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PROCEEDINGS OF THE

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THE THROAT BOT FLY: GASTEROPHILUS NASALIS OR VETERINUS?

(DIPTERA, GASTEROPHILIDAE)

CURTIS W. SABROSKY, *Entomology Research Branch, U. S. Department of Agriculture, Washington, D. C.*

Adoption of the name *Gasterophilus veterinus* for the throat bot fly of horses in the latest taxonomic study of the Gasterophilidae, by Zumpt and Paterson (1953), has again raised the question of the proper scientific name for that species, long known to North American entomologists as *Gasterophilus nasalis* (L.). Authors who reject *nasalis* for a horse bot have applied the name instead to a deer nose bot called *Cephenemyia trompe* (Modeer) by other authors.

In Opinion 106 of the International Commission on Zoological Nomenclature (1929), *Cephenemyia* was placed on the Official List of Generic Names with *Oestrus trompe* Fabricius as the type species (Fabricius actually credited the species to Modeer!). In the body of the Opinion, although not in the Summary, *trompe* is said to be a synonym of *Oestrus nasalis* Linnaeus. However, that is a zoological conclusion, and its acceptance or rejection is not affected by the Commission's action relative to the generic name and its type species.

After reviewing the evidence and the conflicting opinions, it is my conclusion that the proper scientific name of the throat bot fly should be *Gasterophilus nasalis* (L.)[1] for three major reasons discussed below.

(1) A Mixed Series and the First Reviser Rule

Early descriptions of bot and warble flies (Oestridae in the old and very broad sense) soon involve one in uncertainty and confusion. Descriptions of adults, which are often brief and generalized, are combined with various statements of larval habitat, and it is difficult to be positive about what an author described or included.

In four important publications of Linnaeus, species are described as follows in the genus *Oestrus:*

1746. Fauna Suecica, ed. 1, pp. 306-307: Six species described; not named

[1]Dr. F. Zumpt, of the South African Institute for Medical Research at Johannesburg, South Africa, has kindly permitted me to state that he has read the manuscript and agrees fully with the conclusions, at which he had arrived independently subsequent to his 1953 publication. I am also indebted to Dr. F. van Emden, of the Commonwealth Institute of Entomology at London, for suggestions and review of the manuscript.

binominally, but from comparison of data and references with the next three works, it is clear that the species are described in the following order: *bovis, tarandi, nasalis, ovis, haemorrhoidalis,* and a sixth species not subsequently referred to *Oestrus.*

1758. Systema Naturae, ed. 10, pp. 584-585: Five species, in the order *bovis, tarandi, nasalis, haemorrhoidalis, ovis.*

1761. Fauna Suecica, ed. 2, pp. 428-430: Five species, in the same order as in 1758.

1767. Systema Naturae, ed. 12, vol. 1, part 2, pp. 969-970: Five species in the same order as in 1758.

By the order of listing of species, which is consistent throughout for *bovis, tarandi,* and *nasalis,* and by the references, one could conclude that *nasalis* is the same throughout. If one considers only the 1746 description and associated information, it seems certain that the deer nose bot was described. But the starting point for zoological names is the tenth edition of the Systema Naturae in 1758. Abbreviated though it is, the diagnosis in the latter is markedly different from that in 1746, plus the fact that Linnaeus introduced the statement "Habitat in Equorum fauce, per nares intrans." The diagnosis has been interpreted by some able specialists (Aldrich 1926; van Emden *in litt.*) as applying perfectly to a species of *Gasterophilus,* and by other able specialists (Railliet 1918; Rodhain and Bequaert 1920) as applying perfectly to a species of *Cephenemyia.* Its perfection is clearly open to difference of opinion. It appears to me to agree most nearly with the usual appearance of the *Gasterophilus* which has been called *nasalis.* The habitat statement quoted above has long been dismissed as an erroneous observation by primitive peoples, a lapsus, or the erroneous association by Linnaeus of the habitat of still another — and non-Scandinavian — species, *Rhinoestrus purpureus* (Brauer). However, in view of the fact that throat bot larvae may in their early stages attach to the throat or pharynx, sometimes in numbers, the habitat statement may represent a keen observation that was far ahead of its time and not appreciated.

