polished dorsally with fine longitudinal striae; median area

[1] This work was supported by a grant from the University of Akron Faculty Research Committee.
[2] Immediate publication secured by full payment of page charges.—Editor.



Figs. 1–3. *Iphitrachelus foutsi,* new species, female. Fig. 1, dorsal view; Fig. 2, lateral view; Fig. 3, antenna. Figs. 4–5. *I. gracilis,* female. Fig. 4, thorax and abdomen, dorsal view; Fig. 5, gaster, lateral view. Fig. 6. *I. lar,* female gaster, dorsal view.

polished with large, deep 3-lobed depression; coarsely reticulate ventrally. Metaplurae sparsely covered with long white hairs; dorsal, ventral and posterior margins obscured by continuous membrane. Dorsal surface of propodeal membrane forming a narrow border surrounding a median and two lateral, steep-sided depressions. Fore wings as long as entire body; truncate distally; marginal fringes very short; submarginal vein straight, one-fifth of length of wing. Hind wing as long as thorax and abdomen combined; distal surface sparsely covered with microtrichia; marginal hairs sparse and less than one-third of width of wing. All tarsi 4-segmented; spur of fore tibia comb-like, and opposing surface of basitarsus with similar comb-like row of hairs. Ratio of lengths of fore tarsal segments, 5:2:2:3.

Gaster less than twice as long as wide; shorter and narrower than thorax. Segment 1 transverse; tergite with pair of widely separated, scale-like membranes; sternite covered by single membrane. Tergite 2 polished, basal foveae sharply separated from median area; laterotergites wide, vertical, not adpressed to sternite and not forming carinated edge to gaster; in lateral view not extending past ventral surface of gaster. Sternite 2 with four sharply separated basal foveae; surface with fine longitudinal striae. Terminal segments narrow, carinated laterally, bare, polished, and forming a broad, pointed triangle.

Male.—unknown.

Holotype.—Female, unique. USNM No. 69099. Cabin John, Maryland; Summer, 1916; R. M. Fouts. Left antenna, wings, fore and middle legs mounted on slides with same data.

Although *I. foutsi* is easily distinguished from the Palearctic species *I. lar* Walk. and *I. gracilis* Masn. several of the characters used by Masner (*op. cit.*) to separate these latter species occur in curious combinations in *foutsi*; e.g. the lower scape lamella is very wide, the mesonotum deeply incised and the propodeal membrane semitranslucent with steep sided depressions as in *lar*, while the reduced upper scape lamella, the very wide terminal antennal segment and the form of the gaster (with membranous scales on tergite 1, and the laterotergites of segment 2 very wide, not adpressed to the sternite) are essentially like those of *gracilis*.

The following key will serve to separate the known females of the genus. In *gracilis* the arrangement of the membranes on tergite 1 is identical in male and female, and the use of this character in the key will probably also serve to separate the males of all three species.

Key to the Species of **Iphitrachelus**

1. First gastral tergite without scale-like membranes (Fig. 6); laterotergites of segment 2 not especially wide, adpressed to sternite .... **lar** Walk.
   First gastral tergite with pair of scale like membranes; laterotergites of segment 2 wide, not adpressed to sternite 2
2. Membranes on tergite 1 contiguous (Fig. 4); laterotergites of segment 2 hanging below level of sternite (Fig. 5) .... **gracilis** Masn.
   Membranes on tergite 1 widely separated, (Fig. 1); laterotergites of segment 2 at widest point level with ventral surface of sternite (Fig. 2) .... **foutsi** n. sp.

References

Masner, L. 1957. Remarks on the genus *Iphitrachelus* Walker, 1935. (Hym. Scelionidae) Acta. Soc. Ent. Czechosl. 54:54–61.

————. 1958. Zusatzliche Bemerkungen zur Gattung *Iphitrachelus* Walk. (Hym. Scelionoidea) Schweiz. Ent. Gesell. Mitt 31 (1):52–56.

Muesebeck, C. F. W. 1939. A new mealybug parasite. (Hymenoptera: Scelionidae) Can. Ent. 71:158–160.

TAPINOMA MELANOCEPHALUM ATTACKS LABORATORY FLEAS IN PUERTO RICO

(Hymenoptera: Formicidae)

Paratrechina longicornis (Latreille) attacks fleas in Puerto Rico (Fox and Garcia-Moll, 1961, J. Econ. Ent., 54 (4): 1065). Herewith, we implicate another species, *Tapinoma melanocephalum* (Fabricius), known also to prey on flies (Pimentel, 1955, J. Econ. Ent., 48 (1): 29).

In March 1966, *T. melanocephalum* workers began to visit a laboratory colony of the sticktight flea, *Echidnophaga gallinacea* (Westw.), maintained on a hamster. We suspected that the ants were removing eggs and possibly attacking larvae when a sharp decrease in daily flea egg counts followed. Although ants did not attack flea eggs and larvae when placed together in vials, they did rapidly remove eggs and attack larvae which were placed across an ant column on a laboratory bench. Smaller larvae were seized and, still wiggling, removed almost immediately by a single ant. A larger larva was seized by one to five workers and held for approximately a minute, but only one worker carried the larva, now moribund, from the area. Similar results were obtained with the larvae of the oriental rat flea, *Xenopsylla cheopis* (Rothschild).

Before the ant invasion daily counts of sticktight flea eggs were over a hundred, but after three days of ant attacks counts dropped to five. Beechwood-creosote, applied outside the flea colony, repelled the ants. Thereafter, daily egg counts progressively increased to a high of 70 five days later.

D. R. Smith identified the ant. This work was supported by Graduate Research Training Grant 5 T1 AI 15 from the National Institutes of Health, U. S. Public Health Service.—J. R. Tamsitt and Irving Fox, *Dept. of Medical Zoology, School of Tropical Medicine, San Juan, Puerto Rico.*

A KEY TO THE SPECIES OF THE GENUS XANTHACRONA WULP
(DIPTERA, OTITIDAE)

The catalog of the "subfamily" Pterocallinae by Aczél (1951, Acta Zool. Lilloana 11: 397–433) gives bibliographic citations for the known species of *Xanthacrona* Wulp, but no key has so far appeared. Examination of the type of *X. tuberosa* Cresson, topotypical material of *X. ypsilon* Enderlein, and other material in the U.S. National Museum has been the basis for the following effort. Data on the distribution of the species will be cited in the catalog of neotropical Diptera now in preparation, but the record of *X. bipustulata* Wulp within the limits of the North American catalog, may be cited; Hidalgo County, Texas, in trap, 30 Nov. 1937 (Burl Stugard), in USNM.

The modifications of the scutellum mentioned in the key and the flattened bristles of *X. phyllochaeta* do not appear to differ in the sexes. *X. ypsilon* was described as a variety of *X. bipustulata.*

KEY TO SPECIES OF **Xanthacrona**

1(2). Large part of marginal cell of wing hyaline, median band not extending thereinto; scutellum largely yellow; posterior fronto-orbital and penultimate dorsocentral bristles broadly fan-shaped .... **X. phyllochaeta** Hendel

2(1). Marginal cell wholly brown or yellowish; median band running into it; scutellum largely black or with protuberances and grooves; all bristles simple.

3(4). Scutellum with 3 polished black spots; thorax dark brown, rusty yellowish in vicinity of root of wing and humerus; dark color of median wing band traverses yellow of costal seam and fills pterostigma with exception of both ends .... **X. tripustulata** Enderlein

4(3). Scutellum largely black, with 2 large black areas, or with 5 black areas; thorax largely yellowish, or if darker then without root of wing and humerus lighter; pterostigma either wholly dark brown or with hyaline spot in anterobasal corner.

5(6). Scutellum simply swollen, ovoid, largely black, but with median yellow stripe apically and on under side; wing pattern and costa usually evenly dark brown, the costa never yellowish with closely alternating small dark spots .... **X. ypsilon** Enderlein, new status

6(5). Scutellum swollen, but with median channel or high dorsal protrusions; costa yellowish with closely spaced dark brown spots; wing pattern variegated with yellow and brown.

7(8). Scutellum with distinctly developed median yellow channel, protruding side parts rounded, black, usually yellowish at base of bristles; membrane about tip of vein *Sc* only slightly paler than pterostigma generally .... **X. bipustulata** Wulp

8(7). Scutellum with pair of high, two-domed, black-tipped dorsal elevations, apex of scutellum with 3 black spots, of which the lateral pair are connected by dark lines with the lower base of scutellum; membrane about tip of vein *Sc* with more or less extensive hyaline areas .... **X. tuberosa** Cresson

GEORGE C. STEYSKAL, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

SYNONYMY OF A WEST INDIAN SPITTLEBUG, DELETING THE GENUS CLOVIA FROM THE AMERICAS

(HOMOPTERA: CERCOPIDAE)

Comparison of specimens collected during the Bredin-Archbold-Smithsonian Biological Survey of Dominica with descriptions of the several cercopids listed for the West Indies revealed the synonymy of two species names, as summarized below:

Pseudocraniolum modestum (Gibson), **New Combination**

Clovia modesta Gibson, 1919, Proc. U.S. Nat. Mus., vol. 55, pp. 276–277 (Dominica).

Pseudocranion insularis Schmidt, 1922, Archiv Naturgesch., Abt. A, Heft 8, pp. 183–184 (Guadeloupe) **New Synonymy.**

Pseudocraniolum insularis; Hedicke, 1923, Deut. Ent. Zeitschr., 1923, p. 72.

Clovia modesta; Metcalf, 1962, Gen. Cat. Homoptera, Fasc. VII, Part 3, p. 112.

Pseudocraniolum insularis; Metcalf, 1962, ibid, p. 135.

The type of *modesta*, which Gibson reported as deposited in the U.S. National Museum, was not found during this study. The description of *insularis* permits confident association of that name with this insect so no effort was made to consult its type originally described as property of the Stettin Museum.

Gibson expressed doubt about assigning his species as the sole New World representative of a large, common, Old World genus. Although Metcalf kept *modesta* as the lone *Clovia* for the Western Hemisphere, the species definitely does not belong to that genus and the name is transferred as above.—RICHARD C. FROESCHNER, *Department of Entomology, Smithsonian Institution, Washington, D.C. 20560.*

THREAT DISPLAY IN UNACCOMPANIED FEMALES OF THE DAMSELFLY, ISCHNURA VERTICALIS (SAY)
(Odonata: Coenagriidae)

Grieve (1937, Entomologica Americana 17: 121–152) mentions courtship in *Ischnura verticalis* (Say) stating that a perched female flexes her abdomen ventrally, and vigorously fans her wings to attract the attention of an approaching male. Corbet (1963, A Biology of Dragonflies, p. 180) considers it remarkable that the ventral curving of the abdomen in *verticalis*, interpreted as attracting males, resembles the posture which aeshnids use to escape males. Johnson (1962, Texas Jour. Sci. 14: 297–304) notes that Grieve's observation suggests cleaning processes, and states that reinvestigation is needed.

During the summer of 1965, behavior, apparently identical with Grieve's description, was very frequently observed at a small pond. Details of the behavior (here designated as WWAC, i.e., wing warning and ventral abdominal curving) were recorded 223 times in 10 females. The wing movement was essentially as we (1963, Southwestern Nat. 8: 57–84) describe wing warning in *Enallagma civile* (Hagen), but in *civile* there was no ventral abdominal curving. WWAC occurred 163 times as conspecific males approached, yet neither tandem nor sexual contact resulted, and the female always held her perch. Further evidence that WWAC did not attract males was obtained when a female, introduced into a cage with 18 males, warded off all males by performing the movement 16 times in 84 minutes. Moreover, WWAC occurred in the field, not only when *verticalis* males, but also when any Zygoptera (*verticalis* ♀—12, *Enallagma* spp.—34, *Lestes* spp.—6, undetermined—8) approached, and this behavior always permitted the *verticalis* female to maintain her perch. Cleaning could not have been involved since the ventrally curved abdomen never reached the legs, nor was there sufficient dorsal lifting of the abdomen for it to separate possibly adhering wings.

WWAC in *verticalis* females is neither a signal attracting conspecific males nor a cleaning movement. It is simply a threat display which successfully wards off any approaching zygopteran, including *verticalis* males, and the unaccompanied female thereby maintains a perch at water. Pajunen (1963, Ann. Ent. Fennici 29: 236–239) shows that females of various Zygoptera exhibit threat displays, but we are uncertain if the movements are identical with WWAC in *verticalis*.—George H. Bick, *Saint Mary's College, Notre Dame, Indiana.*

A NEW SPECIES OF CALYXOCHAETUS FROM MEXICO
(Diptera, Dolichopodidae)

Calyxochaetus metatarsalis, n. sp.

Male.—Length ca. 2.5 mm, wing 2.2 mm by 0.8 mm; setae mostly black.

Face 0.25 as wide below as above, covered with silvery pollen; front glabrous, violet. Palpus concolorous with face; proboscis pale. Antennae blackish, segment 1 slender, bare above; 3rd broad, 1.5 times as long as wide with broadly rounded tip; arista dorsal, nearly basal.

Thorax mostly dark with greenish reflections above, yellowish above middle and hind coxae; grayish pollen on pleura. A single row of small acrostichals, 6 dc, one pair of scutellars.

Legs pale yellow with tip of hind femur and distal joints of fore and mid tarsi darker, last half of hind tibia and all of hind tarsus blackish. Mid femur with anterior and posterior preapicals; hind femur with anterior preapical; mid tibia with 1 posterodorsal near basal third, 2 anterodorsals, 3 apicals; hind tibia with 2 antero- and 5–6 posterodorsals, ca. 4 small ventrals, 3 apicals. Fore tarsus not modified, lengths of joints from base as 7-5-3-2-2; mid tarsus as 10-4-3-2-2, 2nd and tip of first joint with long curved setae anteriorly; hind tarsus as 6-8-4-3-3.

Wing narrowly elliptical, brownish tinged; 2nd, 3rd, and 4th longitudinal veins nearly straight; crossvein half as long as last part of 5th vein. Calypter, its setae, and halter pale.

Abdomen cylindrical, first 3 terga pale, others dark; hypopygium dark, capping tip of abdomen, conical with short dark prongs and vestigial pale appendages.

Female similar to male but face half as wide below as above, 3rd antennal segment not longer than wide, mid tibia with 2 small ventrals, 3–4 apicals, yellow color restricted to sides and venter of abdomen.

Holotype ♂, and allotype ♀ #69069 in U.S. National Museum, 5 ♂ and 2 ♀ paratypes presently in the author's collection. All found hovering over wet limestone by small shaded pool, El Salto, San Luis Potosí, Mexico, May 9, 1963.

The species agrees in most characters including color of the front, shape of the face and shape of the hypopygium with others of the genus. As the genus is presently delimited, however, it includes no other species with an unmodified fore basitarsus in the male.—Harold Robinson, *Dept. of Botany, Smithsonian Institution, Washington, D.C.*

ADDITIONS TO THE LIST OF APHIDS OF MASSACHUSETTS

In my paper entitled "A preliminary list of the aphids of Massachusetts (Homoptera)" in Trans. Am. Ent. Soc. 92: 29–66, 1966 the following records, which were in the manuscript, were omitted from the printed paper. They should have appeared on page 33.

Acyrtosiphon solani (Kaltenbach), Foxglove Aphid. Amherst, 5 Feb. 1963, 5 alatae on a house plant of burnet, *Sanguisorba* sp. (Hazel Lanphear coll.—ATO det.); Jul. 1963 on *Arctium minus* and *Hieracium* sp. (H. E. Wave coll. and det.).

Amphorophora sp. Marblehead, 11 Oct. 1920, no food plant given. (L. C. Bragg coll.). The alate male and last instar nymph are described by P. W. Mason in Proc. U.S.N.M. 67, Art. 20, p. 73, 1925.

Amphorophora sp. Wareham, 22 Ju. 1933 on cranberry (MDL coll.—ANT det.).

Amphorophora sp. Amherst, 28 Aug. 1963, 5 apterae on cult. blackberry (FEC coll.).

Amphorophora sp. Amherst, 10–25 Sept. 1963. 1 alate in MT (CPA coll.—JOP det.).

Amphorophora braggi Mason. Marblehead, 4 Oct. 1920 on lettuce (TYPE—a single alate viviparous female described in Proc. U.S.N.M. 67, Art. 20, p. 13, 1935).

Amphorophora crataegi (Monell), Four-spotted Hawthorn Aphid. Lawrence, 22 Oct. 1917 on *Crataegus* sp. (Mosher coll.—1 slide in U.S.N.M.).

Amphorophora rubi (Kaltenbach), European Raspberry Aphid. Rockport, 22 Sept., 2 Oct., 2 Nov. (male) 1917 on raspberry (Mohler coll.—3 slides in U.S.N.M.). Amherst, 29 Ju. 1960 on *Rubus occidentalis* (R. H. Converse coll.) and on *R. strigosus* (E. H. Wheeler coll.—slides in U.S.N.M.); 12 Sept. 1960 on boysenberry, *R. loganbaccus* × *R. baileyensis* × *R. argutus* and on *R. strigosus* (R H Converse coll.—slides in U.S.N.M.).—MORTIMER D. LEONARD, *Collaborator, Entomology Research Division, ARS, USDA, Washington, D.C.*

A NEW NAME COMBINATION IN CHAETANAPHOTHRIPS PRIESNER, 1925
(THYSANOPTERA, THRIPIDAE)

Karny (1913, Buitenzorg Jard. Bot. Bul. (ser. 2) 10: 58–62, figs. 38–41) described *Euthrips deformans* from adults of both sexes and immatures taken from *Hygrophila salicifolia* leaf galls, Djerakah, Java, August 24, 1912, by W. Docters van Leeuwen. A female of this series in the U.S. National Museum has the lateral stippled areas found by Stannard (Mitri and Stannard, 1962, Ent. Soc. Amer. Ann. 55(4): 383–386, plates 1–3) on tergum viii of all Chaetanothrips species. *Chaetanaphothrips deformans* (Karny), **n. comb.,** agrees in wing color with *orchidii* (Moulton), *machili* Hood, and *signipennis* (Bagnall) (Mitri and Stannard, op. cit., fig. 6), and has a larger dark portion than *clarus* (Moulton) (op. cit., fig. 3). Ocellar seta pair i occurs in *machili* and *signipennis* (op. cit., fig. 4), but not in *deformans, orchidii,* or *clarus* (op. cit., fig. 1). Unless both setae of the inner pair are broken, the posteroangular setae in *deformans* are short as in *clarus.* Apparently the body of *deformans* is as small as that of *machili* and its stippled areas similarly do not attain the antecosta as do those of *clarus* (op. cit., fig. 9) and *signipennis* (op. cit., fig. 13). Characters of the sternum cannot be seen in the available specimen.—KELLIE O'NEILL, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D.C.*

BOOK REVIEW

Radioisotopes and Ionizing Radiations in Entomology (1961–1963), No. 15. International Atomic Energy Agency, Vienna, 1965. 564 pp. Available from National Agency for International Publications, 317 E. 34th St., New York, New York 10016. Price $11.00.

This bibliography on radioisotopes and ionizing radiations in entomology, covering 1961 to 1963 inclusive, is a continuation of a first volume on the same subject covering the period 1950 to 1960. The size of this second volume attests to the tremendous amount of research being undertaken in this all important field. The information is presented in an author-title-publication-date format, each reference with an abstract. The references are arranged by subject matter and are indexed separately by author and subject.—RICHARD H. FOOTE, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D. C.*

SOCIETY MEETINGS

741st Regular Meeting—March 3, 1966

The 741st meeting of the Society was called to order by the president, Miss Louise M. Russell, on March 3, 1966, at 8:00 p.m. in room 43, U. S. National Museum. Thirty-five members and sixteen guests were in attendance. Minutes of the previous meeting were approved as corrected.

One new member was received into the society, *R. J. Gagné*, and one name was presented as candidate for membership, *Jim C. Hitchcock, Jr.*

President Russell noted the death of Harold J. Grant and asked M. D. Leonard to give a few words about Dr. Grant. President Russell also noted that one of the Society's members, Dr. Karl V. Krombein, had been appointed an honorary member of the Entomological Society of Egypt.

Mr. L. J. Davis announced that the June meeting of the Society would be a dinner to be held at the University of Maryland.

Under notes and exhibitions, Dr. R. H. Foote gave a short review of a book entitled Agricultural Insects of Ghana. Mr. Davis placed on exhibit and distribution several more pamphlets from the Plant Pest Control Division, USDA, concerning quarantined pests.

The speaker for the evening was Dr. John Buck, Laboratory of Physical Biology, National Institute of Health. His interesting talk entitled "Synchronous Flashing of Fire Flies" recounted his experiences in southeast Asia where he made the first visual and photographic records of synchronous flashing in fire flies.

Following the introduction of visitors, the meeting was adjourned at 10:00 p.m. Respectfully submitted, PAUL M. MARSH, *Acting recording secretary.*

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of the
ENTOMOLOGICAL SOCIETY of WASHINGTON

U.S. NATIONAL MUSEUM
WASHINGTON, D.C. 20560

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MEETINGS.—Regular meetings of the Society are held in Room 43 of the U.S. National Museum 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 $5.00; initiation fee is $1.00 (U.S. currency).

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THE DISTRIBUTION AND BIOLOGY OF AQUATIC MIDGES IN MISSOURI LAGOONS

(DIPTERA: CHIRONOMIDAE)[1]

E. BRAD FAGAN AND W. R. ENNS[2]

Department of Entomology, University of Missouri, Columbia[3]

The rapidly increasing use of waste stabilization lagoons has brought about an urgent need for a better understanding of their biological aspects. Usinger and Kellen (1955) in California, Tubb and Dorris (1965) in Oklahoma, and Kimerle (1965) in Missouri reported that certain aquatic midges (Diptera: Chironomidae) were the most common and abundant lagoon insects. The investigation reported here was designed to contribute basic biological knowledge concerning aquatic midges associated with lagoons in mid-Missouri.