If therefore one considers only the diagnosis and habitat information of 1758, it is possible to conclude, from one point of view at least, that Linnaeus was indeed dealing with the horse bot that we know as *Gasterophilus nasalis.* However, he also cited species No. 1026 of the Fauna Suecica (1st edition), which is admittedly the deer nose bot. I believe that in all such cases one must consider all the information present,[2] including descriptive material, habitat, and references,

[2]If this is not done, some peculiar situations will arise. For example, the original diagnosis of adult *Oestrus bovis* L. (now *Hypoderma bovis,* the northern cattle grub) is unmistakably that of the horse bot fly, *Gasterophilus intestinalis* (DeGeer), associated in error with the larvae living in the backs of cattle. DeGeer recognized the confusion, restricted *bovis* to the cattle pest, and proposed *intestinalis* for the horse bot fly. I doubt that anyone would insist on calling the horse bot fly *Gasterophilus bovis* on the basis of only the diagnosis part of the original publication.

as representing the total species concept of the author, no matter how confused it may be by modern standards. Accordingly, I consider *Oestrus nasalis* L. (1758) to have been based upon a mixture of species. It then becomes necessary to determine the first reviser, i.e., the first author who recognized that a mixture existed and who clearly restricted the name *nasalis* to one of its component parts.

Linnaeus himself appears merely to have continued his confusion of 1758 in his later works. As far as I can find, the first author who clearly recognized and resolved the confusion was Modeer (1786), who proposed *Oestrus trompe* for the deer nose bot, and restricted *Oestrus nasalis* to the horse bot. Under *trompe* he pointed out that Linnaeus described the species on deer, though not perfectly, in the first edition of the Fauna Suecica. However, wrote Modeer (pp. 134-5), "A greater error has occurred in the second edition of the same book, for in that there is an entirely different and quite separate description bearing on an entirely different little creature, entered under the name of *nasalis* (whose larva lives in the horse's pharynx)." After noting the elimination of accompanying citations from *Oestrus nasalis* in the fifth edition of the Systema Naturae, Modeer stated that "From all this it can certainly be concluded that *Oestrus trompe* is far different from the *nasalis* cited in the more recent Fauna Suecica and the above-mentioned Systema . . . " (p. 135). Later, under *nasalis*, Modeer wrote that "There is no other author who has described this nose-sting fly [Nosstyng-fluga, i.e. *Oestrus nasalis*] except von Linné" (p. 146) [Translations from Swedish by Miss Ruth Ericson].

Modeer's work made a clear-cut distinction between *trompe* and *nasalis*. After his work, the name *trompe* was widely recognized by the great dipterists of the time (e.g., Fabricius, Fallén, Meigen, Zetterstedt, etc.) as applying to a deer nose bot, and *nasalis* to a horse bot (either as the name of choice or as a synonym of *veterinus*).

(2) Substitute Name

In 1797 Bracy Clark definitely accepted *nasalis* as applying to the throat bot fly, but renamed it *veterinus* only because he regarded the name *nasalis* as inappropriate ("I have given it the name *veterinus*, because beasts of burden are particularly subject to it, in preference to the erroneous one of *nasalis*," p. 313). *Veterinus*, which has been used for the throat bot fly by those authors who regard *nasalis* as a deer nose bot, is thus really only a substitute name for *nasalis* and neither a separate proposal nor a restriction. It is, however, an invalid substitute name, because zoological names are not to be rejected because of inappropriateness (International Rules of Zoological Nomenclature, Article 32); hence the proper specific name is *nasalis*, with *veterinus* as an objective synonym.

(3) Usage

Although a few authors, chiefly taxonomists, have used *nasalis* L. for the deer nose bot and *veterinus* Clark for the throat bot fly of horses, predominant usage since Modeer (1786) has *nasalis* L. as the throat bot fly and *trompe* Modeer as the deer nose bot. As a purely practical approach, there will be less inconvenience and more contribution to stability by maintaining that predominant usage. Otherwise, the specific names of two important economic species would have to be changed, including the transfer of the name *nasalis* from one species to another. We are not always so fortunate to find that usage and technical priority yield the same answer.