Waste stabilization lagoons, which are characterized by their high organic content and richness in phytoplankton, are particularly favorable for the production of aquatic midges. Phytoplankton is an important chironomid food item. Because the larvae of certain species of midges are able to withstand the rigorous respiratory conditions, they become quite abundant in lagoon waters to the virtual exclusion of other organisms.

References to mass emergence of midges from highly productive and polluted waters are common in the literature (Burrill, 1913; Johnson and Munger, 1930; Fellton, 1940, 1941; Bonnell and Mote, 1941, 1942; Lieux and Mulrennan, 1956; Hilsenhoff, 1962, 1966; and Grodhaus, 1963). Probably the most common complaint received about lagoons is the emergence of excessive numbers of adult chironomids. Although generally noticed only near the larval habitats, mass emergences discourage people from being out-of-doors and inconvenience them by the necessity of removing the insects and their remains.

The specific aims of this investigation were (1) to determine the species composition of aquatic midge populations in waste stabilization lagoons; (2) to determine the distribution of midge larvae on

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[1] This investigation was supported by Grant No. WP-00718, U. S. Public Health Service. Contribution from the Missouri Agricultural Experiment Station. Journal Series No. 4085. Approved by the Director.

[2] Research Assistant and Professor, respectively.

[3] Immediate publication secured by full payment of page charges—Editor.

Table 1.—Characteristics of Study Lagoons.

Lagoon	Location	Size (Acres)	Average Depth (Inches)	Load (B.O.D.)[4]	Age (Years)
A	Woodhaven Christian Home	1.0	32	17.0	2.0
B	Pine Grove Trailer Park	1.4	20	23.0	2.5
C	West Lagoon South Cell	4.5	35	20.6	2.5
D	West Lagoon North Cell	4.4	35	21.0	2.5
E	South Drive Residential Lagoon	0.5	42	34.0	5.0
F	Walnut Hills Trailer Park	0.2	38	64.0	5.0

[4] Biochemical Oxygen Demand.

lagoon bottoms; and (3) to contribute knowledge on the biology of the most common species.

In an effort to fulfill these objectives, the chironomid populations of six lagoons in the Columbia, Missouri area were sampled both qualitatively and quantitatively from April, 1965 through April, 1966.

Materials and Methods.—Of the lagoons chosen for study, two were municipal lagoons, two were trailer park lagoons, one was a residential type, and one served a children's nursing home. The parameters of size, average depth, loading, and age were used to characterize the lagoons. Data concerning the characteristics of the study lagoons are summarized in Table 1.

Quantitative samples of lagoon bottom organisms were taken about 3 feet from shore with a 6 in. by 6 in. Eckman dredge. Extraneous materials were removed in the field using a bucket made of 30-mesh brass screening. Further sorting was accomplished in the laboratory utilizing a flotation technique which separates the organisms from the debris (Anderson, 1959).

Quantitative samples of insects emerging from the study lagoons were made using stationary emergence traps. These traps were constructed of 1 in. white pine. They were 1 yd. square and 6 in. deep. Five sides were covered with 30-mesh nylon screening leaving 1 sq. yd. side open for sampling. A 6 in. strip of transparent polyethylene sheeting was attached around the bottom. The traps were attached by hook-and-eye bolts between two 2 in. by 4 in. boards which had been driven into the substrate. They were set directly on the surface of the water with only the plastic strip under the surface. The traps covered an area from about 2 ft. to 5 ft. from shore.

In order to facilitate removal of the insects from the emergence traps, a method of killing them was devised. A separate bottom was made which could be slipped between the trap and the water, producing a cage with the insects inside. The bottom frame was made of a Masonite board and 30-mesh nylon screening. After the bottom was in place, the entire trap was lifted from the water and transferred to shore where it was put into a collapsible fumigation chamber. The chamber was made of clear polyethylene sheeting which formed a box slightly larger than the trap. The trap was slipped into the chamber through an opening at one end. A large cloth was soaked in ethyl acetate and placed in the chamber. Then a flap of plastic sheeting was placed over the open end producing an enclosed chamber. After the insects died, the trap was taken from the chamber, the bottom removed, and the dead insects shaken into a corner for easy removal. The sample was picked up using a miniature vacuum cleaner powered by flashlight batteries.

Both bottom and emergence samples were brought to the laboratory for counting and species determination. Bottom and emergence data were recorded on individual sheets as numbers per square foot and numbers per square yard respectively.

Results and Discussion.—Including species recorded in a previous study (Kimerle, 1965), 12 species of midges have been recorded from lagoons in mid-Missouri. The species listed below marked with an asterisk were recorded only by Kimerle (1965) from larval identifications; those marked by a plus sign were identified only from larvae in the present study; those designated by a minus sign were identified from adults captured in lagoon effluent drainage; and the remaining species were taken in emergence traps placed in the lagoons.

Subfamily TANYPODINAE

- *Anatopynia (Psectrotanypus) dyari* (Coquillett)
- **Clinotanypus* sp.
- *Tanypus punctipennis* Meigen

Subfamily ORTHOCLADIINAE

- *Cricotopus remus* Sublette

Subfamily CHIRONOMINAE

Tribe CHIRONOMINI

- *Chironomus (Chironomus) attenuatus* Walker
- **Chironomus (Chironomus) fulvipilus* Rempel
- +*Chironomus (Chironomus) plumosus* (Linnaeus)
- *Chironomus (Chironomus) riparius* Meigen
- *Chironomus (Chironomus)* n. sp. (fide Sublette)
- *Glyptotendipes (Phytotendipes) barbipes* (Staeger)
- *Glyptotendipes (Phytotendipes) meridionalis* Dendy and Sublette

Tribe TANYTARSINI

- –*Micropsectra nigripila* (Johannsen)

Glyptotendipes barbipes was common to all the study lagoons and was by far the most numerous species recorded. In lagoons A, B, C, and D it averaged over 6,000 larvae per square foot for the entire growing season. In lagoons E and F it averaged 1,593 and 91 larvae per square foot respectively. All other species were insignificant, quantitatively, compared with *G. barbipes.* The larvae of *Chironomus plumosus* and *Anatopynia dyari* were also encountered in all six lagoons. The former attained an average of 213 individuals per square foot in lagoon E. Except for this, no species other than *G. barbipes* averaged over 100 larvae per square foot in any of the study lagoons.

Preliminary work by Kimerle (1965) indicated the majority of benthic insects in lagoons, especially midge larvae, were restricted to a 5 to 8 ft. margin next to shore. One phase of this investigation was designed to determine where the midge larvae were concentrated and to ascertain the factors influencing this distribution. This portion of the investigation was conducted in August in lagoon C.

To accurately determine and standardize sampling areas, a transect line was stretched across the lagoon. At 15 sample stations, the depth of the water was recorded, an Eckman dredge sample was taken, and a water sample next to the bottom was removed for analysis. Table 2 summarizes the results.

Qualitatively, the kinds of benthic insects are greatest within two feet of the shore or in water 2 to 6 inches deep. An average of eleven species was recorded within this range. All of these except two chironomids, *G. barbipes* and *C. plumosus,* were predators. Common predators were dytiscid larvae and adults, and chaoborid larvae. At the next sample site, 3 feet from shore and in water 16 inches deep, the species composition dropped to an average of five. This reduction continued toward the middle with at least one species of chironomid larva always present. The phantom midge larvae, *Chaoborus punctipennis* (Say), were the only insects recorded at the middle, 153 feet from shore and in 47 inches of water. This agrees with the findings of Kimerle (1965). The probable reason that more predatory species exist next to shore is their dependence on overhanging and emergent vegetation for protection and oviposition sites.

Quantitatively, chironomid larvae far outnumbered all other species combined. Except in two instances, they were the only insects to number over 100 individuals per square foot. At the first sample site, the chironomid population averaged 1,620 larvae per square foot. Broken into species, there were 103 *Tanypus punctipennis* and 16 *C. plumosus* per square foot with the rest being *G. barbipes.* At the 3 foot site, the average chironomid population was 18,210 per square foot. Except for 54 *C. plumosus* per square foot, *G. barbipes* made up

Table 2.—Comparative Distribution of Midge Larvae on a Lagoon Bottom.

Sample Site	From West Shore			From East Shore		
Feet from Shore	Depth (Inches)	No. Species	Larvae/ Sq. Ft.	Depth (Inches)	No. Species	Larvae/ Sq. Ft.
1	2	9	1,780	2	14	1,460
3	9	6	22,968	9	5	13,452
5	16	4	10,916	16	5	16,812
7	25	3	9,816	19	4	14,484
9	33	3	216	23	3	9,128
11	40	4	140	33	2	108
79	46	2	16	48	2	16
153	47	1	0	47	1	0

this entire concentration. High populations of midge larvae were maintained at the 5 and 7 foot stations with averages of 13,864 and 12,150 per square foot respectively. As before, *T. punctipennis* and *C. plumosus* were lightly represented and never averaged over 20 larvae per square foot with *G. barbipes* making up the rest. At the 9 foot site, the population had dropped to an average of 4,672 larvae per square foot and the phantom midge larvae, *Chaoborus punctipennis*, first appeared in the samples. The next sample site, 11 feet from shore, showed a significant change in the populations. Only 124 chironomid larvae per square foot were recorded. Obviously the outer margin of the chironomid concentration had been reached. *C. punctipennis* became the most abundant insect, averaging 103 larvae per square foot throughout the remainder of the lagoon.

Picking this particular lagoon for study was fortunate because the slopes of the opposing sides were equal enough to show comparisons and unequal enough at one point to show a striking contrast. An analysis of Table 2 reveals the close association of larval populations and water depth.

Next to shore, in water 2 to 6 in. deep, larval populations were considerably below maximum concentrations. Predators were most numerous in this area. Also, extreme water temperatures and maximum light intensity during the growing season could adversely affect larval populations in this area and the algal mat was generally thin or lacking.

The highest concentrations of larvae occurred in water from 6 to 25 in. deep. Examination of opposing sites 9 feet from shore clearly showed the effect of water depth on these populations. At this point from the east shore, water depth was 23 in. and there were approximately 9,128 larvae per square foot. However, at 9 feet from the west shore at 33 in. factors were present which prohibited heavy concentrations of midge larvae. Concentrations of larvae were always associated with a thick sponge-like mat consisting of algae and bottom ooze adhering to the sticky salivary secretions which the midge larvae used in the construction of tubes. Where larval numbers began to drop, this mat became thinner and unorganized. The algal mat is undoubtedly a product of large populations of midge larvae.

One explanation for the abrupt decrease in the number of larvae at a certain depth may be the stratification of the lagoon waters during the growing season. Analysis of water samples taken at various depths revealed that the lagoon was thermally stratified. It was noted that stratification occurred at approximately the same depth at which chironomid larval numbers decreased rapidly. At this depth the dissolved oxygen content of the water dropped to zero, presenting an unfavorable environment for bottom organisms. Phytoplankton was found only in the epilimnial layer of water, which was superimposed upon the area of lagoon bottom where midge larvae occurred in numbers. Since chironomid larvae depend on phytoplankton for food, they would occur in greatest numbers only where this food source was available.

If stratification occurs throughout the growing season, as it almost certainly does, it would exert a constant influence on the distribution of midge larvae on the bottom. Since the first instar of *G. barbipes* is free swimming for a short period after hatching, it would naturally select the most favorable area. Even later instars are mobile and capable of moving from an unfavorable environment into a more favorable one.

Since stratification limits the area where an adequate oxygen supply and food source is available to a margin approximately ten feet from shore, it is within this margin that the highest concentrations of chironomid larvae are found.

Because chironomid larval populations are concentrated in a known area in the lagoons, the larval stage is probably the most susceptible of the life stages to control measures. In any application of larvicide, it would be necessary to treat only the 10 foot productive margin of the lagoons. At least 95% of all the larvae in the entire lagoon could be controlled in this manner.

The productive margin is related to the slope of the lagoon bottom. The flatter the slope, the wider the margin of larval productivity. Conversely, constructing lagoons in such a way that the bottom slopes rapidly to maximum depth should prohibit large concentrations of midge larvae.

Observations on mass emergences—From data collected on the larval fluctuations in the study lagoons, it seems improbable that any chironomid other than *Glyptotendipes barbipes* would ever occur in numbers sufficient to cause nuisance conditions.

The only mass emergence actually observed in this study involved the spring emergence of *G. barbipes* from lagoon B. For four days, starting April 20, an astronomical number of adults emerged which caused nuisance conditions to exist in the area. During this time an average of 1,632 adults per square yard per day were captured. The sex ratio averaged 756 males and 876 females per square yard per day. A total of 13,056 adults in two traps, or 6,528 per square yard, were captured in the four days.

If only the margin extending ten feet out from shore is considered productive, there are about 1,400 square yards in lagoon B which are inhibited by midges. Simple multiplication reveals that approximately 9,139,200 adult midges could have emerged in the four days. This figure is conservative because, due to the shallowness of the water, the productive margin of this lagoon is wider than ten feet.

Due to the mass emergence, great quantities of exuviae accumulated at the surface of the lagoon. A steady southern breeze moved the floating exuviae to the north end of the lagoon where they formed a solid layer at the surface about 20 feet wide. Within three days after the mass emergence this mass of exuviae had disappeared, probably assisted by wind action. There had been some speculation that an exuvial mass, which occurs after a mass emergence, might provide an oviposition site for mosquitoes. However, this seems unlikely due to the temporary nature of the mass.

When conditions in a lagoon are so unfavorable for benthic organisms that *G. barbipes* larvae are not abundant, usually few other species are present. So, at least in this area, only *G. barbipes* associated with lightly loaded lagoons is capable of producing a mass emergence and nuisance conditions.

Biology of **Glyptotendipes barbipes** in Lagoons

G. barbipes (Staeger) has been positively identified in association with only one mass emergence in this study. However, this is probably the species in question whenever a nuisance problem is created by excessively abundant midges in this area.

The life stages of *G. barbipes* consist of the egg, four larval instars, the pupa, and the adult.

The eggs are laid in a gelatinous mass which in water swells to a length of about 24 mm. and a diameter of 3 mm. Kalugina (1963) in describing the structure of the mass by other species of *Glyptotendipes* states, "strands of eggs run parallel to the surface of the egg mass; each time the ring is nearly complete the strand swings back to form a U-shaped loop." The mass is flaccid and does not retain its shape out of water. The number of eggs in ten masses averaged 1,674. Egg masses are either dropped directly into the water or at-

Fig. 1, Head Capsule of Fourth Instar Larva of *Glyptotendipes barbipes*.

tached to an object in the water. Free egg masses float and evidently stick to the first object they touch. Many times during periods of heavy oviposition, large clusters of egg masses were seen floating on the surface.

The time required for the eggs to hatch is dependent upon the temperature of the water but is probably not more than three days even in early summer. In the laboratory, eggs incubated at 90°F began hatching in 30 hours.

Each of the four larval instars can be distinguished by the width of the head capsule (Dyar, 1890). The first instar larvae are colorless. A dark red pigment appears in the second instar. The fourth instar is very dark reddish-brown with a considerable amount of metallic green pigment scattered throughout.

Although there is some overlap with the third instar, the length of the fourth instar larvae ran from 10 mm. to 17 mm. with the average being 14 mm. Important taxonomic structures are similar in all the instars but are best seen in the fourth. One pair of ventral gills is present on abdominal segment 11. The antennae have five segments and the paralabial plates are wide, arched, medially pointed, and separated from each other. The labial plate consists of a large rounded middle tooth and 6 pairs of lateral teeth (Fig. 1).

The first instars are free-swimming for a short period after hatching. In the laboratory, they exhibit a strong positive phototaxis. This stage represents one of the most vulnerable periods in the life cycle, where the larvae are especially susceptible to predation.

The active nature of the first instar disperses it throughout the lagoon. It eventually settles where the substrate and other environmental factors are suitable. The physiological ability of the species to tolerate only certain degrees of pollution forces it into areas of the lagoon in which aerobic conditions and a food source exist. At least during the growing season, this is the marginal area in which the epilimnial layer of water is superimposed upon the substrate. In this area, intraspecific competition probably becomes the limiting factor.

The later instars settle to the bottom and construct tubes in the substrate. Algae are drawn into and precipitate onto these tubes giving them a green color. When great numbers of larvae are present the tubes become so closely packed that a continuous algal mat is produced. *G. barbipes* larvae feed indiscriminately by the filter feeding method and generally remain in their tubes until time for emergence.

Pupation takes place in the larval tubes. In early spring, pupae were present 6 to 7 days before the first emergence from the lagoons. When the pupae swim to the surface to emerge, this represents an-

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Fig. 2, Pupal Exuviae of *Glyptotendipes barbipes.*

other stage which is subject to predation. The pupal length ranges from 9 to 11 mm. with the average of about 10.1 mm. The female pupae are somewhat larger than those of the males. The pupae of the subgenus *Phytotendipes* are characterized by the mace-like processes on the dorsum of abdominal segments 2 to 6 (Fig. 2).

Emergence takes place in about 10 seconds. The newly emerged midges are somewhat reddish but become darker quite rapidly. Emergence began when the water temperature was around 54°F. *G. barbipes* adults were first collected on April 14 in lagoons A, B, and D. A total of 132 males and 76 females were taken in six traps during that 24-hour period. First emergence of this species appeared on April 20 in lagoons C and E. Emergence activity evidently occurs sporadically throughout the day and the growing season.

Adult midges are characterized by the presence of a median, basal, scar-like impression on abdominal tergites 2 to 6 which coincide with the mace-like processes in the pupae. The inferior appendage of the male genitalia is shorter and stouter than in other nearctic members of the subgenus (Fig. 3).

G. barbipes larvae overwinter as third and fourth instars in the lagoons. The larvae are evidently able to overwinter in large numbers only in lagoons loaded with less than 30 lbs. B.O.D. per acre per day. Larval populations in April varied from 10,208 larvae per square foot in lagoon A to 3,488 individuals per square foot in lagoon D. However, in lagoons E and F very low spring populations of 20 and 4 larvae per square foot respectively were recorded. *G. barbipes* larvae are apparently tolerant of certain degrees of pollution but cannot withstand the extreme year around conditions present in lagoons loaded with more than 30 lbs. B.O.D. per acre per day.

After an initial drop in the larval populations in early spring due to emergence it becomes exceedingly difficult to follow the succeding generations. Larval populations in lagoons peaked during July and dropped in August indicating a second emergence. Although development is dependent upon the water temperature, at least two generations probably developed in the lagoons with major emergences occurring in April and early August.

Even with a large spring emergence, many larvae remain in the lagoons. Because many of the overwintering larvae emerged sporadically during the year, it became impossible to separate the second-generation larvae from overwintering larvae. Something in the physiology of the larvae apparently inhibits the development of some of the members of a given generation. As a result, the life cycles of larvae from a given egg mass are not equal. This behavior probably aids in maintaining the population by minimizing the probability of a catastrophic event destroying the entire population.

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Fig. 3, Male Genitalia of *Glyptotendipes barbipes.*

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A NEW SPECIES OF SCIAPUS FROM CALIFORNIA, WITH A REVISED KEY TO THE SPECIES OF SCIAPUS FOUND IN AMERICA NORTH OF MEXICO
(DIPTERA: DOLICHOPODIDAE)

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Among material recently submitted for determination was a species of *Sciapus* that is apparently undescribed. The species is here described and a revised key to the species of the genus found in America north of Mexico is also presented together with a few Caribbean species for comparison. Bibliographic reference to most species will be found in the Catalog of the Diptera of America North of Mexico (1965, Stone, A., et al., eds., USDA, Agr. Handbook No. 276:1696 pp., references on pp. 485–486).

Sciapus californicus, n. sp.
(Figs. 1 – 3)

Male. Length of body, 4.5 mm.; of wing, 4.1 mm.

Color metallic bluish green, the following parts yellowish: basal two antennal segments; proboscis; palpus; posterior margin of side of thorax; all legs, including coxae, up to tip of basitarsi, where they become dark brown to black; lateral edges of first abdominal tergite; large anterior corners of tergites 2, 3, and 4, nearly meeting on dorsum and extending narrowly to posterior corners; venter, except dark brown last preabdominal segment; cerci. Haltere whitish. Wing pale grayish hyaline, veins blackish, except at extreme base of wing, where they are yellowish. Abdominal tergites 2, 3, and 4 with rather narrow posterior margin black. Hypopygial processes and aedeagus also blackish, but apically dark brown. Third antennal segment and arista blackish.

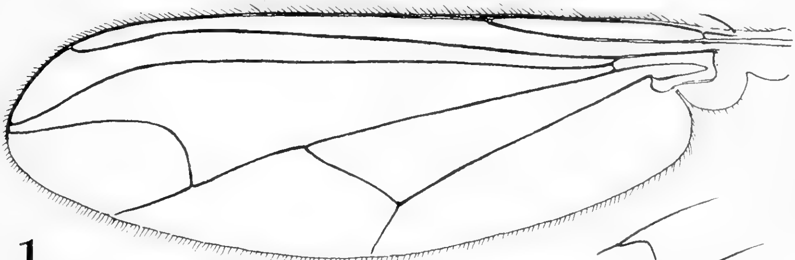
Bristles and hairs black, except the following yellowish ones: hairs of lower head; hairs of palpus (except two long and strong black bristles); coxal bristles and hairs; small basiventral femoral hairs; marginal abdominal hairs; ventral hairs and bristles; hairs of cercus.

White pruinosity covering following parts: face; anterior half of front; small anterior part of mesonotum; sides of mesonotum, including humeri; entire pleura; sides of metanotum. The following parts shining, but covered with very minute and sparse white microsetae: posterior part of front, greater part of mesonotum, scutellum, middle of metanotum, abdominal tergites.

Head with face broad, especially toward antennae; front with strong black bristles only, without small hairs; palpus with two strong curved black bristles; antenna as in fig. 2, basal two segments yellowish, apical segment roundish and black; arista practically apical.

Thoracic chaetotaxy: 1 large and 1 much smaller *dc*; 4 anterior *acr*, hindmost of which quite large; 1 *h*; 1 *sl*; 1 *pa*; 1*sc* (no additional hairs); 1 yellow, weak *pp*.

Legs long and slender; cx_1 with 3 well-developed, apically directed bristles,



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Sciapus californicus, n. sp. 1, wing; 2, mesal view of left antenna; 3, left profile of hypopygium.

uppermost at apical fourth of *cx;* cx_2 and cx_3 each with 1 bristle; tr_2 with 1 small black bristle mesally directed along *f*; f_1 and f_2 a little tapering apically, with small *pv* preapical bristle; *t* simple, only t_3 with a few short *pv* bristles in apical half; tarsi simple, last segment of $tarsus_1$ and $tarsus_2$ very slightly broadened and flattened; t_3 with very small *ad* preapical; $basitarsus_1$ with 5 equally-spaced, small ventral bristles. Lengths of leg-segments, in mm., from *f* distad: p_1: 1.20, 1.43, 1.52, 0.54, 0.36, 0.22, 0.12; p_2: 1.43, 1.79, 1.70, 0.76, 0.50, 0.29, 0.14; p_3: 1.61, 2.42, 1.25, 0.63, 0.36, 0.36, 0.23, 0.12.

Wing (fig. 1) with basal section of costa furnished with small dorsoapically directed bristle preceded by 1 or 2 much smaller ones, a short distance basad of humeral crossvein; costa ciliate from just beyond humeral crossvein to end of second vein.

Abdomen cylindrical; postabdomen (hypopygium) as in fig. 3.

HOLOTYPE, male, Villa Park, Orange Co., California, July 14, 1964 (C. Johnson), in U. S. National Museum (no. 67594).

This species is close to *Sciapus unifasciatus* (Say), as shown in the key below; it is also related to *S. rotundiceps* (Aldrich), which has a distinct group of erect ventral bristles on t_2. It is probably also close to *S. mexicanus* (Aldrich, 1901, Biol. Centrali-Am., Dipt. 1: 365, *Gnamptopsilopus*), but that species has a nonciliate costa and tarsi "but little infuscated."

Sciapus lectus Becker

This species is listed in the North American Catalog as "probably not Nearctic." It was described without definite locality. It is included in the following key by using the characters cited in the original description.

Sciapus delicatus (Walker)

I accept the synonymy of *Psilopodinus pallescens* Bigot and *Sciapus noveboracensis* Van Duzee and refer *Psilopus delicatus* Walker to *Sciapus*, following Parent, 1932, Ann. Soc. Sci. Bruxelles 52 (ser. B, pt. 1, Comptes Rendus): 224. These names are listed under *Condylostylus* in the North American Catalog.

Sciapus unifasciatus (Say)

S. amabilis Parent, **new synonymy**

The Parent species is listed as valid in the North American Catalog, but the series of *S. unifasciatus* in the U. S. National Museum includes specimens with the characters of the Parent species and I must consider the latter as a synonym.

Condylostylus pruinosus (Coquillett)

This species is listed under *Sciapus* in the North American Catalog, but Robinson (1965, Misc. Publ. Entomol. Soc. Am. 4 (4): 111) treated it as a *Condylostylus*, and the type and other material in U. S. National Museum agree with this reference.

Key to the Species of **Sciapus** Found in America North of Mexico.

1 (14). Antenna wholly black.
2 (3). *F* mostly black; basitarsus$_1$ enlarged and flattened ("Carolina"). .... **S. pressipes** Parent
3 (2). *F* mostly yellow; basitarsus$_1$ neither enlarged nor flattened.
4 (5). *Cx* yellow, cx_2 darkened at base; costa with notch before tip of 2nd vein (Ga., Fla.) .... **S. costalis** (Aldrich)
5 (4). Cx_2 and cx_3 black; costa without notch.
6 (9). Wing with dark markings, which may be very faint or even absent in ♀ *S. infumatus;* cx_1 with some black apical bristles.
7 (8). Wing with 2 separate dark crossbands of small extent; f_3 apically and t_3 in apical half and with subbasal band blackish (locality ?) .... **S. lectus** Becker
8 (7). Wing with crossband through *tp* and basal part of wing dark; f_3 and t_3 yellow (Mex., Ariz.) .... **S. infumatus** (Aldrich)
9 (6). Wing plain hyaline.
10 (11). Body dulled with grayish pruinosity; hypopygium small with partly yellowish lamellae (Ga.) .... **S. pollinosus** Van Duzee
11 (10). Body shining blue or greenish; hypopygium rather large.
12 (13). Basitarsus$_3$ mostly or wholly black; t_2 ♂ with row of 8–10 bristles anteroventrally; hypopygial lamellae partly yellow (Fla.) .... **S. trisetosus** Van Duzee

13 (12). Basitarsus$_3$ mostly or wholly yellowish; t_2 with at most a fringe-like row of hairs; hypopygial lamellae black (eastern U.S.) .... **S. scintillans** (Loew)

14 (1). Antenna at least partly yellow.

15 (18). Thorax heavily pruinose; f_1 ♂ bare below, in ♀ with several stout pale bristles (♀ *divergens* unknown).

16 (17). 3rd antennal segment rounded; tarsus$_1$ with 4th segment white, widened in middle, 5th segment black (northeastern U. S.) .... **S. pallens** (Wiedemann)

17 (16). 3rd antennal segment pointed; tarsus$_1$ with 4th segment yellow, with projection and all of 5th segment black (Washington) .... **S. divergens** Van Duzee

18 (15). Thorax lightly pruinose or shining, obviously metallic.

19 (22). Dorsum of thorax yellow with a blue or green stripe.

20 (21). Pleura yellow; t_2 and basitarsus$_2$ with erect cilia (W. I.) .... **S. flavidus** (Aldrich)

21 (20). Pleura with indistinct dark spot; tarsi plain (Cuba; Southeastern U. S.) .... **S. dorsalis** (Loew)

22 (19). Dorsum of thorax wholly metallic.

23 (28). F_1 of both sexes with series of long stout ventral setae.

24 (25). All *cx* yellow; abdomen yellow at base; ♂ costa basally with stout erect thorn not followed by bristles; f_1 with only 3 or 4 bristles basally; f_2 without apical swelling; t_2 and tarsus$_2$ elongated, but not otherwise specialized; 4 *sc* (eastern U. S.) .... **S. tener** (Loew)

25 (24). Cx_2 and cx_3 darkened; f_2 darkened basally; abdomen not yellow at base; ♂ costa basally with stout bent thorn followed by small row of longish bristles; f_1 with 5 or more basiventral bristles; f_2 with apical swelling; 2 or 4 *sc*. (northeastern U. S.).

26 (27). 4 *sc*; ♂ f_2 with strong apical knob; tarsus$_2$ with last 3 segments flattened, broadened, and fringed .... **S. delicatus** (Walker)

27 (26). 2 *sc*; ♂ f_2 with small apical knob; tarsus$_2$ with last 3 segments ordinary, but with longish setae .... **S. filipes** (Loew)

28 (23). F_1 without long setae below.

29 (38). *Cx* almost wholly yellow.

30 (31). Hind margin of pleura green; dorsal abdominal segments where yellow so only on sides and edges (Ont.); cf. also **S. mexicanus** (Aldrich) .... **S. fuscinervis** Van Duzee

31 (30). Hind margin of pleura yellow; dorsum of one or more abdominal segments usually yellow from side to side.

32 (35). Body 4 mm or less in length.

33 (34). Face very narrow throughout; t_2 with irregular row of small ventral bristles; dorsum of 1st 4 abdominal segments yellow with green hind margins (Fla.) .... **S. rotundiceps** (Aldrich)

34 (33). Face not unusually narrow; t_2 without row of bristles; dorsum of 1st 4 abdominal segments mostly green, only sides or bases yellow (Middle States, N. C.) .... **S. bicolor** (Loew)

35 (32). Body 5 mm or more in length.

36 (37). Costa ciliate; abdomen with tergites 1 and 2 green dorsally (Calif.) .... **S. californicus** Steyskal

37 (36). Costa not ciliate; abdomen with tergite 1 and basal third of tergite 2 yellow (eastern U. S.) .... **S. unifasciatus** (Say)

38 (29). Cx_2 infuscated at least on outer side for half its length.

39 (40). ♂ costa not ciliate; abdomen not pale at base (Cuba) .. **S. castus** (Loew)

40 (39). ♂ costa ciliate.

41 (42). Scutellum with smaller bristles at each side of larger pair (southeastern U. S. to S. Am.) .... **S. variegatus** (Loew)

42 (41). Scutellum with only a small hair at each side of larger bristles.

43 (44). Middle of mesonotum with large patch of long erect hairs (southeastern U. S.) .... **S. bradleii** Van Duzee

44 (43). Middle of mesonotum with only the usual hairs and bristles.

45 (46). ♂ with angular projection on wing margin near tip of 2nd vein; cx_2 extensively darkened on outer surface (W. I.; southeastern U. S.) .... **S. psittacinus** (Loew)

46 (45). ♂ wing margin without angular projection, at most rather evenly rounded near tip of 2nd vein; cx_2 with only a brown streak externally (eastern U. S.) .... **S. unicoiensis** Robinson

BLEPHARICERIDAE ON DOMINICA
(DIPTERA)

The Bredin-Archbold-Smithsonian Survey of the island of Dominica, West Indies, collected two species of Blephariceridae of the genus *Paltostoma* Schiner, but as the material consists of females and immature stages only, it is impossible to name the species at the present time. It is quite probable that one of the species is *Paltostoma schineri* Williston, described from St. Vincent, but associated males would be necessary to determine this. The adults could be either *schineri* or an undescribed species.

Hugh Scott (Ann. & Mag. Nat. Hist. (8)15:181–195, 1915) described with great detail and accuracy the larva and pupa of a *Paltostoma* from Trinidad and called it *P. schineri*. The description, as well as Scott's material loaned me by John Smart, was of a larva different from either of the Dominican species, so it is quite probable that the larva described by Scott was misidentified. Larvae of the three species may be distinguished as follows:

1. Each abdominal segment with a closely set row of 5 to 7 stout spines on anterior margin on each side .... **Paltostoma schineri** of Scott
   No such rows of stout spines in this position 2
2. Abdominal segments each with two pairs of stout, acute, erect, yellowish spines, one pair anteriomediad, the other posteriolaterad; a smaller, blacker larva .... **Paltostoma** sp. **B**
   Stout, erect spines absent although there may be very short, blunt, spinelike protuberances in the same position; larger, browner larvae **Paltostoma** sp. **A**

Collecting data for these forms are: Antrim 1,000 ft. March 11–15, 1956 (J. F. G. Clarke), 3 ♀. Species A: Fond Figues R., Feb. 9, 1965 (W. W. Wirth), 25 larvae; Springfield Estate, July 20–26, 1963 (O. S. Flint), 22 larvae, 9 pupae. Species B: Fond Figues R., Jan. 21 and Feb. 9, 1965 (W. W. Wirth), 41 larvae.

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A NEW GENUS, NYCHIOPTERA, WITH DESCRIPTIONS OF TWO NEW SPECIES AND NOTES ON THE GENUS HEMEROPLANIS (Lepidoptera: Noctuidae)

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The descriptions and notes which follow result from studies on the collections of noctuid moths made in 1959, 1960, and 1963 in Madera Canyon in the Santa Rita Mountains and at Peña Blanca in southern Arizona. The collecting in 1960 and 1963 was made possible by grants from the American Philosophical Society, that in 1960 by Grant No. 303-Johnson Fund and that in 1963 by Grant No. 3339-Penrose Fund. I am most grateful to the Society for this assistance. I also wish to gratefully acknowledge the Grace H. Griswold Fund of the Department of Entomology for assuming the costs of the illustrations.

Nychioptera, new genus

Type: *Pleonectyptera noctuidalis* Dyar, 1907.
Included species: *N. accola* n. sp., *N. noctuidalis* (Dyar), and *N. opada* n. sp.

A genus apparently related to *Hemeroplanis* Hübner, 1818, but differing markedly in the genitalia of both sexes. The development of the sacculus of the valve of the male genitalia into a heavily sclerotized projecting lobe and the presence of an inner process bearing a group of specialized setae is unlike either of the two groups of species of *Hemeroplanis*. The genitalia of the females possess a wide band of short, stout spines on the internal surface of the bursa copulatrix. In this they differ from *Hemeroplanis* and agree with the moths in the complex of genera related to *Metalectra*. The venation is essentially the same in all three genera; *Metalectra* has the accessory cell small, R_5 connate with the stem of R_{3+4} at base, and R_4 to the apex of the wing; *Hemeroplanis* has a larger accessory cell than *Metalectra*, and R_4 to the costal margin slightly before the apex, otherwise it is the same; *Nychioptera* has the accessory cell as in *Hemeroplanis* and R_4 to the costal margin before the apex, but R_5 arises a short distance from the stem of R_{3+4} on the accessory cell.

It seems apropos to note that in his "Revision of the species of Pleonectyptera Grt.", Smith dismissed *noctuidalis* with the following comment, "*Pleonectyptera noctuidalis* has nothing to do with this genus, ..." Notwithstanding, the species remained associated with those in *Pleonectyptera* or later *Hemeroplanis*, the prior name for the concept.

The genus may stand near *Glympis* Walker, 1859, and *Hemeroplanis* pending a review of this rather large group of unstudied tropical and subtropical noctuids.

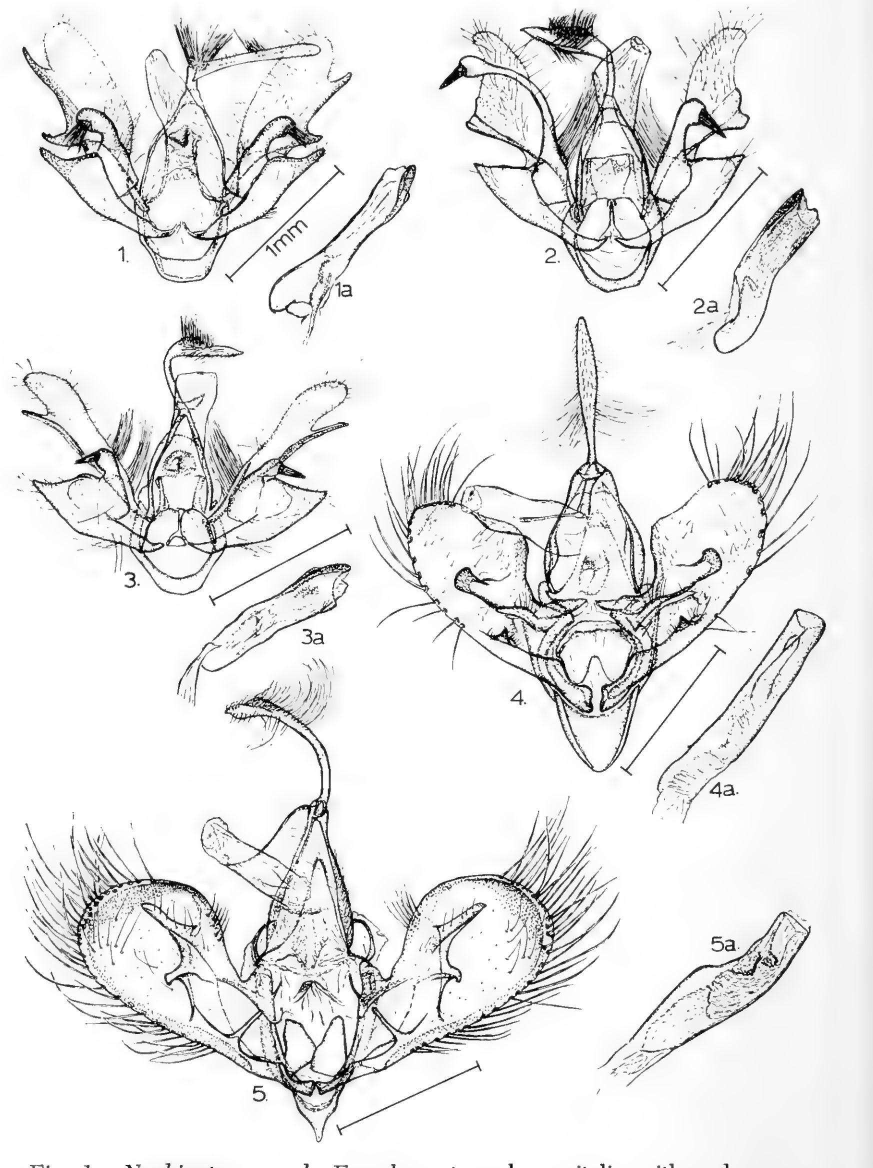

Fig. 1, *Nychioptera accola* Franclemont, male genitalia with aedoeagus removed, slide: J. G. Franclemont 4746, paratype, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 5 August 1959; fig. 1a, same, aedoeagus, slide: J. G. Franclemont 4746; fig. 2, *Nychioptera noctuidalis* (Dyar), male genitalia with aedoeagus removed, slide: J. G. Franclemont 4748, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 18 July 1959; fig. 2a, same, aedoeagus, slide: J. G. Franclemont 4748; fig. 3, *Nychioptera opada* Franclemont, male genitalia with aedoeagus removed, slide: J. G. Franclemont 4750, Description: Head with front with an erect, pointed, slightly decumbent tuft of narrow scales; antennae simple, pubescent beneath, scaled above, with a single, short, sublateral seta at base on each side of each segment; eyes naked, large 1 and ⅓ times as wide as front (2:1.5); palpi long, 2 and ½ times width of eye, porrect, the first segment short, the second segment long and broad, fringed above with long hair-like scales and below with shorter hair-like scales, third segment about ⅓ length of second, drooping; tongue well developed. Thorax clothed with broad imbricate scales, with a few long narrow scales intermixed on the tegulae; legs clothed with narrow scales, with some broader ones intermixed; forewing trigonate, apex acute, outer margin slightly undulate and with a slight angulation at M_3, accessory cell present, R_2 from outer ⅓ of accessory cell, R_{3+4} long stalked from apex of accessory cell, R_4 to costal margin before apex, R_5 from outer ⅙ of accessory cell, M_1 from discal cell; hindwing with M_2 2 and ½ times as far from M_1 as from M_3. Abdomen clothed with scales.

Male genitalia with the valves esentially symmetrical, but with the processes from the sacculi of decidedly unequal length in one species (*noctuidalis*); see figures.

Female genitalia with the bursa copulatrix with a broad band of internal, short, stout spines; the ductus seminalis from the base of the bursa copulatrix; see figures.

Nychioptera accola, n. sp.

This is the palest of the three species of this genus; the conspicuous black costal spots, the almost even t. p. line, and the absence of black scaling in the reniform will distinguish it from *noctuidalis;* the pale color and even t. p. line will distinguish it from *opada*.

Description: General color of head, thorax, forewings, hindwings, and abdomen warm gray-brown with most of the scales light tipped, giving a frosty effect under low (2X to 5X) magnification. Forewing with two pronounced, subtriangular black spots on costa at the inception of the t. a. and t. p. lines; t. a. line brownish, inconspicuous, undulate, toothed inwardly on Cu and 2A; t. p. line concolorous with t. a. line, with a hint of vague pale shadow areas on each side, and with very small, inwardly pointing black teeth, almost even (not conspicuously dentate), excurved from black costal spot to R_5, then incurved to inner margin; three small, linear black marks on costa before and above inception of s. t. line; s. t. line vague, undulating, with blackish shades inwardly; terminal line a series of black, linear bars in the interspaces; fringe concolorous with ground; reniform vaguely indicated by a narrow outline of black scales; orbicular absent. Hindwing with a narrow, blackish t. p. line, edged outwardly by paler scales, most conspicuous toward inner margin; s. t. line similar, vague, and only evident near

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paratype, Madera Canyon 5600′, Santa Rita Mts., Santa Cruz Co., Arizona, 30 June 1960; fig. 3a, same, aedoeagus, slide: J. G. Franclemont 4750; fig. 4, *Hemeroplanis punitalis* (Smith), male genitalia with aedoeagus removed, slide: J. G. Franclemont 4455, Peña Blanca 3950′, Santa Cruz Co., Arizona, 14 July 1960; fig. 4a, same, aedoeagus, slide: J. G. Franclemont 4455, fig. 5, *Hemeroplanis incusalis* (Grote), male genitalia with aedoeagus removed, slide: J. G. Franclemont 4449, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 29 August 1959; fig. 5a, same, aedoeagus, slide: J. G. Franclemont 4449.