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ANNUAL MOSQUITO MEETING

The 13th annual meeting of the American Mosquito Control Association, Inc., will be held in the Di Lido Hotel at Miami Beach, Florida, April 28 to May 2, 1957. Subjects of invitational papers include a report of the worldwide malaria eradication program, an evaluation of insect resistance to insecticides and its future significance on a worldwide basis, a report of the present status and future possibilities of biological control of mosquitoes, and a discussion of the importance of the relationship of taxonomy to mosquito control.

PLAN NOW TO ATTEND!!!

ANNOUNCEMENT

Short scientific articles, not illustrated, two double-spaced typewritten pages or less in length, are welcome and will usually receive prompt publication. References to literature should be included in the text.

THE BITING MIDGES OF THE BERMUDA ISLANDS, WITH DESCRIPTIONS OF FIVE NEW SPECIES[1]

(DIPTERA, HELEIDAE)

WILLIS W. WIRTH[2] and ROGER W. WILLIAMS[3]

During June and July, 1955, the junior author conducted light-trap and recovery-cage studies of the Heleidae in each of the several parishes of Bermuda, and made observations on their breeding habits, which he will report on separately. Two pairs of recovery cages were placed for weekly periods in each of 15 areas, and a mosquito light trap was operated for a week in each of 7 of the areas and for 4 days at the Biological Station. In this study 13 species of Heleidae, representing 4 genera, were taken, of which 5 species are new to science.

In the taxonomic descriptions the following terms should be defined: "Antennal ratio" (AR) is the value obtained by dividing the combined lengths of the five elongated distal segments by the combined lengths of the preceding eight, or XI-XV over III-X (in *Pteroboscа* the ratio is X-XV over III-IX). "Tarsal ratio (TR) is the value obtained by dividing the length of the hind basitarsus by the length of the second hind tarsomere. Wing length is measured exactly from the basal arculus to the wing tip. The Tillyard modification of the Comstock-Needham system of wing venation is used whereby the branches of the anterior fork are called M_1 and M_2 and the branches of the posterior fork M_{3+4} and Cu_1. The types of the new species here described and most of the material studied are deposited in the U. S. National Museum in Washington, D. C. Paratypes and other specimens when available will be furnished the Museum of Comparative Zoology in Cambridge, Mass., the British Museum (Natural History) in London, and the Bermuda Biological Station, St. George's, Bermuda.

Johnson (1913) mentioned only two species of the family Heleidae (= Ceratopogonidae) from the Bermuda Islands. One, which he described as new under the name *Ceratopogon fur*, was actually *Pteroboscа fusicornis* (Coquillett); the second species he referred to only as *Ceratopogon* sp., without notes that would give us a clue to its identity. Ogilvie (1928) does not mention this family as occurring in Bermuda, nor does Waterston (1940).

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[1]Contribution No. 226 of the Bermuda Biological Station. This study was supported by a National Science Foundation grant-in-aid and a Childs Frick Fellowship granted to the junior author by the Bermuda Biological Station for investigation of the *Culicoides* of the Bermudas. Thanks are due Wm. Sutcliffe, Jr., director of the Biological Station, for assistance and to members of the Bermuda Agriculture Experiment Station, Gordon R. Groves, director, Idwal Wyn Hughs, assistant director, J. Hubert Jones, assistant horticulturist, and C. A. Baker, horticulturist, for transporting equipment and identifying the plants.

[2] Entomology Research Branch, Agricultural Research Service, U. S. Department of Agriculture.

[3] School of Public Health and Administrative Medicine of the Faculty of Medicine, Columbia University.