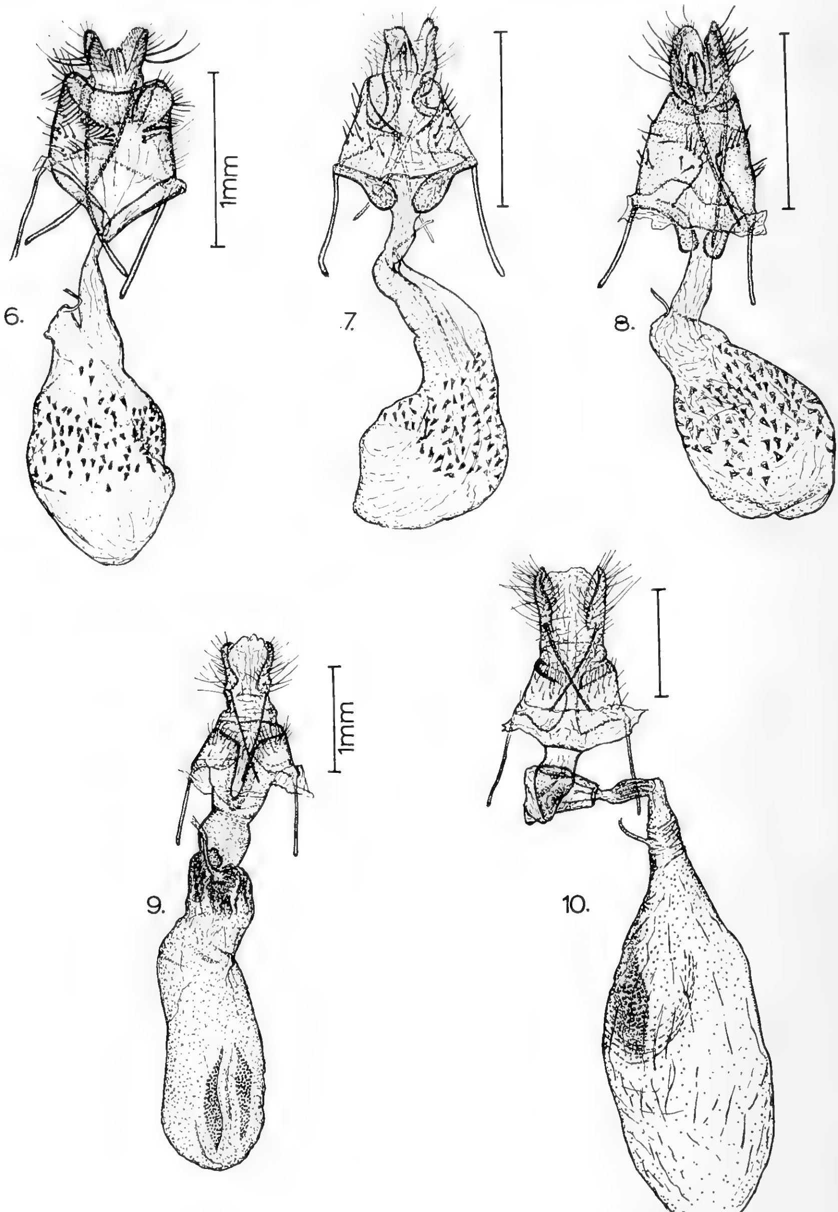

Fig. 6, *Nychioptera accola* Franclemont, female genitalia, slide J. G. Franclemont 4747, paratype, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 8 August 1959; fig. 7, *Nychioptera noctuidalis* (Dyar), female genitalia, slide: J. G. Franclemont 4749, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 11 July 1960; fig. 8, *Nychioptera opada* Franclemont, inner margin; terminal line a series of black, linear bars in the interspaces as in the forewing; a faint discal dot. Abdomen with the apices of the segments with pale annuli.

Expanse: Males, 18–21 mm; mean 19.1 mm; median 19 mm. Females, 20–24 mm; mean 21.8 mm; median 22 mm.

Male genitalia as figured; the long, linear, angulate, and tufted uncus immediately distinguishes this species.

Female genitalia as figured; the lateral, linear, sclerotized plates, narrowing toward and forming a distinct "V" above the ostium bursae will distinguish this species; there is also a line of closely placed setae on the caudal margin of the eighth abdominal segment, encircling the segment except midventrally.

Type: Male. Peña Blanca 3950′, Santa Cruz Co., Arizona; 28 July 1960; J. G. Franclemont. Genitalia slide J. G. Franclemont 4444. In Franclemont Collection.

Paratypes: 9 males. Peña Blanca 3950′, Santa Cruz Co., Arizona; 14 July 1960 (1). Madera Canyon 3800′, Santa Rita Mts., Pima Co., Arizona; 9 August 1959 (1). Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona; 30 June–9 August, 1959 and 1960 (7). J. G. Franclemont. 27 females. Peña Blanca 3950′, Santa Cruz Co., Arizona; 14 July–11 August, 1959 and 1960 (11). Madera Canyon 3800′, Santa Rita Mts., Pima Co., Arizona; 9 August 1959 (1). Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona; 2 July–21 August, 1959 and 1960. J. G. Franclemont. In Franclemont Collection. 1 male and 3 females. Baboquivaria (sic!) Mts., Arizona; F. H. Snow. In United States National Museum Collection. (There are 31 additional unspread specimens in the United States National Museum from Brown's Canyon, Baboquivari Mts., Pima Co., Arizona (6): Baboquivari Mts., Pima Co., Arizona (24); and Paradise, Cochise Co., Arizona (1); all collected by O. C. Poling. These have not been designated paratypes.)

4 males. Madera Canyon, Santa Rita Mts., Ariz.; Aug. 18–24, 1946 (3); J. A. Comstock and Lloyd M. Martin. Madera Canyon, Santa Rita Mts., Southern Ariz.; Aug. 8, 1952 (1); C. W. Kirkwood and R. H. Reid. 11 females. Peña Blanca Canyon, Oro Blanco Mts., Santa Cruz Co., Ariz.; Aug. 4, 1960 (1); Lloyd M. Martin. Madera Canyon, Santa Rita Mts., Ariz.; Aug. 18–28, 1946 (4); J. A. Comstock and Lloyd M. Martin. Aug. 5–15, 1952 (5); C. W. Kirkwood and R. H. Reid. Aug. 21, 1954 (1); Lloyd M. Martin. In the Los Angeles County Museum Collection.

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female genitalia, slide: J. G. Franclemont 4751, paratype, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 8 August 1960; fig. 9, *Hemeroplanis incusalis* (Grote), female genitalia, slide: J. G. Franclemont 4757, Peña Blanca 3950′, Santa Cruz Co., Arizona, 1 September 1959; fig. 10, *Hemeroplanis punitalis* (Smith), female genitalia, slide: J. G. Franclemont 4756, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 29 June 1960.

Nychioptera noctuidalis (Dyar) New Combination

Pleonectyptera noctuidalis Dyar, 1907, Jour. New York Ent. Soc. 15:107. Type locality: Oracle, Arizona (by designation of lectotype). Location of type: United States National Museum.

Pleonectyptera noctuidalis Dyar; Smith, 1907, Trans. Amer. Ent. Soc. 33:367.

Pleonectyptera noctuidalis Dyar; Barnes and McDunnough, 1917, Check List of the Lepidoptera of Boreal America:88.

Hemeroplanis noctuidalis (Dyar); McDunnough, 1938, Check List of the Lepidoptera of Canada and the United States, part 1 (Macrolepidoptera): 127 (Mem. S. Calif. Acad. Sci. 1).

Dyar's type series consisted of ten specimens; eight of these are in the United States National Museum; of the eight, four have been associated with the new species *accola*, and four have been retained as *noctuidalis*. The other two specimens are in the American Museum of Natural History, having been obtained from Rutgers University with the Smith and Hulst collections; I assume that Dyar gave the specimens to J. B. Smith at the time Smith was writing his revision of *Pleonectyptera*. I have not seen the specimens, but inasmuch as both are from Oracle, Arizona, they are probably *noctuidalis*.

In the description of *noctuidalis*, Dyar states that the reniform is "partly filled with black." The specimen chosen as lectotype meets this qualification; it bears the labels: "Oslar/Oracle/Ariz.; ♂ genitalia on /slide Apr 1961/E.L.T. 1290; LECTOTYPE/Pleonectyptera/noctuidalis Dyar/J. G. Franclemont", and it is Type No. 10295 USNM.

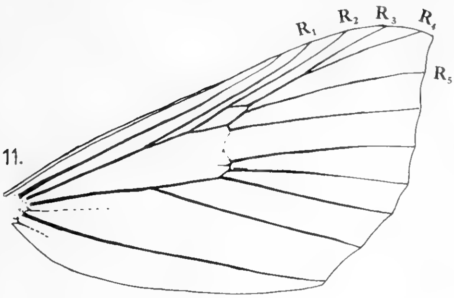
In all the specimens before me, the reniform is mostly black and very conspicuous; this feature will apparently distinguish *noctuidalis* from *accola* and *opada* which have the reniform outlined by black scales but with no black filling.

Description: General color dark gray-brown; the scales pale tipped, giving the wings and thorax a frosted appearance under low magnification. Forewing with the t. a. and t. p. lines black, with accompanying reddish reflections in some lights; both lines with their inceptions in dark costal spots; t. a. line undulate, dentate inwardly on Cu and 2A; t. p. line crenulate outwardly, dentate inwardly, evenly outcurved to R_5, then incurved to inner margin; s. t. line pale, vague, and irregular, with some dark shading on inner side; terminal line a series of linear black bars in the interspaces, with paler scales surrounding the bars; fringe concolorous with ground. Hindwing with weak t. p. and s. t. lines; discal dot vague; terminal line and fringe as on forewing. Abdomen with a pale apical annulus on each segment.

Expanse: Males, 18–21 mm. Females, 19–24 mm.

Male genitalia as figured; easily distinguished by the asymmetrical processes from the sacculi of the valves, that on the left longer than the right.

Female genitalia as figured; the two lateral sclerotized plates expanded toward the ostium bursae.



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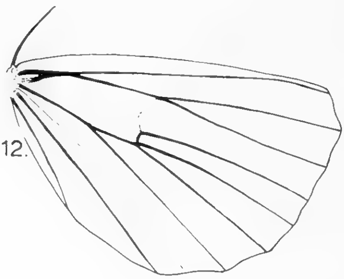

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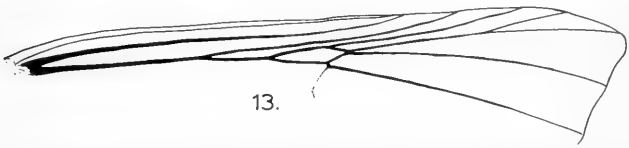

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Fig. 11, *Nychioptera noctuidalis* (Dyar), venation of forewing; fig. 12, same, venation of hindwing; fig. 13, *Hemeroplanis punitalis* (Smith), venation of upper third of forewing.

Distribution: Oracle, Arizona; May and June, Oslar; 4 specimens, including lectotype, in United States National Museum Collection. 30 males and 39 females from Madera Canyon, Santa Rita Mts., Santa Cruz Co., Arizona and Peña Blanca, Santa Cruz Co., Arizona; 4 July–22 August, 1959 and 1960; J. G. Franclemont. In Franclemont Collection. 16 males and 10 females from Peña Blanca Canyon, Oro Blanco Mts., Santa Cruz Co., Arizona, Aug. 5–8, 1960; Madera Canyon, Santa Rita Mts., Southern Arizona, Aug. 1–3, 1954, Sept. 1–5, 1957; Lloyd M. Martin. White Mts., Ariz., Sept. 15, 1926; O. C. Poling. Upper Camp, Pinery Canyon, Chiricahua Mts., Cochise Co., Arizona, July 9, 1956; Lloyd M. Martin, John A. Comstock, William A. Rees. American Museum Research Station, Chiricahua Mts., Cochise Co., Arizona, July 8, 1956; Lloyd M. Martin, J. A. Comstock, William A. Rees. In Los Angeles County Museum.

Nychioptera opada, n. sp.

The darkest of the species, easily separated from *accola* by the much darker color and the crenulate-dentate t. p. line, and from *noctuidalis* by the darker color and the absence of black scaling in the reniform.

Description: General color of head, thorax, forewings, hindwings, and abdomen dull brownish black; most of the scales pale tipped. Forewing with two prominent black costal spots at the inception of t. a. and t. p. lines; t. a. and t. p. lines black with some accompanying reddish highlights; t. a. line undulate, dentate inwardly on Cu and 2A; t. p. line crenulate outwardly and dentate inwardly, outcurved from costa to R_5, then incurved to inner margin; s. t. line pale, vague,

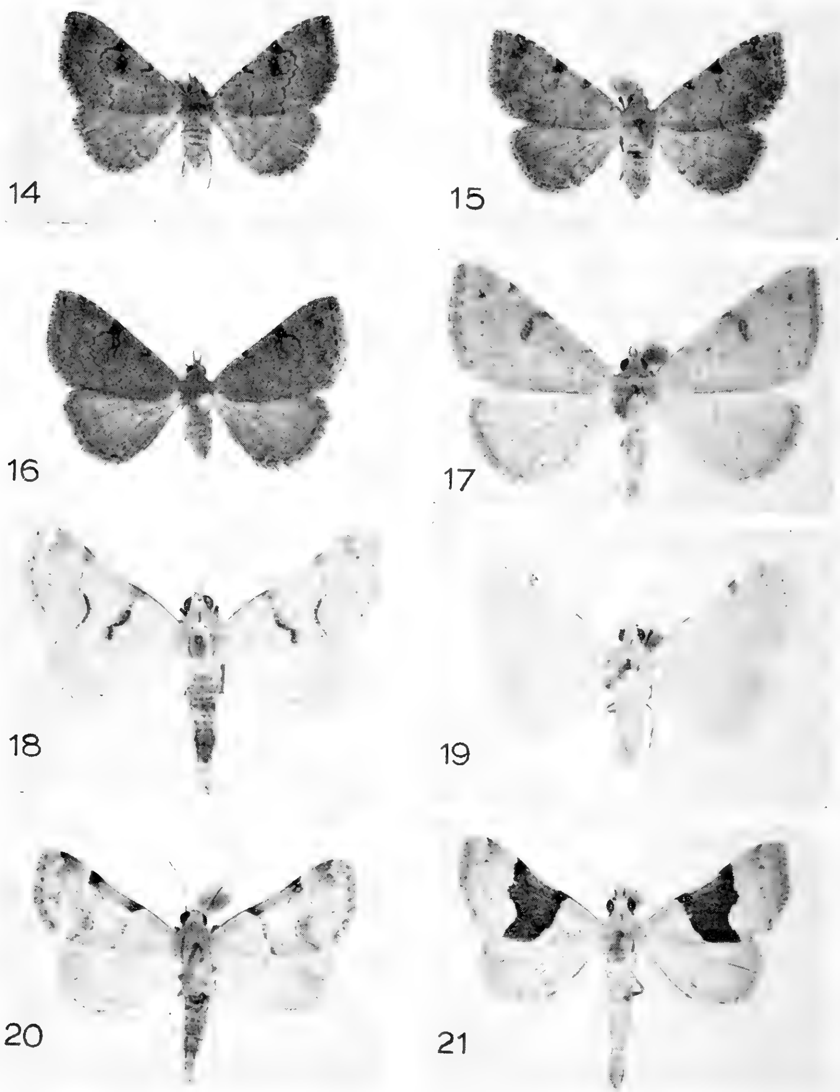

Fig. 14, *Nychioptera noctuidalis* (Dyar), female, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 22 July 1960; fig. 15, *Nychioptera accola* Franclemont, paratype, female, Peña Blanca 3950′, Santa Cruz Co., Arizona, 11 August 1959; fig. 16, *Nychioptera opada* Franclemont, paratype, female, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 21 July 1960; fig. 17, *Hemeroplanis punitalis* (Smith), male, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona; 23 August 1959; fig. 18, *Hemeroplanis incusalis* (Grote), male, Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 17 May 1963; fig. 19, same, female (Equals *subflavidalis* Grote), Madera Canyon 440′, Pima Co., Arizona, 15 June 1963; fig. 20, same, male, Madera Canyon irregular, with some dark shading on inner side; terminal line a series of erect, linear, black bars in the interspaces, with some accompanying pale scales, especially on the veins; fringe concolorous; reniform concolorous, outlined by black scales (some specimens with reniform constricted at middle, the black scales of annulus appearing as a dot at this point). Hindwing with vague t. p. and s. t. lines, accompanied on outersides by pale shades; terminal line as in forewing.

Expanse: Males, 19–21 mm; mean 20 mm; median 20 mm. Females, 21–24 mm; mean 22.3 mm; median 22 mm.

Male genitalia as figured; easily distinguished from *accola* by the single projection from the ventral margin of the valve and the shape of the uncus, and from *noctuidalis* by the almost symmetrical processes from the bases of the sacculi of the valves.

Female genitalia as figured; very similar to *noctuidalis,* but the two plates smaller and more abruptly rounded near ostium bursae.

Type: Male. Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona; 8 August 1960; J. G. Franclemont. Genitalia slide J. G. Franclemont 4446. In Franclemont Collection.

Paratypes: 6 males. Madera Canyon 5600′, Santa Rita Mts., Santa Cruz Co., Arizona; 30 June 1960 (1); Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona; 8 July–9 August 1959 and 1960 (5); J. G. Franclemont. 23 females. Madera Canyon 5600′, Santa Rita Mts., Santa Cruz Co., Arizona; 29 July 1960 (1); Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona; 27 June–15 August, 1959 and 1960 (22); J. G. Franclemont. In Franclemont Collection.

7 males. Madera Canyon, Santa Rita Mts., Southern Arizona; July 19–Aug. 18, 1946–1952; J. A. Comstock, Lloyd Martin, and Robert J. Ford. 24 females. Madera Canyon, Santa Rita Mts., Southern Arizona; July 21–Aug. 11, 1947; J. A. Comstock and Lloyd Martin. In Los Angeles County Museum Collection.

Hemeroplanis Hübner

Hemeroplanis Hübner, 1818, Zuträge zur Sammlung exotischer Schmettlinge (sic!), Erstes Hundert. [vol. 1]:23.

Type: *Hemeroplanis pyralis* Hübner, 1818. Monotypy; monobasic with a new species.

Scopelopus Stephens, 1829 [June], Nomenclature of British insects:43. (*Nomen nudum,* a new generic and a new specific name without description or reference; the species name is *inops.*)

Scopelopus Stephens, 1829 [July], Systematic Catalogue of British Insects, part 2:110.

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4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 29 August 1959; fig. 21, same, male (Typical), Madera Canyon 4880′, Santa Rita Mts., Santa Cruz Co., Arizona, 13 June 1960.

Type: *Scopelopus inops* Stephens, 1829 (*Nomen novum* for *Phytometra scopulaepes* (sic!) Haworth (260)[1809]). Monotypy.

Pleonectyptera Grote, 1872, Trans. Amer. Ent. Soc. 4:23.

Type: *Hemeroplanis pyralis* Hübner, 1818. Designated by Grote, 1874, Bull. Buffalo Soc. Nat. Sci. 2:44.

Coptocnemia Zeller, 1872, Verh. Zool.-Bot. Ges. Wien 22:475.

Type: *Coptocnemia floccalis* Zeller, 1872. Monotypy; monobasic with a new species.

The species of this genus occurring north of the Mexican Border may be divided into two distinct species groups, the *scopulepes* group of Todd (1960, Proc. U. S. Nat. Mus. 112: 505–515) and the *habitalis* group, a group of species centering around *Hemeroplanis habitalis* (Walker), 1858. The two groups exhibit very distinctive differences in the genitalia of both sexes and in one pattern character of the forewing, the presence or absence of a punctiform orbicular spot, noted by Smith (1907, Trans. Amer. Ent. Soc. 33:366) in his discussion of *Hemeroplanis punitalis* (Smith). Modifications of the mid or hind tibiae, or both, occur in some species of each group.

Scopulepes group

Included species: *H. zayasi* Todd, 1960, *H. aurora* (Walker), 1865, *H. scopulepes* (Haworth), [1809], and *H. punitalis* (Smith), 1907.

A full discussion of this group may be found in the Todd 1960 paper referred to previously. The genitalia of both sexes of three of the species, *zayasi, aurora,* and *scopulepes* are figured, and photographs of the moths are given.

The genitalia of the males differ from those of the *habitalis* group in having the central armature (clasper?) of the valve simple, not bifid. The genitalia of the females tend to have the ductus bursae longer, and if a signum is present, it is above the middle of the bursa copulatrix.

All the species of this group have a punctiform orbicular on the forewing. The orbicular is absent in all the species of the *habitalis* group.

Hemeroplanis punitalis (Smith)

Pleonectyptera punitalis Smith, 1907, Trans. Amer. Ent. Soc. 33:375.

Type locality: "Arizona: Palmerlee, Cochise Co., Sept."

Location of type: American Museum of Natural History.

This species was not discussed by Todd because the tibiae of the male are unmodified; nevertheless, it is a member of the group. Superficially, it recalls the brown color form (*geometralis* Grote = *irrecta* Walker) of *scopulepes,* and it has been confused with it by some workers. The genitalia of both sexes show it to be a close ally of *scopulepes* and *aurora*; the male genitalia are closest to those of the former species, and the female genitalia resemble most those of the latter species. However, the female genitalia differ from those of the other three species by the presence of a signum composed of an elongate-ovoid patch of short blunt spines on the upper (basal) half of the bursa copulatrix.

Habitalis group

In America north of Mexico, this group includes all the species listed by McDunnough under the genus *Hemeroplanis* in 1938 (Check List of the Lepidoptera of Canada and the United States, part 1, Macrolepidoptera, Mem. S. Calif. Acad. Sci. 1:127) except *scopulepes, punitalis* and *noctuidalis.*

This is a compact group of very closely related species; the genitalia are exceedingly similar in both sexes, and the differences are not of sufficient magnitude to be relied upon as a means for always distinguishing the species. The wing patterns and, especially, the secondary sexual characteristics of the males, the modifications of the tibiae and the various specialized scale tufts on the abdomen and undersides of the wings, offer excellent means for differentiating the species. The sexes of the species have not proved difficult to associate.

The male genitalia of all the species I have examined are much as in figure 5; the relative size and the relative development of the processes are the only evident differences among the species.

Hemeroplanis incusalis (Grote)

Bomolocha? incusalis Grote, 1881(June), Can. Ent. 13:133.

Type locality: "Colorado Rio (Prof. Glover); Arizona (Mr. Hy. Edwards)."

Location of type: Not determined.

Pleonectyptera incusalis (Grote); Smith, 1907, Trans. Amer. Ent. Soc. 33:373.

Megachyta subflavidalis Grote, 1881 (October), Papilio 1:166. **New synonymy.**

Type locality: "New moths from Arizona, ..." ". . . , collected at Tucson, are in the collection of Berthold Neumoegen."

Location of type: United States National Museum.

Pleonectyptera subflavidalis (Grote); Smith, Trans. Amer. Ent. Soc. 33:378. (Partim!)

The type of *subflavidalis*, now without an abdomen, is a female of the pale form of this species; it is easily matched by specimens in the large series taken in the late spring of 1963 in Madera Canyon. The summer broods rarely produce specimens as pale as many of the ones of the spring brood.