Key to the Bermuda Species of Heleidae

(Based primarily on females)

1. Fore femur with strong ventral spines; tarsal claws large; macrotrichia of wing absent; wing with only one radial cell, the costa extending to 0.72 of distance to wing tip ..... 14. *Bezzia atlantica*, n. sp.
   Fore femur without ventral spines; tarsal claws small; macrotrichia present on wing, usually abundant; wing with two radial cells present; costa extending to less than 0.6 of distance to wing tip 2
2. Empodium well developed; wing with abundant, long appressed macrotrichia; first radial cell narrow, second radial cell not sharply angled at apex 3
   Empodium absent; wing with sparse, suberect macrotrichia 6
3. Terminal six segments of antenna elongated; empodium greatly developed, pad-like TR 3.0 ..... 1. *Pterobosca fusicornis* (Coquillett)
   Terminal five segments of antenna elongated; empodium normal, small; TR 0.5-1.3 4
4. TR 0.5; mesonotum with pale mesal longitudinal band; pleuron with transverse dark band; legs with apices of femora and bases of tibiae dark; wing without pale spots; halter brown ..... 3. *Forcipomyia raleighi* Macfie
   TR 1.0-1.3; mesonotum unicolorous brown; pleuron not banded; legs banded or unbanded; wing with or without pale spots; halter pale or brown 5
5. TR 1.0; legs with broad pale and dark bands; wing with pattern of pale spots; halter knob brownish ..... 4. *Forcipomyia varipennis*, n. sp.
   TR 1.3; legs unbanded; wing uniformly brownish gray; halter pale ..... 2. *Forcipomyia ingrami* Carter
6. First radial cell nearly or completely obliterated, second obliterated or square-ended; humeral pits not developed; eyes pubescent; wing hyaline without color pattern 7
   First and second radial cells well developed, subequal; humeral pits well developed; eyes bare; wing usually with pattern of pale spots 12
7. Abdominal terga with posterior borders narrowly white; large species (wing 1-1.4 mm. long) 8
   Abdominal terga uniformly blackish; small species (wing 0.65-0.9 mm. long) 10
8. Abdominal pleura dappled with many small black streaks; large species (wing 1.4 mm. long); mesonotum with median tuft of scale-like bristles ..... 5. *Dasyhelea cincta* (Coquillett)
   Abdominal pleura uniformly pale or with several large dark areas; medium sized species (wing 1-1.2 mm. long); mesonotum without median tuft of scale-like bristles 9
9. Mesonotum grayish green pollinose; abdominal pleura III-VI extensively black ..... 6. *Dasyhelea grisea* (Coquillett)
   Mesonotum yellowish brown with three obscure darker brown vittae; abdomen without dark areas on pleura III-VI ..... 7. *Dasyhelea luteogrisea*, n. sp.

10. Thorax uniformly dull, jet-black; male dististyle bifid ..... 8. *Dasyhelea scissurae* Macfie

Thorax shining brown to black with yellow scutellum, humeri and pre scutellar and supra-alar spots; male dististyle simple 11

11. Antennal segments longer, segment XI 1.39 times as long as X; second radial cell twice as long as broad; spermatheca 0.04 mm. in diameter with sclerotized base of duct one-third as long as diameter of spermatheca; male genitalia as in figure 1 ..... 9. *Dasyhelea atlantis*, n. sp.

Antennal segments shorter, segment XI 1.25 times as long as X; second radial cell not twice as long as broad; spermatheca 0.06 mm. in diameter with base of duct sclerotized only a short distance; male genitalia as in figure 2 ..... 10. *Dasyhelea bermudae*, n. sp.

12. Color subshining pale yellow; wing without pattern; two spermathecae present ..... 11. *Culicoides floridensis* Beck

Color pruinose grayish brown; wing with pattern of large pale areas; only one spermatheca present 13

13. Wing markings consisting of sharply defined pale areas, second radial cell blackish to tip; mesonotum with prominent pattern ..... 12. *Culicoides crepuscularis* Malloch

Wing markings not sharply defined; second radial cell yellowish at the extreme apex; mesonotum without pattern ..... 13. *Culicoides bermudensis* Williams

1. **Pterobosca fusicornis** (Coquillett)

Ceratopogon fusicornis Coquillett, 1905, Jour. New York Ent. Soc. 13: 63 (female; Biscayne Bay, Florida).

Pterobosca fusicornis Johannsen, 1951, Florida Ent. 34: 117 (records; syn.: *macfiei* Costa Lima and *floridana* Johannsen).

Ceratopogon fur Johnson, 1913, Ann. Ent. Soc. Amer. 6: 444 (female; Bermuda; fig. wing; attached to a small agrionid dragonfly). NEW SYNONYMY.

The two cotypes of *Ceratopogon fur* in the Museum of Comparative Zoology at Harvard University were examined through the courtesy of Dr. P. J. Darlington. One female is attached to the thorax of the agrionid host at the membranous portion at the base of the wings, with the proboscis of the midge parasite piercing the integument of the host. The other cotype female which was glued to a card point on a separate pin was dissected and mounted on a slide by the senior author. Examination of the following characters shows the species to be the same as *Pterobosca fusicornis* (Coquillett), the type of which was used for comparison. Eyes bare; third palpal segment with a shallow, definite pit; tarsal ratio 3.0; tarsal claws each deeply cleft and the two parts each broadly expanded, bladelike; empodium large and broad, modified for clinging; wing 1.13 mm. long, with moderately dense, long, suberect hairs arranged in lines, with narrow bare lines along the veins; halter brown; legs brown; thorax shining brown, with brown hairs, scutellum slightly paler. This species, which was not

taken in the present study, was the only named species of the family previously known from Bermuda.

2. **Forcipomyia ingrami** Carter

Forcipomyia ingrami Carter, 1919, Ann. Trop. Med. Parasit. 12: 290 (male, female; Gold Coast; fig. antenna, wing, tarsus, palpus, genitalia, larva, pupa); Edwards, 1928, Ins. of Samoa, pt. VI, fasc. 2, p. 51 (Samoa); Macfie, 1933, B. P. Bishop Mus. Bull. 114: 94 (Marquesas Ids.); Macfie, 1934, Stylops 3: 133 (Hawaii); Macfie, 1934, Ann. Trop. Med. Parasit. 28: 179 (Malaya).

Specimens examined: 16 males, 314 females, in light traps from Biological Station, Wilkinson Pond, Pampas Farm (South Shore Marsh), Spittal Pond, Paget Marsh, Warwick Marsh, Southampton Marsh, and Evans Pond, and in recovery cages from Pampas Farm, Devonshire Marsh, Paget Marsh, Pembroke Marsh, Warwick Marsh, and Southampton Marsh.

Forcipomyia ingrami is a pale brown, unmarked species with female TR about 1.3, the male TR from 0.8 to 1.1. The male genitalia offer the best characters for the separation of *ingrami* from the related species such as *calcarata* (Coquillett) from Mexico and *quasiingrami* from Brazil; in *ingrami* the aedeagus is in the form of a truncated cone and the sclerotized band of the parameres is broadly U-shaped rather than narrowly V-shaped anteriorly.

Macfie's records of *ingrami* from Trinidad were later referred by him to *quasiingrami*, and the present record constitutes the first authentic record of *ingrami* from the Western Hemisphere.

3. **Forcipomyia raleighi** Macfie

Forcipomyia raleighi Macfie, 1938, Proc. Roy. Ent. Soc. London (B) 7: 160 (male, female; Trinidad; fig. male genitalia).

Specimens examined: 77 males, 36 females, in light traps from Biological Station, Wilkinson Pond, Spittal Pond, Paget Marsh, Southampton Marsh and Evans Pond.

Forcipomyia raleighi is easily recognized by its short basitarsus (TR about 0.5), plain wings, mesally pale mesonotum, dark halteres and dark-banded pleura and banded abdomen. It is widely distributed in the Caribbean area.

4. **Forcipomyia varipennis**, new species

Female.—Length of wing 0.67 mm.

Head brown, eyes bare. Antenna with flagellar segments in proportion of 13:12:12:12:12:12:12:12:15:18:18:18:23, AR 0.95, proximal flagellar segments short, tapering, segments XI-XIV vase-shaped with short distal necks, last segment with terminal papilla which has a spherical tip. Palpal segments in proportion of 10:10:20:10:10, third segment greatly swollen to apex, three-fourths as broad as long, with a large, deep, sensory cavity opening by a small pore. Mouthparts rudimentary, mandibles not developed.