I cannot align Smith's comments concerning *subflavidalis* with my specimens or my observations; I assume that he must have had a mixed series.

This is an extremely variable species. The angulation of the t. a.

line may be evident as in figure 18, which Smith apparently considered typical of *incusalis*, or it may be wanting as in figures 19 and 21; the latter is typical of *incusalis*, which Grote described as having the median area dark brown and contrasting and t. a. line "even, upright, nearly straight, a little oblique."

The drawings were "inked" by Miss Linda Yu-ling Chu and retouched by the author; the photographs are by the author.

A NEW SPECIES OF THE GENUS PICTINELLUS USINGER AND MATSUDA, 1959.
(HEMIPTERA: ARADIDAE)

NICHOLAS A. KORMILEV, *365 Lincoln Pl., Apt. 2 F, Brooklyn, N. Y. 11238*

Through the kind offices of Dr. Richard C. Froeschner, Associate Curator in charge of Hemiptera at U. S. National Museum, Washington, D. C., I have had the privilege of examining a lot of Aradidae collected in dead tree fern fronds by Dr. J. F. Gates Clarke, Senior Research Scientist, Department of Entomology, U. S. National Museum, Washington, D. C., and his wife, Mrs. Thelma M. Clarke, during their trip to Rapa late in 1963. I am very indebted to Dr. Froeschner for giving me this opportunity. These specimens were collected with the aid of a grant from the Office of Naval Research (NONR 358560).

All 18 specimens in this lot belong to a new species of the genus *Pictinellus* Usinger and Matsuda, 1959. Usinger and Matsuda listed only four species as belonging to this small genus, distributed in Micronesia, Somoa, and Marquesas Islands. Actual range of distribution of *Pictinellus* is much wider. Besides the new species from Rapa, I have seen also species from Malay Peninsula, Fiji, and New Guinea. The mere presence of Aradidae on Rapa Island, lost in the South Pacific far from other islands, is very significant, the more so because they are absent on Juan Fernandez Islands, Galapagos, and Hawaii, though on the latter specimens were recently found, probably imported from India.

Genus **Pictinellus** Usinger & Matsuda, 1959

Pictinellus thelmae, n. sp.

(Fig. 1.)

Male. Elongate, with almost parallel sides, gently widening backward.

Head as long as width through the eyes (♂–12:12, ♀–12:12). Anterior process short, conical, strongly tapering, rounded apically, tylus longer than genae, reaching 2/5 of antennal segment I. Antenniferous tubercles dentiform, blunt,

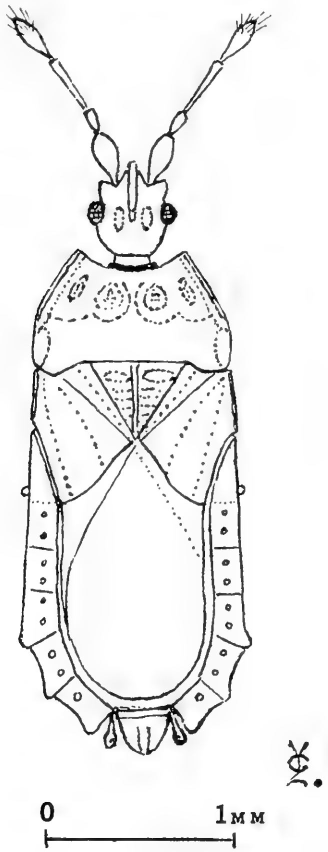

Figure 1.

reaching slightly over the base of antennal segment I. Eyes moderately protruding. Postocular borders convex, rounded, without tooth or tubercle. Vertex convex, with two (1 + 1) ovate callosities between eyes. Antennae strong, long, more than twice as long as the head (♂–26:12, ♀–25.5:12). Antennal segment I clavate, rather thick; II ovate, much thinner; III subcylindrical, slightly tapering toward the base; IV fusiform; proportions, I to IV: ♂–7:3.5:8:7.5; ♀–6.5:4:8:7. Rostrum produced over the fore border of prosternum, not reaching fore coxae.

Pronotum half as long as maximal width (♂–13:26, ♀–13:26). Collar tiny, sinuate in front. Antero-lateral angles produced forward beyond collar, forming a slightly acute angle. Lateral borders parallel at humeri; carinate, strongly convergent, and almost straight in front of them. Hind border straight medially, slightly produced, rounded, laterally. Interlobal, transverse depression not reaching lateral borders of pronotum. Fore lobe depressed on median line, provided with two (1 + 1) low, ovate elevations, laterad of them with two (1 + 1) low ridges. Hind lobe densely, finely granulate.

Scutellum shorter than width at base (♂–10:12.5, ♀–12:14). Lateral borders carinate, slightly convex at base, then slightly sinuate; tip acute. Median carina low, moderately wide. Disc roughly transversely rugose.

Hemelytra reach to middle of tergum VII (♂), or slightly over fore border of tergum VII (♀). Corium produced slightly over spiracle II; baso-lateral border straight, reflexed, forming a thin, low carina; apical angle acute; apical border slightly convex, rounded. Membrane large, with branched veins.

Abdomen much longer than maximal width across segment V (♂–43:30, ♀–47:31). Connexiva II and III semifused, others clearly separated from each other. Lateral borders subparallel from II to V; slightly sinuate, convergent at VI and VII. Postero-exterior angles of connexiva II to IV not protruding; postero-exterior angles of V, and VI slightly protruding, rounded; postero-exterior angle of VIII rounded, slightly produced backward, not reaching tips of either paratergites, or hypopygium. In male, paratergites clavate, almost reaching tip of hypopygium; latter globose, caudal in position, with short median ridge on upper surface. In female, paratergites subtriangular, rounded at tips, reaching 3/4 of segment IX; latter truncate posteriorly. Spiracles large; II lateral, visible from above; III to VII ventral, placed near border, not visible from above; VIII almost terminal.

Legs unarmed.

Color. Dark brown; connexivum variegated: dark brown, brown, and ochraceous; antennal segments reddish brown at bases; tibiae and tarsi yellow brown to yellow. Membrane brown, lighter at base.

Total length: ♂ 3.2, ♀ 3.4 mm.; width of pronotum: ♂ 1.04, ♀ 1.04 mm.; width of abdomen: ♂ 1.20, ♀ 1.24 mm.

Holotype ♂, Rapa Island (Austral or Tubai archipelago), Tevaitau, 200′ – J. F. Gates Clarke & Thelma M. Clarke coll.; in dead tree fern fronds and beneath loose bark of dead branches. Deposited in the U. S. National Museum, Washington, D. C., type No. 68051.

Allotype ♀, collected with the holotype; deposited in the same collection.

Paratypes: 10 ♂, and 5 ♀, collected with the holotype and allotype; deposited in the same collection, and collection of the author. 1 nymph, collected with adults, in the USNM collection.

It is a pleasure to dedicate this species to its collector, Mrs. Thelma Clarke.

Pictinellus thelmae is closely related to *P. parallelus* (Van Duzee), 1932, but may be separated from the latter by: absence of tubercles behind eyes; convex apical border of corium, acute apical angle of corium; much shorter postero-exterior angles of connexical segment VII in the male, not reaching either the tips of paratergites nor tip of hypopygium (in *P. parallelus* they reach both).

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STUDIES OF THE GYPONINAE: TWO NEW PRIMITIVE GENERA—COELOGYPONA AND SULCANA (Homoptera: Cicadellidae)[1]

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The two genera described at this time are apparently rare groups and may represent the primitive forms of the *Prairiana* complex. They are both South American groups and probably limited to the tropical areas. Four species are represented, two in each genus, and all are new to science.

These two genera differ from the other genera in the subfamily by the presence of an additional terminal femoral seta. These new genera thus have the setal formula of 2-2-1-1 (Fig. 5) while the other known genera have the formula of 2-2-1 (Fig. 4).

Genus **Sulcana**, n. gen.

Elongate, flat-headed leafhoppers with a flattened crown bearing two elongate median carinae, one either side of median line. Crown variable in length, always blunt, rounded. Eyes small, ocelli on basal third of crown. Crown flattened, almost parallel margined on basal half. Face with a broad, deep furrow extending from apex of crown almost half way to the clypeus. Pronotum distinctly shorter than crown. Forewings long and narrow with regular venation.

Type—species: *Sulcana brevis*, n. sp.

Sulcana carinata, n. sp.
(Figs. 1–3 and 6–12)

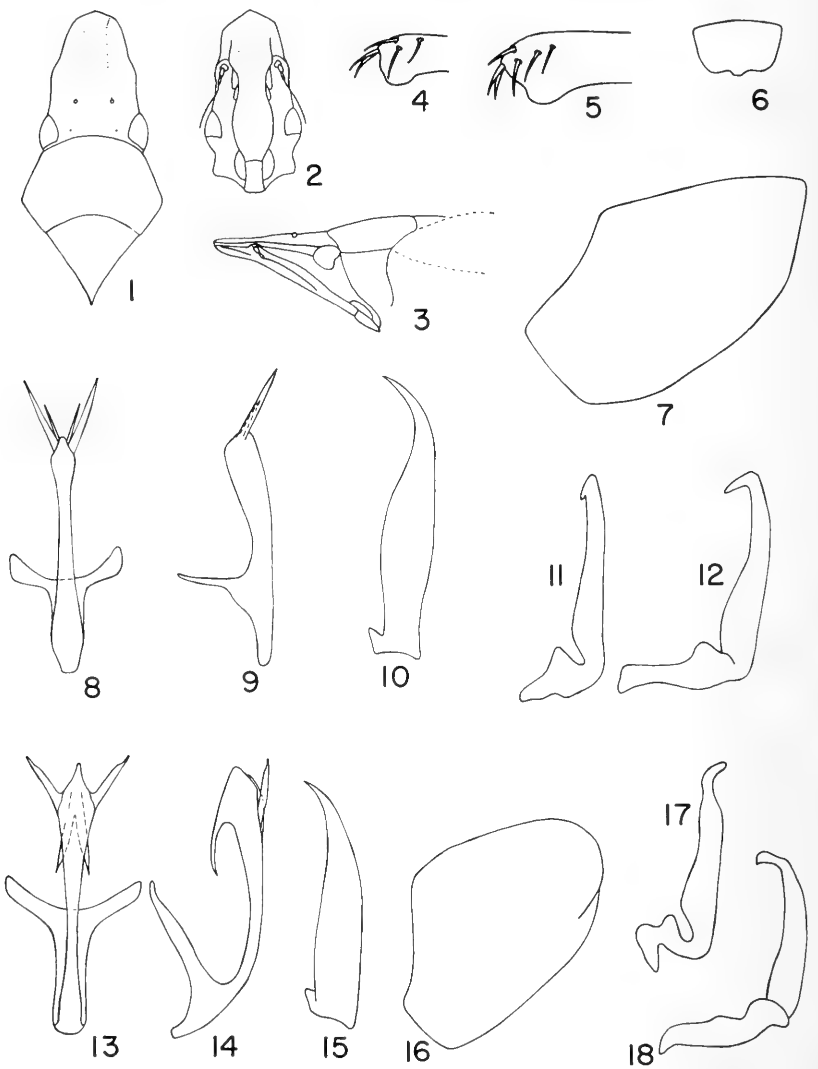
A long narrow species with a long blunt, carinated head. Length of male 11.5 mm., female 14.5 mm.

Crown flat, with a pair of median longitudinal carinae, ocelli on carinae near base; median length nearly twice basal width between eyes, much longer than pronotum. Crown sloping from eyes to a median broad rounded tip which is about half as wide as basal width between the eyes with margin thin and foliaceous. Pronotum distinctly wider than head.

Color.—Buff with darker impressed spots. Forewings buff, subhyaline, veins inconspicuous. Face buff except portion just beneath margin of crown which is pale brown.

Genitalia.—Female seventh sternum with rounded lateral angles, posterior margin gradually sloping to a median slightly produced broad tooth which is about one-sixth the width of the segment. Male plate broad at base, slightly broadened at middle, apical third gradually tapered and curved outwardly forming a narrow, sharp pointed apex. Style narrowed on apical third with apical seventh

[1] This work was supported by the National Science Foundation (Grant No. BG-2932). The authors wish to acknowledge the assistance of Dr. James P. Kramer for contributing some of the illustrations.



Figs. 1–18. *Sulcana carinata*, n. sp. Fig. 1, dorsal view of head, pronotum, and scutellum; fig. 2, face; fig. 3, lateral view of head and pronotum; fig. 6, ventral view of female ninth sternum; fig. 7, lateral view of male pygofer; fig. 8, ventral view of aedeagus; fig. 9, lateral view of aedeagus; fig. 10, ventral view of plate; fig. 11, ventral view of style; fig. 12, lateral view of style. *Ponana aquila* (Gibson). Fig. 4, tip of hind femur. *Coelogypona venosella*, n. sp. Fig. 5, tip of hind femur. *Sulcana brevis*, n. sp. Fig. 13, ventral view of aedeagus; fig. 14, lateral view of plate; fig. 15, ventral view of plate; fig. 16, lateral view of male pygofer; fig. 17, ventral view of style; fig. 18, lateral view of style.

bent abruptly outward, slightly deflected and tapered to a blunt pointed apex. Aedeagus with shaft narrowed on central half, then enlarged with a tapered apex which bears two pairs of straight spines. Outer pair longer, stout at base, tapered to pointed tips which are about one-third the length of shaft. Inner pair two-thirds as long and much narrower. Pygofer simple with a blunt apex.

Holotype male.—Chapada, Brazil, May, C. F. Baker Collection. Allotype female.—Murtinka, H. Grosso, Brazil, October 1927, A. Maller Coll., Frank Johnson Donor. Both specimens are in the U. S. National Museum Collection.

Sulcana brevis, n. sp.
(Figs. 13–18)

Resembling *carinata* in form and appearance but with a shorter head and different genital structures. Length of male 10.5 mm.

Crown produced and bluntly angled, a little wider between eyes at base than median length. Median longitudinal carinae conspicuous, ocelli near base on outer margin of carinae. Margin thin each side just above antennal sockets. A deep excavation or furrow on face just beneath tip of crown.

Color.—Crown brown to black, the median furrows and other depressions darker, in some places almost black. Pronotum mostly dark brown. Scutellum pale brown with basal and apical angles dark. Forewings brownish subhyaline, veins inconspicuous. Beneath flattened portion of crown and the depression beneath apex, dark brown; other portions of face and clypeus buff to pale brown.

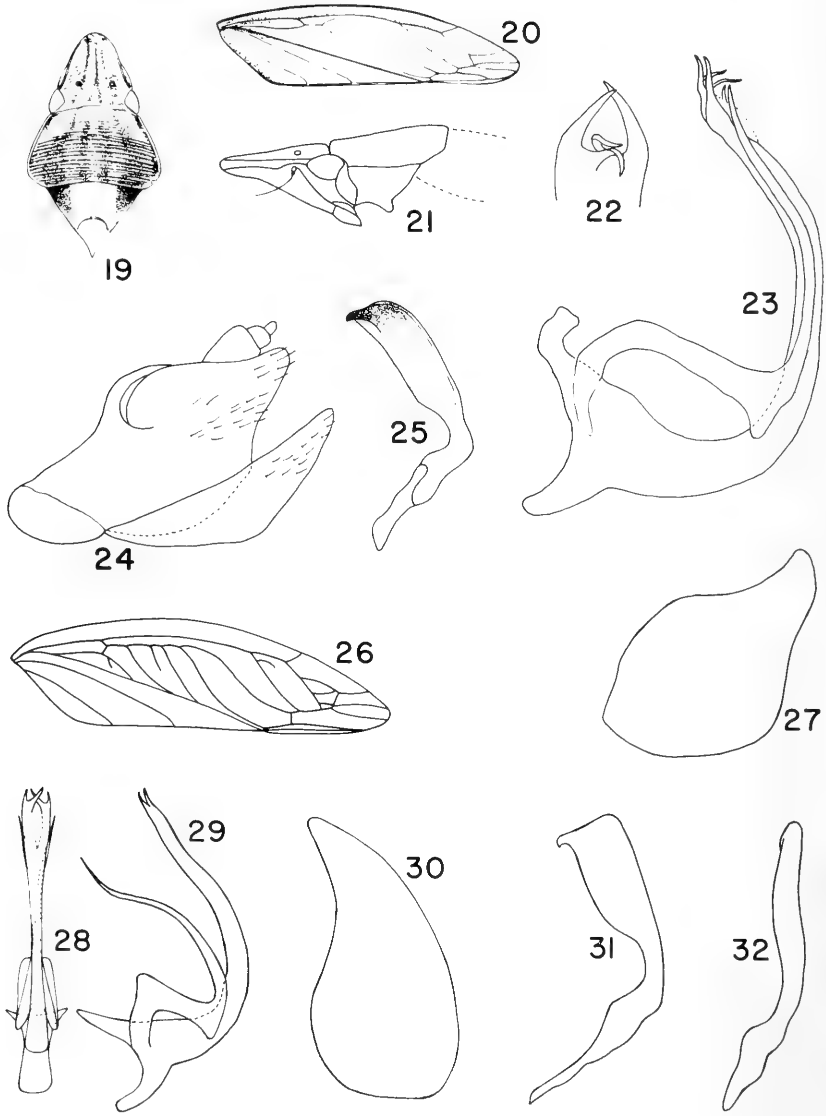
Genitalia.—Male plate narrowed on apical third, curved outwardly and tapered to a narrow pointed apex. Style rather narrow with apical fifth bent abruptly, outwardly narrowed but enlarged at apex producing a broad blunt tip. Aedeagus with a long slender apodeme directed dorsally; shaft slender, apical third enlarged. In lateral view shaft greatly broadened at apex and bearing a pair of bifid spines which are long and narrow, pointed at apex and arising on the dorso-cephalad margin and extending basally. A pair of stout and pointed lateral spines arise on the shaft at the widest portion, as viewed ventrally, and extend lateroapical. Pygofer rounded at apex.

Holotype male.—Chapada, Brazil, Dec., C. F. Baker Collection. Paratype male.—Same data as holotype except April. Both in the U. S. National Museum Collection.

Genus **Coelogypona**, n. gen.

Related to *Sulcana* but without dorsal carinae on crown. The crown is produced, distinctly longer on middle than basal width between the eyes, and slopes from eyes to rounded apex which is less than half as wide as basal width between eyes. Margin thin just above antennal sockets but thicker on median portion. Ocelli on basal portion of crown, not far from eyes, twice as far apart as either is from the proximal eye. Pronotum much broader than head. Forewings narrow and bluntly pointed at apex. Venation highly unusual with subapical veins oblique and at times with extra veinlets and cells.

Type-species: *Coelogypona venosella*, n. sp.



Figs. 19–32. *Coelogypona venosella,* n. sp. Fig. 19, dorsal view of head, pronotum, and scutellum; fig. 20, forewing; fig. 21, lateral view of head and pronotum; fig. 22, tip of aedeagal shaft; fig. 23, lateral view of aedeagus; fig. 24, lateral view of male pygofer, plate, and anal tube; fig. 25, lateral view of style. *Coelogypona venosana,* n. sp. Fig. 26, forewing; fig. 27, lateral view of male pygofer; fig. 28, ventral view of aedeagus; fig. 29, lateral view of aedeagus; fig. 30, central view of plate; fig. 31, lateral view of style; fig. 32, ventral view of style.

Coelogypona venosella, n. sp.
(Figs. 5 and 19–25)

Resembling *venosana* in form and appearance but with different male genital structures. Length of male 17 mm.

Crown produced, margins sloping from eyes to a narrowed rounded apex which is less than half as wide as basal width between the eyes; a little longer than width between the eyes at base. Pronotum slightly longer and much wider than head. Forewings long and with narrow, bluntly pointed apices.

Color.—Buff with reddish peppered markings on crown and pronotum. Forewings orange brown with paler veins. Costal margin yellow. Face yellow; eyes red.

Genitalia.—Male plates broad, narrowed on apical half, the apices blunt, almost rounded and curved outwardly. Style thick, as long as aedeagus, broadened on apical half, apex truncate with a short hooked spine on outer apical margin. Aedeagus with a narrow shaft, gradually broadened on apical third with a prominent apical spine on each outer edge and two shorter medial spines; basal processes long, slender and contiguous with shaft to apex. Pygofer narrow, bluntly angled at apex.

Holotype male.—Achinamiza, Peru, 9-20-27, F 6001, H. Bassler Collection, Acc. 33951, in the American Museum of Natural History. Paratype male.—Huanuco R. Valley, tropical jungle, 500 M.A.S.I., Huanuco, Peru, Feb. 10, 1954, F. L. Woytkowski, in the U. S. National Museum.

Coelogypona venosana, n. sp.
(Figs. 26–32)

Superficially resembling a large pale brownish specimen of *Parabolocratus flavidus* but with ocelli on basal portion of crown and with distinct male genitalia. Length of male 16 mm.

Crown produced, gradually sloping from eyes to a narrow rounded apex which is less than half the basal width between the eyes; longer on middle than basal width between eyes. Pronotum distinctly wider than head and longer than crown. Face gradually sloping from margin of crown to clypeus.

Color.—Buff to pale brown without markings. Forewings pale brownish subhyaline, costal area yellow.

Genitalia.—Male plates broad, narrowed on apical third by the strongly convex inner margin; bluntly pointed apices turned outwardly. Styles thick and as long as aedeagus, apical half broadened and with a short produced hook on outer apical margin of truncate apex. Aedeagus with shaft very slender on median portion, apical fourth broadened and appearing divided with each portion converging at apex and each bearing a pair of apical spines, the inner spine in each case longer. A long slender basal process on each side is as long as the shaft, extending dorsally and tapering to long slender pointed apices. Pygofer bluntly pointed.

Holotype male.—Macas, Oriente, Ecuador, July 1921, J. B. Rorer Coll., in the U. S. National Museum.