Thorax dark brown, mesonotum and scutellum with numerous long, mixed

brown and golden, upright hairs and appressed slender, yellowish scales. Coxae yellowish; fore and hind tibiae with narrow sub-basal and broader subapical brown bands, the latter subequal in width to the yellowish band of each side; mid tibia brown except at extreme base and apex; tarsi brown with narrow segmental yellow bands. Legs with numerous long, upright, stiff hairs and appressed, narrow, striated scales; six spines in hind tibial comb; hind tibial spur almost half as long as basitarsus, scaly at base; TR 1.0; claws slender and curved, simple.

Wing with abundant long, striated, blackish scales; adorned with small yellowish anterior spot past end of costa and irregular, diffuse, paler areas on distal and posterior portions. Halter knob brownish. Abdomen dark brown with numerous dark brown hairs and slender scales. Spermathecae two, subequal, elongate oval, each measuring 0.035 by 0.055 mm.

Holotype.—Female, Warwick Pond, Bermuda, 4 July 1955, R. W. Williams, recovery cage (type No. 62916, U.S.N.M.). *Paratypes.*—8 females, Bermuda, same data as type; 1 female, Warwick Marsh, recovery cage, 4 July 1955. PUERTO RICO—1 female, El Yunque, 20-23 March, 1954, J. Maldonado and S. Medina. UNITED STATES—1 female, Brownsville, Texas, 1 October 1951, A. B. Gurney, palm grove. GUATEMALA—2 females, Actenango, 22 June 1951, Gibson and Ascoli, at light; 1 female, Yepocapa, 26 July 1951, Gibson and Ascoli, at light.

Forcipomyia cinctipes (Coquillett) from United States (type locality, Florida)is very similar, but has pale halteres, dark coxae, femora dark nearly to bases, the second dark band on hind tibia is twice as broad as the pale bands on each side, the third palpal segment is not greatly swollen and has a small sensory pit and the size averages larger (wing up to 1.4 mm. long). *Forcipomyia ornatipennis* Macfie from Brazil is also related, but also is a larger species (wing 1.3-1.4 mm. long) with three large pale spots on the anterior margin of the female wing, halteres pale, and the legs have more extensive yellow bands on the femora and mid tibia. Macfie's reference (1953, Beitr. zur Ent. 3: 96) to a damaged male specimen of *ornatipennis* from Costa Rica probably refers to *varipennis*.

5. **Dasyhelea cincta** (Coquillett)

Ceratopogon cinctus Coquillett, 1901, Proc. U. S. Nat. Mus. 23: 605 (female; Lake Worth, Florida).

Dasyhelea cincta, Johannsen, 1943, Ann. Ent. Soc. Amer. 36: 778; Wirth, 1952, Univ. Calif. Pub. Ent. 9: 150 (male, female; fig. wing, antenna, palpus, spermathecae, male genitalia; many U. S. localities).

Specimens examined: 7 males, 18 females, from recovery cages at Paget Marsh, Warwick Marsh, and Southampton Marsh.

This is a relatively large species (wing about 1.4 mm. long) with pruinose bluish-black mesonotum spotted with yellowish, especially on the borders, and bearing a tuft of black scale-like bristles in the middle of the mesonotum; wings with bare lines, abdomen with posterior borders of terga white and abdominal pleura with many small black streaks.

6. **Dasyhelea grisea** (Coquillett)

Ceratopogon griseus Coquillett, 1901, Proc. U. S. Nat. Mus. 23: 602 (female; Washington, D. C., Lake Worth, Florida).

Dasyhelea grisea Thomsen, 1935, Jour. New York Ent. Soc. 43: 283; Wirth, 1952, Univ. Calif. Pub. Ent. 9: 155 (male, female; many U. S. localities; fig. antenna, palpus, male genitalia).

Specimens examined: 19 males, 43 females, from recovery cage at Warwick Marsh.