STALIA MAJOR (COSTA) IN NORTH AMERICA
(HEMIPTERA: NABIDAE)

JOHN D. LATTIN[1], *Department of Entomology, Oregon State University, Corvallis*

Stalia major was described (as a *Nabis*) from southern Europe by Costa in 1842. It occurs in England, throughout Europe, south to Morocco and the Canary Islands and east to Caucasia. Barber (1932) first recorded this species from North America, based on specimens from Corvallis and Dever, Oregon. Lattin (1957, 1959) and Scudder (1960, 1961) cited several localities from Oregon and British Columbia, respectively. Additional specimens now have been examined from California and New York.

Barber (*op. cit.*) mentions that this species was the first representative of the subgenus *Nabis* Latreille to be found in North America. China (1943) considers *major* to be in the subgenus *Himacerus* Wolff. Southwood and Leston (1959) put it in *Stalia* Reuter, a practice followed by Scudder (1961). Mitri (1960) and Carayon (1961), both working with the ectodermal female genitalia, place *major* in *Himacerus.* Carayon tentatively puts *Stalia boops* (Schiodte) (the type of *Stalia*) into *Himacerus* but states that the exact position is not clear. He suggests that *Stalia* might be considered as a subgenus of *Himacerus* with *boops* the only included species. Kerzhner (1963), in an important paper on the subfamily Nabinae, considers *major* to be in *Stalia* and bases his decision on a variety of characters including: length of the first two antennal segments, hind margin of the sixth abdominal segment, shape of the claspers, and the biologies of the included species. There are a few characters that negate this decision: lack of spines on the abdomen, few spines on the aedeagus, female ectodermal genitalia and the similarity in shape of the right and left claspers (they are slightly asymmetrical in the other two species Kerzhner includes in *Stalia*). Current research on the Nabidae shows that many of the taxa formerly considered as subgenera, including *Stalia*, deserve full generic status. *Stalia* is considered here as a genus.

S. major can be separated from other nabids in our area by the following characters (taken in part from Kerzhner): front and middle femora without long thin spines; front and middle tibiae with two rows of short, black spines; first antennal segment shorter than head; second antennal segment shorter than pronotum; larger size (7.5–9 mm.); more robust appearance; generally darker color and the distinctive genital characters of the male and female. Figures of the adult, male clasper and seminal depository (the latter redrawn from

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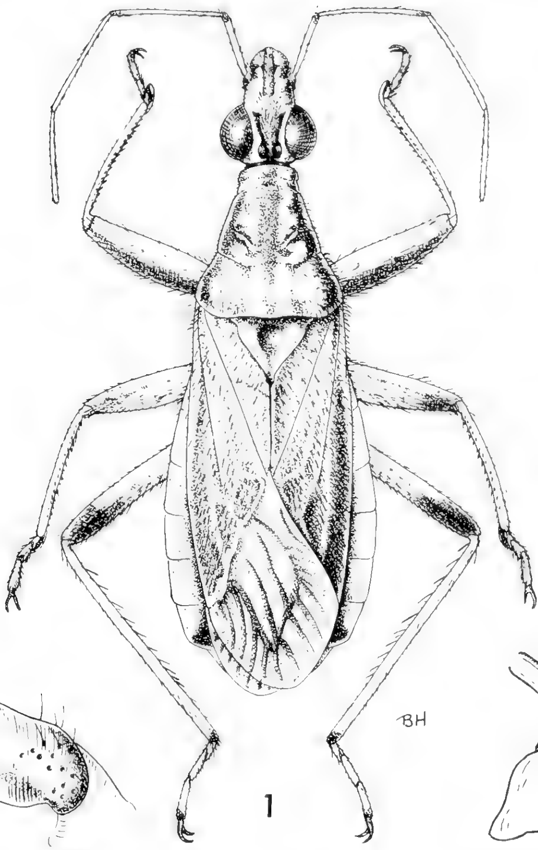

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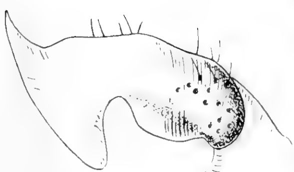

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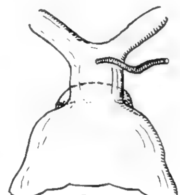

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Stalia major (Costa). Fig. 1, Adult, dorsal view; fig. 2, female seminal depository, dorsal view (redrawn after Mitri, 1960 and Carayon, 1961); fig. 3. Male clasper, lateral view.

Mitri and Carayon) are provided here to facilitate identification. The clasper is shown in the same view as those in the classic monograph by Harris (1927).

I have examined specimens from the following localities: BRITISH COLUMBIA: Vancouver, University of British Columbia campus, Oct. 20, 1949 (W. Orchard); Brighouse, Lulu Island, New Westminster District, Oct. 15, 1944 (*vide* Scudder, 1961). CALIFORNIA: Del Norte Co., Crescent City, under beach drift, Sept. 24, 1959 (J. Schuh). NEW YORK: Ithaca, July 24, 1957 (USNM collection). OREGON: Benton Co.: Corvallis, July 22, 27, 28, 1931 (USNM collection); many specimens, July–November, 1956-date (J.D.L.—author); Kiger Island, 2 mi. se. Corvallis, July 15, 1959 (B. D. Ainscough); 3.5 mi. ne. Summit, Oct. 15, 1961, Oct. 17, 1963 (J.D.L.); Winkle Lake, 10 mi. s. Corvallis, Oct. 8, 1959, Oct. 6, 1960, under debris along edge of pond (J.D.L.); Coos Co.: Fairview, 5 mi. ne. Coquille, Aug. 8–22, 1959 (J. Rodgers); Clatsop Co.: Warrenton, Aug. 17, 1960, under beach plants (K. Goeden); Josephine Co.: Grants Pass, July 2, 1947 (J. W. Bell); Lane Co.: 4 mi. n. Coburg, July 20, 1954 (F. F. Hasbrouck); Spencer Butte, 1 mi. s. Eugene, Oct. 1, 1956 (1500 ft.) (J.D.L.); Lincoln Co.: 2 mi. s. Waldport, Aug. 31, 1961 (D. Smith); 1 mi. n. Waldport, July 29, 1959 (J.D.L.); Linn Co.: Dever, Aug. 10 (USNM collection); Marion Co.: Salem, Aug. 12, 1952 (P. Boal); Multnomah Co.: Portland, July 10, 1957 (R. G. Mitchell); Portland, 26th and NW Front, near Municipal Pier No. 4, ballast dump, July 16, 1959 (J.D.L.); Tillamook Co.: Island Camp, 6½ mi. n. Woods, Sept. 23, 1959 (J.D.L.), Aug. 12, 1960, under beach debris and beach grass (J.D.L.); Sandbeach Forest Camp, 2 mi. w. Sandlake, Sept. 23, 1959 (J.D.L.).

This is a species that clearly has been introduced into the United States and Canada; probably via ship ballast materials, a view expressed by both Lattin (*op. cit.*) and Scudder (*op. cit.*). Lindroth (1957) gives a thorough treatment of ballast as a means of potential or actual introduction. There are a number of ballast dumps in the Pacific Northwest, made up of material probably brought from southwest England. These dumps could have served as loci for subsequent dispersal. Most records for *major* are clustered around various ports—Vancouver, British Columbia; Portland and Waldport, Oregon and Crescent City, California. The author collected a specimen on a ballast dump in Portland. Although not yet known from the Puget Sound region of Washington or from San Francisco, California, it seems likely that *major* will be collected in one or both areas.

Since this is a widespread, ground-inhabiting nabid in England, it is likely that it would be gathered up with ballast material from that region. Although Lindroth did not record *major* from any of the ballast source areas he collected in England, he did collect two other ground forms. These two species have not yet been recorded from North America. According to Southwood and Leston (*op. cit.*, p. 167) "It (*major*) occurs in most grassy places but it is especially noticeable on sandhills, where it is usually the only damsel bug and on salt marshes where it is often taken in company with *Dolichonabis lineatus*." In Oregon, numerous specimens were collected along the coast from around the bases of beach grass. Specimens of *Dolichonabis propinquus* Reuter, a species close to *D. lineatus*, were taken with *major* in a salt marsh at Island Camp, Tillamook County, Oregon.

The majority of the Oregon records for this species (excepting those from Josephine County and the three coastal counties—Clatsop, Lincoln and Tillamook) are located around Portland and along the Willamette River in the western part of the state. This river valley has been the center of extensive agricultural activity for many years with considerable movement of trade up and down the river. The close association between the collecting sites and the river suggests the species was transported via the activities of man. The coastal localities are all associated with ports, again suggesting the role of man in transport. Most of the ships visiting these ports carried, and still do carry, lumber products, thus making transport of ground forms quite probable. The single California record is also from a well-used port in the northern part of the state.

The earliest collection date for North America is 1931 (Barber 1932). There were no specimens in the Oregon State University collection in 1955, when the author arrived, although the family Nabidae was well represented with specimens dating back to 1898. Since this is a ground form, there is some chance it would not be collected by causal collectors. However, extensive entomological collecting has been done in conjunction with various agricultural investigations and by individuals and still the species was not encountered until relatively recent times. This is further evidence that *major* is a recent introduction and probably is still expanding its range, a range Lindroth (*op. cit.*, p. 138) refers to as an "immature" distribution pattern.

The single specimen from Ithaca, New York, in the collections of the U. S. National Museum, is of particular interest. Northeastern United States has been collected intensively for Heteroptera for well over 50 years. The late date of capture (1957) again suggests quite recent introduction, in this case probably after the western introduction and perhaps via nursery stock from Europe. Only further collecting will determine whether it has become established.

Scudder (1958) suggests that most of the species introduced into the Pacific Northwest arrived at a relatively late date compared to eastern North America. He correlates this arrival with the opening of the Panama Canal in 1914. If this is in fact true, then there are excellent opportunities to study the establishment and spread of introduced species in the Northwest. Studies by the author, on Miridae associated with seedgrass fields in western Oregon, revealed that most species involved were introduced and many showed the distribution pattern mentioned by Lindroth. Studies comparable to that done by Lindroth (1955) with the Carabidae in Newfoundland would add much to our knowledge of this "recent" zoogeographical problem.

Acknowledgments

Thanks are due to Mrs. James (Bonnie) Hall, who prepared the excellent drawing of the adult and male clasper.

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THE NEARCTIC SPECIES OF CONTARINIA WHICH INFEST GRASSES
(Diptera: Cecidomyiidae)

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Of the 32 previously known species of *Contarinia*, only *C. sorghicola* (Coquillett), the sorghum midge, has been reared from grass. The two new species described here were found in and reared from heads of little bluestem and sand bluestem by Dr. J. G. Watts of New Mexico State University. They were not found on sorghum growing in nearby fields.

The genus *Contarinia* may be distinguished from all other gall-midges by the equally binodose ♂ flagellomeres, each node surrounded by one circumfilum; the palpus 4-segmented; the tarsal claws simple; and the radius interrupting the costa at the juncture of the two. The following is a key to the species of *Contarinia* found on grasses in North America:

1. Fewer than 15 scutal and usually fewer than 25 dorsocentral setae .... **C. sorghicola** (Coq.)
   More than 15 scutal and usually more than 25 dorsocentral setae 2
2. Length of 2nd tarsomere less than 0.360 mm.; usually fewer than 38 dorsocentral and fewer than 30 scutal setae .... **C. wattsi**, n. sp.
   Length of 2nd tarsomere more than 0.395 mm.; usually more than 38 dorsocentral and more than 30 scutal setae .... **C. halliicola**, n. sp.

In the following descriptions I have taken advantage of some innovations used by Harris (1964) in his study of the sorghum-midge complex. These are the chaetotaxy of the frontoclypeus and thorax and a method of expressing accurately the dimensions of the third flagellomere. The term, "scutal setae" refers to those setae along the lateral portion of the scutum from the humerus to the scutellum.

Contarinia wattsi, n. sp.

Adults. Antenna in ♂ and ♀ with 12 flagellomeres. Third flagellomere of ♂ (parts expressed as per cent of total length): Proximal node, 32–40 (avg. of 11 observations, 38); internode, 10–14 (12); distal node, 32–43 (39); neck, 06–14 (10). Palpal segments of variable length, about 3 : 4 : 5 : 7. Chaetotaxy: Frontoclypeal setae, 3–8 (avg. of 19 observations, 6); dorsocentral, 21–37 (28); scutal, 16–29 (21); scutellar 7–10 (8); subalar 6–11 (8). Length of tarsomeres (in mm.): I, 0.070–0.080 (avg. of 13 observations, 0.075); II, 0.280–0.360 (0.330); III, 0.125–0.180 (0.155); IV, 0.090–0.110 (0.100); V, 0.080–0.090 (0.85). Wing length: ♂, 1.43–1.53 mm.; ♀ 1.50–1.75 mm. Male genitalia: No apparent distinguishing characters. Ovipositor: Long, protrusible as in other *Contarinia* spp.; length, from 8th abdominal segment to tip, inclusive, 1.90–2.35 mm.

Reared from heads of little bluestem, *Andropogon scoparius* Michx.

Immature stages. Larva: The last-instar larva is practically featureless as is that of *C. sorghicola,* and also lacks the sternal spatula. Pupa: Two pairs supraclypeal papillae, one of each haired; 3 papillae over base of each palpus, one haired.

Material examined. Holotype (on slide): "♂; ex little bluestem; coll'd 8-10-1965; reared 8–10 to 8–16; Los Lunas, N. Mex.; J. G. Watts; USNM type # 68932." Deposited in USNM. Paratypes (all on slides): 11♂♂, 8♀♀, 12 pupae, and 5 larvae, coll'd 7–20 to 8-27-1965, Los Lunas, N. Mex., reared 8–10 to 8-24-1965. Two ♂ and 2 ♀ paratypes deposited in the Department of Botany and Entomology of New Mexico State University; the remainder in the USNM.

Contarinia halliicola n. sp.

Adults. Antenna in ♂ and ♀ with 12 flagellomeres. Third flagellomere of ♂ (parts expressed as per cent of total length): Proximal node, 33–38 (avg. of 11 observations, 35); internode, 13–20 (16); distal node, 33–36 (35); neck, 10–15

(13). Proportions of palpal segments about 3: 4: 5: 7, generally averaging slightly longer than in *C. wattsi.* Chaetotaxy: Frontoclypeal setae, 4–8 (avg. of 21 observations, 6); dorsocentral, 32–51 (41); scutal 24–40 (34); scutellar, 6–13 (9); subalar, 6–13 (11). Length of tarsomeres (in mm.): I, 0.085–0.090 (avg. of 12 observations, 0.090); II, 0.395–0.460 (0.430); III, 0.175–0.225 (0.215); IV, 0.105–0.145 (0.120); V, 0.090–0.105 (0.100). Wing length: ♂, 1.71–1.92 mm.; ♀ 1.89–2.05 mm. Male genitalia: No apparent distinguishing characters. Ovipositor: As in *C. wattsi* but longer, 2.50–2.75 mm.

Reared from heads of sand bluestem, *Andropogon hallii* Hack.

Immature stages. Larva unknown but probably fits remarks for that of *C. wattsi,* as does the pupa.

Material examined. Holotype (on slide): "♂; ex sand bluestem; F-4; coll'd 8-23-1965; reared 8-26-1965; Los Lunas, N. Mex.; J. G. Watts; USNM type no. 68933." Deposited in USNM. Paratypes (all on slides): 14 ♂♂, 8 ♀♀, and 8 pupal exuviae, all collected from same locality and on same date as holotype, emergence dates from 8-26 to 9-12-1965. Two ♂ and 2 ♀ paratypes deposited in the Department of Botany and Entomology, New Mexico State University; the remainder in USNM.

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AN APHID WITH FOUR CORNICLES
(Homoptera: Aphididae)

Mr. Roy Latham collected a number of apterous aphids at Orient, Long Island, New York on June 20, 1966 from *Sambucus nigra* which he sent me for determination. These proved to be *Aphis sambucifoliae* Fitch. I was surprised to find that one mature specimen had a pair of adventitious cornicles. These are situated on the following abdominal segment and nearer to the median line. They are cylindrical and narrower, appear to be less heavily chitinized, and are about one-half the length of the primary cornicles.

I had thought that this was an unique instance but, as has so often been said "there is nothing new under the sun," Dr. H. L. G. Stroyan has kindly called my attention to a paper by Remaudière "Sur la presence de cornicules surnuméraires chez un *Aphis.*" (Rev. Path. Veg. 43:31–35, 1964). The species in this case was an *Aphis* of the group living on *Euphorbia* spp. and Stroyan writes "the situation of the extra cornicles was as you describe for *sambusifoliae.*" He says that Remaudière also refers to a paper by Zirnitz "Duplication of cornicles in *Megoura viciae* Kalt." (Fol. Zool. Hydrobiol. 2:1–3, 1930, Riga). Mortimer D. Leonard, *Colloborator, Entomology Research Division, ARS, US Dept. Agriculture, Washington, D.C.*

CHLAENIUS PATRUELIS LECONTE A VALID SPECIES
(COLEOPTERA: CARABIDAE)

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Leconte (1844) described *Chlaenius patruelis* from Georgia. Later, he synonymized it with *C. herbaceus* Chevrolat (1834) of Mexico (Leconte, 1856). Recently, through the courtesy of Dr. Philip J. Darlington, Jr. of the Museum of Comparative Zoology, I have been able to compare specimens from Mexico and Florida. The male genitalia (Figs. 1 and 2) are strikingly different, indicating that *patruelis* is a distinct species. In *patruelis*, the internal filament is relatively much thicker, the aedeagus is less abruptly bent at the middle, the apical lobe is longer, and there is no dilated, subangulate "shoulder" near the tip.

The female genitalia of the Mexican *herbaceus* apparently consistently lack spines, while three minute spines occur on each valvule in most *patruelis*. In my revision of *Chlaenius* (Bell, 1960), however, I did report a single North American specimen without spines.

I have since observed females of several species of *Chlaenius* in which minute spines apparently had been shed. In such a case, it is very easy to overlook the pits from which the spines have been lost, and to conclude that spines are absent. Both species are too rare to permit conclusions about the reliability of this character.

C. herbaceus is consistently larger (total length 16.2–17.3 mm.) than *patruelis* (12.9–15.5 mm.). Typical specimens of the two species differ in several external features. In *herbaceus*, the punctures of the pronotum are slightly less dense, especially on the anterior part of the disc. The pronotum is shorter and broader. Sinuation of lateral margin located more posteriorly, closer to hind angle. The head is distinctly larger. The elytra are less parallel-sided, becoming slightly broadened behind the middle. The proportional differences are most easily expressed by ratios between measurements (Table 1).

Among the Florida specimens measured in 1960 was a single one

Table 1.

	C. herbaceus (4 specimens)	*C. patruelis* (7 specimens)	*C. patruelis* (1 dwarf specimen)
Total length	16.2–17.3 mm.	14.7–15.5 mm.	12.9 mm.
Ocular width/pronotal length	0.85–0.89	0.79–0.82	—
Pronotum: length/greatest width	0.78–0.84	0.90–0.94	0.82
Pronotum: basal width/length	1.07–1.09	0.96–0.99	1.16
Elytra: length/greatest width	0.67–0.71	0.61–0.64	—

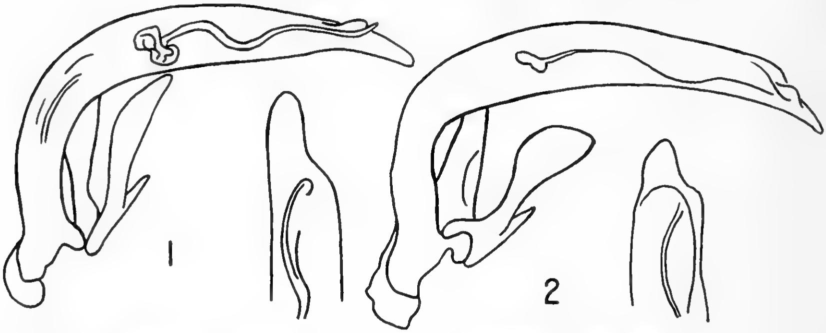

Fig. 1, *Chlaenius patruelis* Lec.; fig. 2, *Chlaenius herbaceus* Chev.

whose proportions fall within the range for the Mexican specimens. This specimen, however, was extremely small (length 12.9 mm.), in contrast to the true *herbaceus*, which is larger than *patruelis*. Indeed, the Florida one is so much smaller than any other specimens of *patruelis* that it probably represents an abnormal dwarf. Its measurements are given separately in Table 1. Unfortunately, I did not measure the ocular width and elytral proportions of this specimen. The sinuation and punctation of the pronotum were normal for *patruelis*.

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THE ORDINAL POSITION OF THE GENERIC NAME SINOSTEMMIULUS CHAMBERLIN & WANG, 1953

(Diplopoda: Julida: Nemasomatidae)[1]

Richard L. Hoffman, *Department of Biology, Radford College, Radford, Va.*

The new generic name *Sinostemmiulus* was proposed in a paper on Oriental diplopods by R. V. Chamberlin and Y. M. Wang (1953). Based upon a new species, *S. simplicior*, (type by original designation

[1] A contribution from studies supported by a grant (G-21519) from the National Science Foundation.

and monotypy) the generic taxon was diagnosed in the following words:

"A genus agreeing with *Stemmiulus* and *Prostemmiulus* in lacking a lateral fissure or suture setting off the lower from the upper part of the tergites. It differs from these genera in lacking lateral lamellae in the sternites."

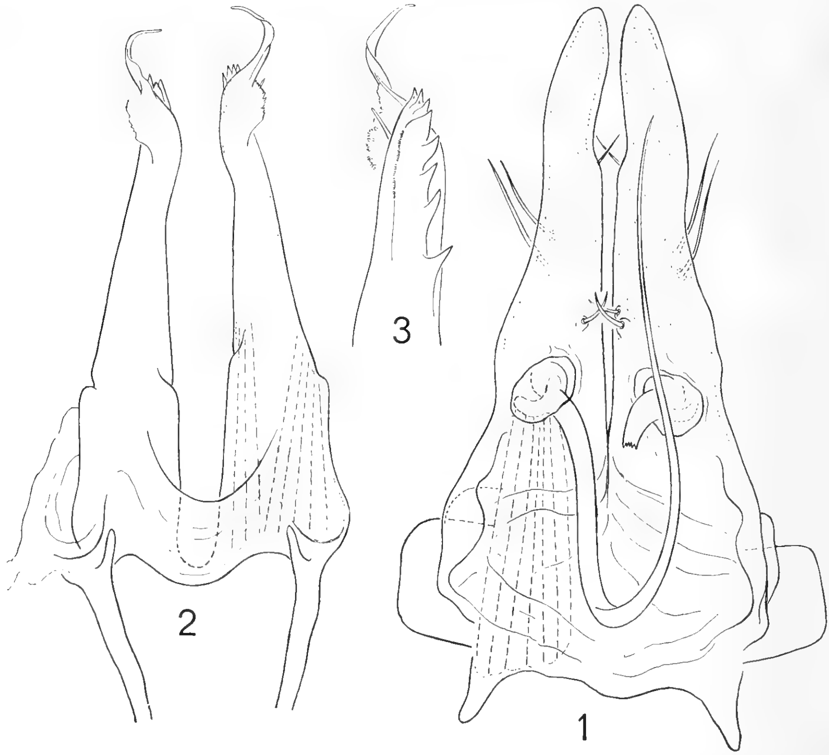
The type species, collected at Chenghsien, Chekiang Province, China, was "described" in extremely concise terms, totalling seven short sentences alluding to the size, coloration, and gonopod structure, the latter being elaborated with two illustrations.

From the first reading of this account, I felt considerable doubt and uncertainty about the exact status of this form, because it originated at a locality quite outside the known or expected range of the Stemmiulida, and because the gonopods appeared totally unlike those of any known member of that order (in which the posterior pair is quite rudimentary). However, nothing was done to explore the matter until December of 1963 when I received an inquiry from my colleague Dr. C. A. W. Jeekel, who expressed doubt that *Sinostemmiulus* was really a stemmiulid on the same grounds that had occurred to me.

Through the characteristic kindness of Dr. W. J. Gertsch, it was possible to restudy a male paratype of *S. simplicior* belonging to the American Museum of Natural History. The specimen is in several fragments and most of the legs are missing, but the first glance revealed at once that the species is not a stemmiulid at all, but belongs in fact to the julid family Nemasomatidae! Although I did not dissect out the mouthparts, every other external structural character attests to the julid attributes of the creature. The gonopods were removed and temporarily mounted in glycerin for microscopic study, and I think that the present figures (figs. 1–3) likewise substantiate my allocation.

Most of the nemasomatid genera known from eastern Asia are largely confined to the Japanese islands, and most of them were proposed by K. W. Verhoeff. Insofar as I can determine, *Sinostemmiulus* is not synonymous with any other genus, although it rather approaches *Antrokoreana* both in body form and gonopod structure. An outstanding generic character is the complete suppression of peltogonopodal telopodites. The gonopods are unusually elongate, and show distinct retention of a coxite in contrast to acropodite dichotomy. This is indicated both by the external profile and by evident musculature (fig. 2).

As regards the taxonomic position of the genus within the family, I am of the opinion that both *Sinostemmiulus* and *Antrokoreana* are referable to the subfamily Nemasomatinae. Verhoeff erected a subfamily Antrokoreaninae for his genus, but based it entirely upon the characters that would be modified by cavernicoly: long antennae and legs, loss of pigment, reduction of ocelli. Verhoeff admitted that the



Sinostemmiulus simplicior Chamberlin & Wang, male paratype, gonopods. Fig. 1, peltogonopods, aboral view, flagellar muscles shown on one side; fig. 2, gonopods, aboral view, vestigial muscles (origin: sternum; insertion; base of acropodite) shown on one side; fig. 3, apex of gonopod, oral aspect, more highly magnified.

gonopods ". . . *sind nach demselben Typus gebaut, wie die der Isobatinen* . . ."

By regarding such modifications of body form as of secondary importance in classification, we can place better *Antrokoreana* either in the tribe Nemasomatini (see my 1964 paper on this group) or, generously, in a tribe of its own between the Nemasomatini and Trichoblaniulini. The gonopods of *Antrokoreana gracilipes* Verh. are not greatly different from those of *Trichoblaniulus hirsutus,* aside from being more elongated, but the peltogonopods of the latter genus do retain the telopodites while losing the flagella instead. Until *Sinostemmiulus* is more closely studied for the characters of the gnathochilarium, first pair of male legs, ect., it can be aligned with *Antrokoreana* or perhaps better left in the status of "Nemasomatinae of uncertain position".

In any event, the resolution of this matter serves to dispose of a zoogeographic anomaly. The species of Stemmiulida are known to occur in the Neotropical (Vera Cruz to Ecuador), Ethiopian (West Africa, Tanzania), and Oriental (south India, Ceylon) regions, and the presence of members of this old group in the Holarctic of central eastern China would be an unusual (although not impossible) situation. We can not, unfortunately, correct the nomenclatorial anomaly that results from the relocation of *Sinostemmiulus* into the Nemasomatidae; this name remains as an immortal self-indictment.

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ON SOME EMESINAE FROM DUTCH GUIANA (SURINAM), WITH A NEW SPECIES.

(Reduviidae)

J. Maldonado-Capriles[1] *and* P. H. van Doesburg, Jr.[2]

The material treated in this paper was collected by the junior author. Types are deposited in the authors' collection and at the USNM. The junior author will at a future date donate his material to the Museum at Leiden.

All the species discussed represent new records for Dutch Guiana. A new species of *Stenolemus* is described. The junior author made some observations on the habits of this new species. A microscopic drawing of a modification of the antenna of this species is included. This organ, also noted in an other species of *Stenolemus*, may have something to do with the spider-web frequenting habit of this species.

We are grateful to Dr. Pedro Wygodzinsky, from the American Museum of Natural History at New York City, for helping us with the identification of this material.

Stenolemus arachniphagus, n. sp.

Belongs in the group of species with a short pedicel in the pronotum and lacking ventral spines on the abdomen. It can be distinguished from the other species in the group by details of the coloration and genitalic characters.

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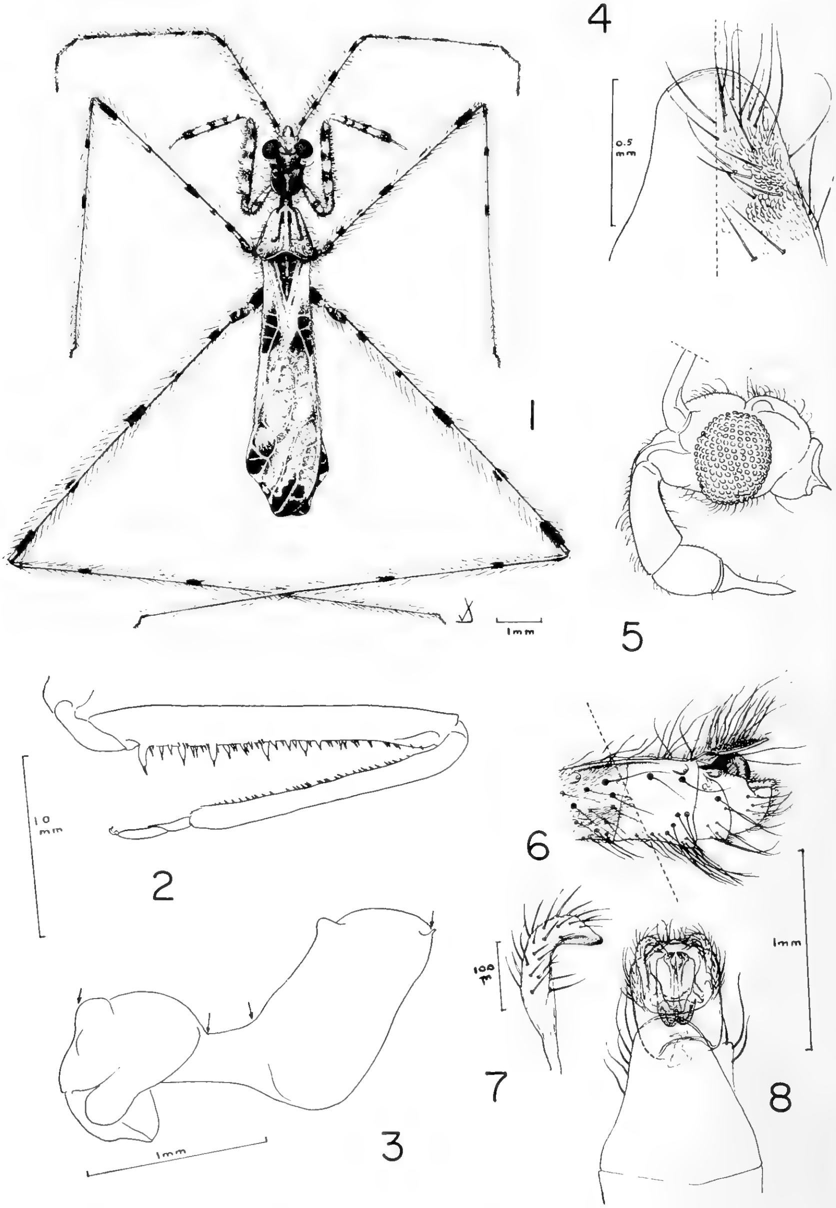
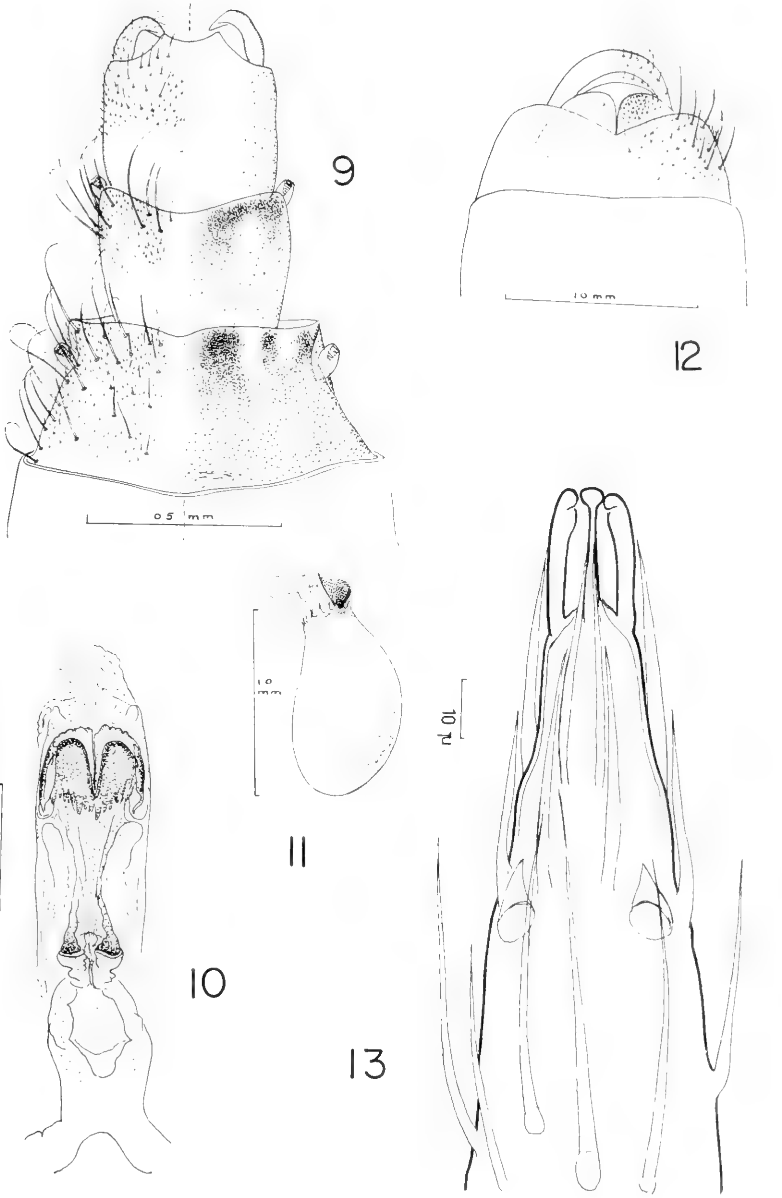


Stenolemus arachniphagus sp. nov., male: 1. habitus. 2. foreleg, lateral, 3. pronotum, lateral, 4. seventh tergum, 5. head, lateral, 6. apex of abdomen, lateral,



7. left clasper, dorsal, 8. apex of abdomen, dorsal, 9. apex of abdomen, ventral, 10. penis, dorsal. Female: 11. egg, 12. apex of abdomen, ventral, 13. microscopic detail of apex of antenna.

Male—overall color pale stramineus and marked with brownish and brown. Head grayish-brown; anterior lobe stramineus dorsally. Antenna stramineus, with four darker bands on first and second segments as illustrated; third basally and fourth with a short basal and an apical blackish band. Beak of same color as posterior lobe of head. Pronotum with anterior lobe and pedicel grayish-brown, of same color as posterior lobe of head, anterior lobe medianly and laterally paler; posterior lobe stramineus. Mesonotum, including spine, stramineous; metanotum brownish, spine stramineous apically. Meso- and metathorax ventrally brownish, darker than anterior lobe of pronotum. Forelegs stramineous; coxa with a subapical brownish band; femur and tibia with four brownish bands as illustrated; tarsus darkening toward apex. Midlegs stramineous; coxa blackish-brown; trochanter brown apically and basally; femur with a dark untufted brown ring about midway and another subapically, with two brownish basal bands and another before subapical band; tibia with three short bands on basal half; tarsus brown. Hind legs colored as midleg, bands slightly darker and longer. Forewing stramineous; with three principal brown areas as follows: at base of first discal cell and extending over to costal cell, at apex of outer apical cell, and at inner angle of inner apical cell; small dashes or small areas of brown or brownish each side of some or most veins of discal and apical cells (fig. 1). Abdomen brown, of same color as metathorax ventrally. Pilosity typical of the genus, i. e., long fine pilosity on the appendages and short decumbent and long semierect pilosity on body. Armature of foreleg as in figure 2.

Width of head across eyes 1.05 mm.; interocular space 0.42 mm.; length of head from base of beak to posterior margin 0.84 mm. Beak segments laterally as follows: I, 0.54 mm.; II, 0.34 mm.; III, 0.42 mm.; shape as in figure 5. Segments of forelegs as follows: coxa, 1.04 mm.; trochanter, 0.34 mm.; femur, 1.95 mm.; tibia, 1.45 mm.; tarsus, 0.4 mm.; Antennal segments I, 2.53 mm.; II, 3.07 mm.; III, 0.5 mm.; IV, 0.77 mm. Width of anterior lobe at shoulders 0.70 mm.; caudal width of posterior lobe 1.30 mm. Anterior lobe of pronotum from shoulder or antero-dorsal angle to apex of pedicel 0.65 mm., pedicel dorsally 0.25 mm., and posterior lobe 1.20 mm. (figure 3, from arrow to arrow). Posterior lobe with a short blunt spine at end of each lateral arm of the dorsal carina; dorsal carina like a three-point fork (fig. 1). Length of forewing 5.9 mm.; greatest width 1.54 mm. Forewing with veins inside all cells, giving it a somewhat reticulate appearance; apical margin concave. Abdomen without ventral spines, figs. 6 and 9. Overall length 8.5 mm.

Male genitalic segments and penis as in figures 4, 6, 7, 8, 9, and 10.

Female—coloration much as in male; in some specimens with slightly more marked contrast between the light and dark areas. Most specimens with more abundant brown coloration along the veins inside the cells than in the male. Apex of abdomen from below as in figure 12; egg as in figure 11. Overall length 9.0 mm.

This species seems closer to *Stenolemus dureti* Wygodzinsky. They can be separated as follows:

Forewing dark brown along costal and inner margin; brown rings on femora longer than whitish areas in between .... **S. dureti**

Forewing with three principal dark areas (fig. 1); brown rings on femora much shorter than whitish areas in between .... **S. arachniphagus**

Holotype—male, Paramaribo, Surinam, Aug. 25, 1959, P. H. van Doesburg collector, in junior author's collection. Allotype, female, same data in the junior author's collection. Paratypes: one male, in the U. S. National Museum, same data; one male in Dr. P. Wygodzinsky's collection, same data; three males and three females in the senior author's collection, same data; 10, including both sexes in the junior author's collection, same data.

The specimens were collected from the webs of the social spider *Anelosimus rupununi* Levi. This spider makes huge webs on trees. The adults and the nymphs were observed to prey on young spiders. Microscopic examination of the tip of the antenna shows the organ or modification illustrated in figure 13. As stated, this organ is present in another undetermined species of *Stenolemus* that also lives in spider-webs. Whether this organ has something to do with the spider-web inhabiting habit remains to be proven.

Other material examined:

Gardena marcia McAtee and Malloch

Seven specimens including both sexes, from Paramaribo.

Gardena aggripina McAtee and Malloch

One male and one female, from Paramaribo.

Gardena faustina McAtee and Malloch

Two males from Paramaribo.

Ploiaria punctipes McAtee and Malloch

Four specimens of both sexes from Paramaribo.

Emesaya brevipennis australis McAtee and Malloch

Six specimens, including both sexes, from Paramaribo.

Myiagreutes praecellens Bergroth

Six specimens of both sexes from Paramaribo.

Ghilianella ica McAtee and Malloch

One male from Wonotobo.

Ghilianella sp. 1

A female specimen from Spilaliwini, different from all known females, that may represent a new species or the female of one described only from males.

Ghilianella sp. 2

Two males from Paramaribo, different from all known males. May represent an undescribed species. Probably not the other sex of species 1 above.

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RECENT COLLECTIONS OF THE GIANT SUCKING LOUSE, PECAROECUS JAVALLI BABCOCK AND EWING, FROM THE TYPE LOCALITY[1]

(ANOPLURA: HAEMATOPINIDAE)

B. McDANIEL,[2] R. D. BARNES,[3] *and* W. LOW[4]

In 1938 Babcock and Ewing described the giant sucking louse, *Pecaroecus javalli* from a month old peccary, *Pecari angulatus* (*Tayassu angulatus* by some authors). Ferris (1951) reported this species as known only from the type lot. Eads (1951) and Menzies et al. (1951) reported collecting twenty-five specimens of *P. javalli* from a single animal collected June 15, 1949, in Terrell County, Texas by B. G. Hightower. Neal (1959) reported *P. javalli* as infesting seven peccaries (*Pecari angulatus sonoriensis*) in Arizona.

Two lots of *P. javalli* have been recently collected from peccaries in Texas. The first was collected 20 miles southeast of Ozona, Crockett County, Texas, November 25, 1963 by R. D. Barnes, from a single animal. The second was collected 36 miles south of Ozona, on the Watson Ranch, January 20, 1966 by William Low.

All of the collections in Texas fall within a restricted area, being confined to two counties, Crockett and Terrell, which are located in the southwest section of the State. The most recent collections are within a 50 mile radius. During the past two years an intensive study of the javelina of south Texas has revealed that in trapping 175 specimens of *P. angulatus*, not a single specimen was found to be infested with the giant sucking louse. During this time period all animals were carefully handled to obtain data in connection with life history studies being carried out by W. Low in conjunction with the Welder Wildlife Refuge, Sinton. The recent collections of *P. javalli* by Low was in connection with the life history study. The animals collected in Crockett County were handled in the same manner as those trapped in south Texas.

Collections of external parasites by Eads (1951) from pigs taken from Aransas, Kleberg, Nueces, and Uvalde Counties and the recent work by Low (unpublished data) from pigs collected from the King Ranch, Kleberg County were not infested with sucking lice. Disregarding the Arizona parasites collected by Neal (1959) from *P. angulatus sonoriensis*, a subspecies of the Texas wild pig, all parasites are found to be confined to an area within 30 miles of the type locality in Texas.

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[3] *Department of Biology, Del Mar College, Corpus Christi, Texas.*

[4] *Graduate Fellow, Welder Wildlife Refuge, Sinton, Texas.*

Even though several animals were collected in the same locality only a few were found to be infested by sucking lice, indicating that the lice do not readily transfer from one animal to another even though the host definitely maintains a herd relationship. This also coincides with the belief that the javelina, at least in Texas, maintains itself in small herds with a restricted range. This would account for the confined distribution of the giant sucking louse to its type locality. The question as to the relationship of the members of *P. javalli* found in Texas and those recorded from Arizona needs to be studied due to the restricted nature of parasite collection data.

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A NEW SPECIES OF COQUILLETTIDIA FROM SAMOA
(Diptera: Culicidae)

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When Belkin (Mosquitoes of the South Pacific 1: 308, 1962) described *Mansonia* (*Coquillettidia*) *fijiensis,* he tentatively included a male from Samoa in the species, although not as a paratype. The U. S. National Museum recently received through Capt. R. T. Holway of the U. S. Navy a male and female from Samoa. These two specimens and the specimen that Belkin mentioned, which was loaned to me by Dr. E. N. Marks of the University of Queensland, appear to be sufficiently different from *fijiensis* to warrant treatment as a new species.

Coquillettidia (C.) samoaensis, n. sp.

A rather dark species, the scutum with a pair of median dark stripes, a large dark area above the wing base, and sternopleuron almost entirely dark.

Female. Head yellow with narrow recumbent scales dorsally, these broad and flat laterally, and erect dark scales on vertex; clypeus yellowish brown with a thin grayish sheen anteriorly; torus yellowish brown; flagellum with long dark hairs and short pale hairs; palpus about 0.30 length of proboscis, with dark purplish scales; proboscis about 0.80 length of abdomen, with dark purplish

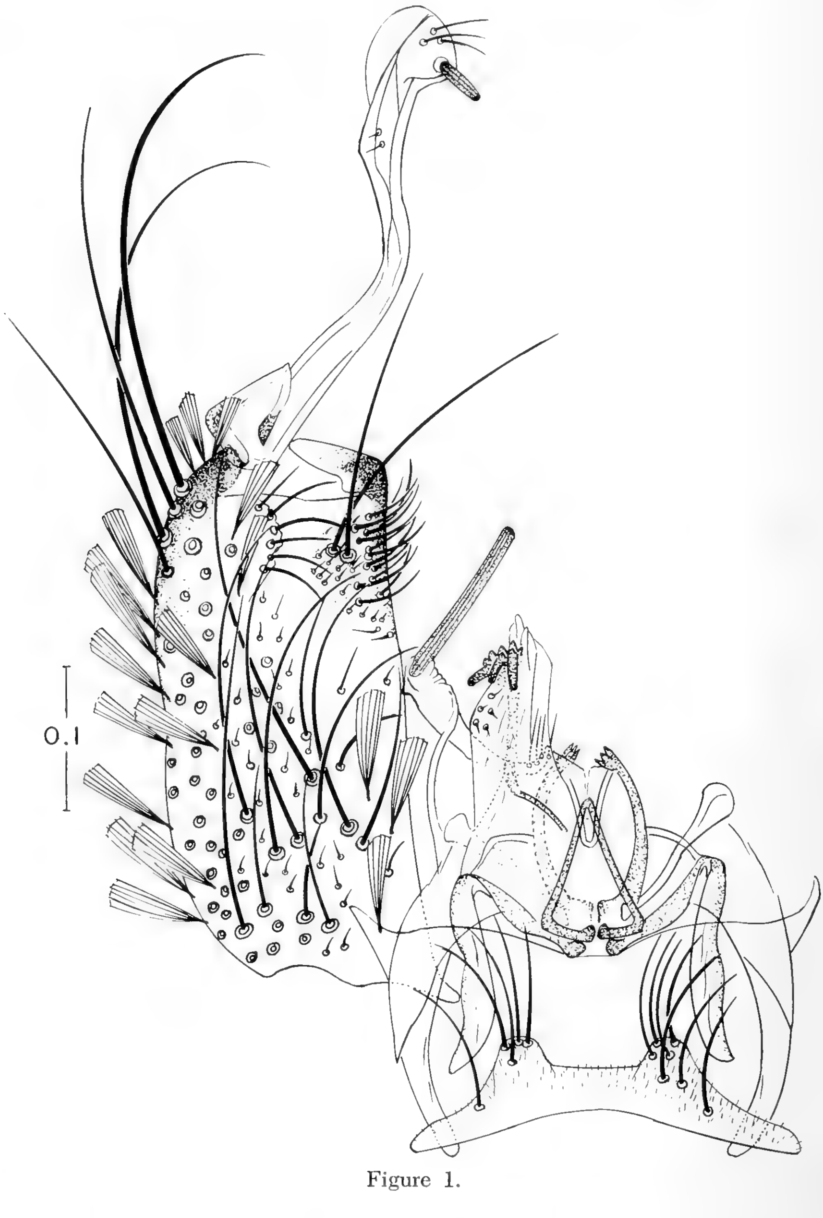

Figure 1.

scales, the labellum with pale membranous margin. Anterior pronotum pale yellow; posterior pronotum shiny, dark brown, with a few setae on posterior margin; scutum yellow, with dark brown markings in a pair of central stripes back to prescutellar area and a large sublateral dark spot on each side from hind margin forward to level of hind margin of anterior spiracle; short recumbent golden hairs centrally and narrowly to either side of the dark central stripes, the rest of the scutum bare except for setae; scutellum pale yellow with 5 setae on central lobe, 7 on each lateral lobe; postnotum dark brown, slightly paler laterally; all pleural sclerites dark brown, except for anterior corner of subspiracular area, a small spot on anterior margin of sternopleuron, and meron, yellowish. A patch of silvery scales on sternopleuron in front of meron, and a large patch above middle of mesepimeron. Wing predominately dark scaled, with pale yellow scales at base anteriorly and the fringe at the extreme apex of wing yellowish. Halter yellow, the knob slightly darkened. Femur of fore leg dark purplish above, yellow below; tibia and tarsus dark; mid femur mostly yellow; mid tibia dark above, yellow below; first tarsomere mostly yellow but dark on one side on apical half; rest of mid leg and hind legs missing. Abdomen mostly dark purplish scaled with narrow yellowish anterior bands on terga and the sides of terga 7 and 8 broadly yellow; each sternum yellow scaled anteriorly, dark scaled posteriorly. Wing length 4.5 mm; proboscis 2.5 mm; abdomen 3.5 mm.

Male. Palpus dark, about 0.85 length of proboscis. Coloration essentially as in female, legs somewhat paler, the mid first tarsomere not markedly bicolored; hind femur with scarcely any dark scales and hind tibia darkened only narrowly at apex. Terminalia as figured (Fig. 1).

Holotype female, Tavalogi Ridge, Tau Island, Manua Group, Eastern Samoa, February 18–19, 1965, G. A. Samuelson; paratype male, cliff trail east of Tau Village, 60 m, Tau Island, Manua Group, Eastern Samoa, February 18, 1965, G. A. Samuelson (U. S. National Museum No. 69065); paratype male, Moatai stream, N. Upolu, Western Samoa, January 18, 1956, T. E. Woodward (University of Queensland).

This species closely resembles *fijiensis*, and I can find no means of distinguishing the terminalia of the male paratype of *samoaensis* from that of the holotype of *fijiensis*. The figure here given for *samoaensis*, including the sclerotization at the apex of the basimere and the shape of the distimere, agrees well with the holotype of *fijiensis*, although it differs considerably from the figure presented with Belkin's original description. I consider *samoaensis* to be a new species on the basis of color differences and geographic isolation. In the male of *fijiensis* the scutum centrally shows only the barest trace of the dark central stripes and very little more for the female, and in both sexes the sublateral dark areas above the wing base are very indistinct; the lower half of the sternopleuron is broadly yellow; the apical two-fifths of the hind femur of both sexes is dark purple, the hind tibia is entirely dark, and the yellow abdominal bands are broader.

I am indebted to the Southeast Asia Mosquito Project, Smithsonian Institution for the drawing by Miss Jung Lea Hwang of the male terminalia.

NEW ORIBATID MITES FROM CENTRAL AMERICA (ACARI: CRYPTOSTIGMATA)[1]

TYLER A. WOOLLEY, *Department of Zoology, Colorado State University*[2]

Several oribatids from Guatemala and Honduras were sent to me for identification. Observations of these mites showed them to be new, and they are described below.

LOHMANNIIDAE

The first of these mites is in the family Lohmanniidae, but does not fit any of the existing genera. Balogh (1961) makes the principal separation of the two main groups of genera on the basis of transversely divided or undivided genital covers. Thus, *Lohmannia, Thamnacarus, Cryptacarus, Papillacarus, e.g.*, exhibit divided genital covers; in *Meristacarus, Mixacarus, Torpacarus, Annectacarus, Javacarus, e.g.*, the genital plates are without this transverse suture.

This new lohmanniid seems to fit between these two generic groups because the genital covers are entire, but exhibit faint vestiges of a transverse suture. It was compared with species described by Grandjean (1950) and Balogh (1958, 1960, 1961, 1961a, 1962, 1962a).

Euryacarus petalus, n. gen., n. sp.

(Figs. 1, 2)

Diagnosis: Differs from other genera and species in the arrangement of the finely barbed hairs, the integumental pits, and its general broad and flattened appearance indicated in the names. It resembles *Mixacarus integer* Balogh, 1958, and *Javacarus kühnelti* Balogh, 1961, in the pitted integument and the four pairs of anal setae, but is about a third larger than the latter, much broader than both, differs in the sculpturing of the prodorsum and lacks the transverse notogastral plate associated with the cervical hairs in *J. kühnelti.*

Description: Prodorsum indistinctly separated from hysterosoma by a fine suture; rostrum blunt, rounded, extended over gnathosoma in such a way as to form a slight hood, a distinct marginal line extending posterolaterad of the rostrum almost to pseudostigmata; rostral hairs finely setose, inserted about half their lengths posterior to rostral tip; lamellar hairs nearly a third longer than rostral hairs, inserted near lateral edges of prodorsal margin, closer to rostral hairs than to interlamellar; surface of prodorsum pitted; lamellae and translamella absent; interlamellar hairs twice as long as lamellar hairs, curved outward at tips, finely barbed, inserted mediad of pseudostigmata; pseudostigmata small, cornuate; sensillus lanceolate, with pectinate anterior margin along distal half; anterior exobothridial hair (*exa*) laterad of pseudostigmata, about same length as lamellar hair; posterior exobothridial hair (*exp*) shorter, inserted more medially; dorsosejugal suture indistinctly separating prodorsum and notogaster; hysterosoma with small, rounded pits, but slightly different in sculpturing from prodorsum (Fig. 1); twelve pairs of finely barbed, curved notogastral setae, setae c_2 missing in specimen.

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[1] Research supported by NSF Grant GB 3872.

[2] Immediate publication secured by full payment of page charges—Editor.

Gnathosoma with a ventral groove, chelicerae stout; ventral plate with setae, apodemata as shown in figure 2, slightly broken in type specimen; genital aperture and anal aperture contiguous, genital plates rounded laterally, each genital cover with six medial setae, four longer lateral setae; anal covers elongated, slightly displaced in holotype, ridged toward medial edge, each anal cover with four long hairs; adanal setae as shown in figure 2; some leg segments missing in type specimen; left leg I with keeled, pointed femur; tarsus monodactyle.

Length: 840 μ, propodosma 372 μ, hysterosoma 468 μ; width: 588 μ.

This single type specimen was collected in soil with cuttings from Guatemala, at Nogales, N. M., 27 February 1958, by G. R. Dunn (Lot 58-5907). It will be deposited in the U. S. National Museum.

Epilohmanniidae

Two mites belonging to the genus *Epilohmannia* were among the specimens sent for identification. Both are broken, but the distinguishing features are discernible.

Epilohmannia cultrata, n. sp.
(Figs. 3, 4)

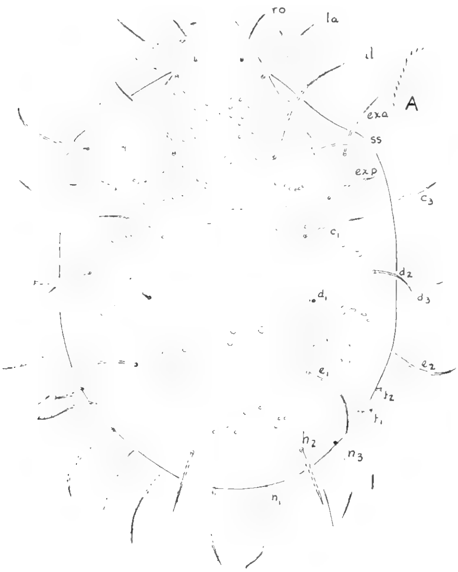
Diagnosis: The species is similar to *Epilohmannia verrucosa* Jacot, 1934, but with five setae on medial edge of genital covers, a longer and narrower sensillus, and lateral glandular fissure on ventrolateral margin of hysterosoma. It differs from *E. insignipes* Balogh (1962) in the pitted prodorsum, from *E. ovata* Aoki, 1961, in the smaller number of ventral hairs, and from all of these species in the knife-like hairs on tarsus IV, implied in the specific name.

Description: Dark reddish brown; prodorsum triangular, surface with small pits; rostrum rounded, translucent, hood-like; rostral hairs simple, setiform, curved, inserted medially on dorsum less than their lengths apart; lamellar hairs setiform, about as long as rostral hairs, curved, inserted closer to interlamellar hairs than to rostral; lamellae and translamella absent; interlamellar hairs about as long as sensillus, finely barbed, somewhat erect, inserted nearer pseudostigmata than to lamellar hairs; pseudostigmata at posterolateral corners of prodorsum; sensillus slightly setose, lanceolate; hysterosoma broken in type specimen; dorsal surface with finely barbed hairs (Fig. 3).

Infracapitulum depressed, withdrawn inside of camerostome; ventral plate, ventral setae, apodemata as seen in figure 4; genital aperture nearly round, genital plates rounded laterally, each cover with five setae near medial margin, three setae nearer lateral edge, medial setae fine, lateral setae longer and stouter; anal aperture longer than broad, separated by ventral plate from genital opening; each anal cover with three simple, relatively long setae; three pairs of adanal setae laterad of anal opening, ada : 3 about twice its length from insertion of ada : 2; anal fissure anterior to a : 1 in margin of cover; fissure *iad* at anterolateral corner of anal opening.

Legs monodactylous; famulus of tarsus I short, spine-like; solenidion ω_2 on tarsus I robust, curved; two flattened, knife-like setae on ventral surface of tarsus IV.

Length: 614 μ; width: 314 μ (in broken specimen).



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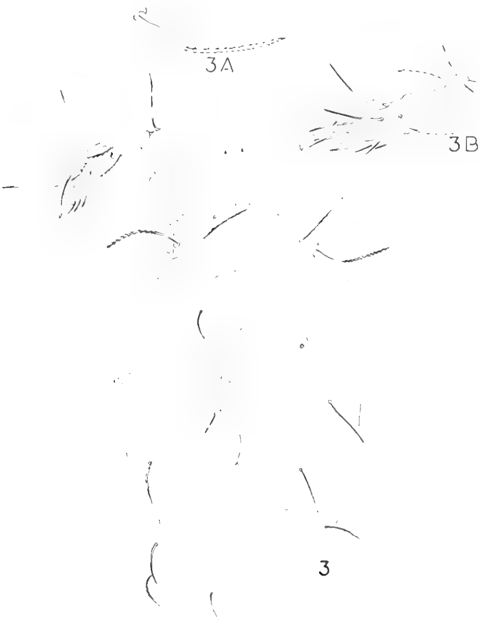

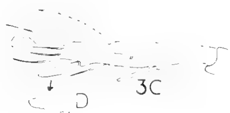

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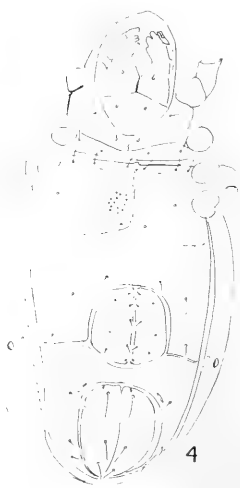

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The type specimen and one other were collected in soil with cuttings from Guatemala, at Nogales, N. M., 27 February 1958, by G. R. Dunn (Lot 58-5907). The type will be deposited in the U. S. National Museum.

Oribatulidae

A new oribatulid was among the specimens from Central America and is described below.

Nasobates spinosus, n. gen., n. sp.
(Figs. 5, 6)

Diagnosis: The new genus and species is readily distinguished by the funnel-shaped, rostral projection, long, robust, spinose prodorsal and notogastral setae. It resembles *Cosmobates tunicatus* Balogh, 1959, in the four pairs of genital setae, the heavy, bristled, prodorsal hairs, but differs in the clavate sensillus, the ten pairs of notogastral setae, the interrupted dorososejugal suture and the elongated pteromorphs. The names are derived from the distinctive rostral snout and the heavy, spinose dorsal hairs.

Description: Color brown; prodorsum broadly triangular, surface beset with small tubercles; rostrum prominently expanded into a funnel-shaped snout; rostral hairs fine, about same length as lamellar hairs, inserted remote from tip of rostrum posterior to level of lamellar hairs; lamellae narrow, along sides of prodorsum, with short truncate cusps; lamellar hairs finely barbed, inserted in distal tips of cusps, projecting beyond rostrum; translamella absent; interlamellar hairs curved, robust, heavily bristled, three times as long as lamellar hairs, inserted near interrupted dorsosejugal suture; pseudostigmata rounded; sensillus clavate, with fine spines on surface of head; pedotecta I short, laterad of pseudostigmata.

Dorsosejugal suture interrupted medially; notogaster broad, rounded in outline, with narrowed, elongated pteromorphs; surface of integument (? cerotegument) tuberculous, surface beneath cerotegument (?) with rounded areolae, finely stippled; ten pairs of robust, curved, heavily bristled setae (Fig. 5).

Camerostome broadly triangular, its anterior cavity extended into snout-like rostral projection; ventral setae, apodemata, sculpturing of venter as seen in figure 6; genital opening rounded, each genital cover with four setae, subequally spaced from each other, g : 1, g : 4 closer to medial edge of cover than g : 2, g : 3; aggenital setae inserted equidistant from genital and anal openings; anal opening trapezoidal, each anal cover with two simple hairs; fissure *iad* close to anal opening, slightly posterior to level of insertion of a : 1; three pairs of short, finely barbed adanal setae; ada : 3 inserted about half way the length of anal aperture, ada : 2, ada : 1 posterior to opening.

←

Figs. 1–2, *Euryacarus petalus*, n. gen., n. sp. Fig. 1, from the dorsal aspect, legs omitted, A. free-hand sketch of sensillus (broken at tip); fig. 2, from the ventral aspect, legs partially shown; fig. 3, *Epilohmannia cultrata*, n. sp., from the dorsal aspect, A. freehand sketch of sensillus, B. tibia and tarsus I, C. tarsus IV, showing knife-like setae, D. free-hand sketch of distal seta; fig. 4, *E. cultrata*, n. sp., from the ventral aspect.

Fig. 5–6, *Nasobates spinosus*, n. gen., n. sp. Fig. 5, from the dorsal aspect; fig. 6, from the ventral aspect.

Legs heterotridactylous; several legs broken and missing in type specimen. Length: 432 μ, prodorsum 78 μ, hysterosoma 354 μ; width: 360 μ.

The single type specimen, which is slightly broken, was taken with orchid plants from Honduras, at Miami, 11 March 1960, by Carl Stegmaier (Lot 60-7191). The type will be deposited in the U. S. National Museum. The measurements may be slightly in error because of the broken specimen; the drawings were reconstructed partially from the broken type specimen.

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SOME UNUSUAL PREY RECORDS FOR POMPILIDAE

The following records pertain to Pompilidae of unknown prey preferences and to spiders rarely if at all reported as prey of these wasps. Richard Thorington, an Associate in Mammalogy at the Museum of Comparative Zoology, recently presented me with a female *Priochilus scrupulum* (Fox) taken with an immature wandering spider of the genus *Ctenus* (Ctenidae) [det. A.M. Chickering]. This specimen was taken at the Hacienda Barbasol, east of San Martin, Colombia, in March 1965. I am not aware of any previous prey records for members of this genus, or of records of the use of Ctenidae by Pompilidae.

Dr. Thorington also took, in the same locality, a female *Pepsis egregia* Mocsary and a female *P. dimidiata* Fabricius, each with a funnel-web tarantula of the genus *Diplura* (Dipluridae) [det. A.M. Chickering]. Little is known of the host relationships of the species of *Pepsis*, an extremely large genus in the neotropics.

Dr. Paul D. Hurd, Jr., of the University of California at Berkeley, recently sent me a specimen of *Pompilus* (*Perissopompilus*) *phoenix* Evans taken with a juvenile hackled-band web-spider of the genus *Filistata* (Filistatidae) [det. H. W. Levi]. The specimen was taken 7 miles NE of Desert Center, Riverside Co., Calif., on March 20, 1966. The wasp was dragging the spider backward across sparsely vegetated soil among *Larrea* bushes. This is the first prey record for this subgenus, and so far as I am aware the first record for Filistatidae for a North American pompilid.—HOWARD E. EVANS, *Museum of Comparative Zoology, Harvard University, Cambridge, Mass.*

NEW SYNONYMY AND A NEW NAME COMBINATION IN NEOPHYLLAPHIS TAKAHASHI
(Homoptera: Aphididae)

Essig (Proc. Calif. Acad. Sci. (ser. 4) 28 (3):63–66, illus., 1953) erected the monotypic genus *Chileaphis,* and designated his new species, *C. michelbacheri,* as its type-species. Through the courtesy of Jerry A. Powell, University of California, Berkeley, I have been able to examine paratype specimens of viviparous and oviparous females, and males of *michelbacheri.* From this study it is evident that *michelbacheri* is congeneric with *podocarpi* Takahashi, the type-species of *Neophyllaphis* Takahashi (Can. Ent. 52:19, 1920). *Chileaphis* Essig, 1953, is therefore a synonym of *Neophyllaphis* Takahashi, 1920 (**new synonymy**), and the species name becomes *Neophyllaphis michelbacheri* (Essig) (**new combination**).—Louise M. Russell, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C. 20250.*

SOCIETY MEETINGS

742nd Regular Meeting—April 7, 1966

The 742nd meeting of the Society was called to order by the President, Miss Louise M. Russell, on April 7, 1966, at 8:00 p.m. in Room 43, U. S. National Museum. Twenty-three members and twelve guests were in attendance. Minutes of the previous meeting were approved as read.

One new member was received into the Society, *Jim C. Hitchcock, Jr.,* and four candidates for membership: *Jeffery N. L. Stibick, Carl J. Mitchell, Botha De Meillon,* and *John D. Lattin.*

H. I. Rainwater reminded the Society of the dinner meeting June 2, at the University of Maryland to be held jointly with the Insecticide Society of Washington.

W. E. Bickley asked for a volunteer to give a talk on Entomology to a gathering of school children at Harpers Ferry.

K. V. Krombein exhibited two drawers of Egyptian insects from the Alfredi collection which was recently obtained by the U. S. National Museum. Dr. Krombein also showed a series of slides of examples of insects in early Egyptian art.

The first speaker for the evening, Lt. Col. R. M. Altman gave an interesting survey of the Army Medical Service Entomology program.

The second speaker for the evening, Capt. Thomas Yuill, discussed anthropod-borne virus studies being conducted on the eastern shore by the Department of Virus Diseases, Walter Reed Army Institute of Research.

After the introduction of visitors, the meeting was adjourned at 9:30 p.m.
Respectfully submitted, W. Donald Duckworth, *Recording Secretary*

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