This moderate sized (wing 1-1.2 mm. long) species can be recognized by its uniformly grayish-green pollinose mesonotum with three narrow darker setigerous vittae; wing with sparse hairs and bare lines; legs pale with blackish knees; abdomen black above, the apices of segments narrowly white-margined; pleura of abdominal segments III-VI extensively black; spermatheca one, oval with a short sclerotized neck; male genitalia with blunt dististyle, a distinct sclerotized hook on mesal margin of basistyle, ninth sternum not produced caudad, and apicolateral processes of ninth tergum well developed.

7. **Dasyhelea luteogrisea**, new species

Female.—Length of wing 1.0 mm.

Structurally nearly identical with *grisea* (Coquillett). Mesonotum yellowish brown with three broad, obscure, darker, dull, grayish-brown vittae; halter knob yellowish; abdominal pleura without integumental dark patches on segments III-VI, but with denser, longer, conspicuous patches of brownish bristly hairs; all hairs of body slightly longer and more conspicuous than in *grisea*.

Male.—Mesonotum uniformly dark brown with heavy bluish-gray pollinosity; scutellum dull yellowish brown. Genitalia with spine of apicolateral processes of ninth tergum short and stout. Otherwise as in *grisea*.

Types.—Holotype female, allotype male, Bermuda, from recovery cage at Spittal Pond, 17-23 June 1955, R. W. Williams (type No. 62917, U.S.N.M., mounted on slides). Paratypes: 250 males, females, Bermuda, from recovery cages at Spittal Pond, Trott's Pond, Paget Marsh, Warwick Pond, Warwick Marsh, Evans Pond, Southampton Marsh and Mid-Ocean Country Club Pond, and in the light trap at Spittal Pond. Also the following paratypes: United States—22 males, 7 females, Lake Worth, Florida, 9 August 1951, W. W. Wirth, light trap; 7 males, 13 females, North Miami Beach, Florida, 18 April 1951, J. E. Porter, light trap; 3 females, Lake Charles, Louisiana, 9 June 1917, J. M. Aldrich; 2 females, Galveston, Texas, 16 April 1905, W. D. Pierce, on *Tamarix gallica*. Bahamas—1 female, South Bimini Island, June 1951, Cazier and Vaurie.

This species is evidently a salt marsh relative of *Dasyhelea grisea* (Coquillett), with which it occasionally occurs, but without showing evidence of interbreeding.

8. **Dasyhelea scissurae** Macfie

Dasyhelea scissurae Macfie, 1937, Ann. Mag. Nat. Hist. (10) 20: 15 (male; Trinidad; fig. genitalia); Macfie, 1953, Beitr. zur Ent. 3: 103 (male, female; Costa Rica).

Specimens examined: 2 males, 1 female, Paget Marsh, light trap, 28 June and 1 male, Evans Pond, in light trap, 12-18 July 1955.

The uniformly dull, jet-black color with only the halteres white, small size (wing 0.9 mm. long) and the bifid male dististyles will readily identify this species.

9. **Dasyhelea atlantis,** new species

(Figure 1)

Male, female.—Length of wing 0.75-0.8 mm.

Color in specimens preserved in alcohol shining dark brown; male mesonotum uniformly blackish, female mesonotum paler brown with humeri, supra-alar spots and a pair of oval spots in prescutellar depression, yellowish. Scutellum yellowish, with six bristles; postscutellum and pleuron dark brown. Antenna brown, palpus yellowish; legs yellowish, femora and tibiae more or less infuscated; halter knob whitish, stem dark; wing grayish hyaline, the radial cells slightly darkened; abdominal terga uniformly blackish. Eye pubescent. Antenna with flagellar segments in proportion of 15:10:11:11:12:12:13:13:18:18:18:18:25; tenth segment 1.6 times as long as broad; last segment without terminal stylet. Palpal segments in proportion of 15:25:12:12. TR 2.4; six or seven spines in hind tibial comb. Wing with second radial cell twice as long as broad, macrotrichia numerous, arranged in lines on disc but forming patches on distal and posterior wing margins. Spermatheca one, subspherical, diameter about 0.04 mm., with a very slender sclerotized duct one-third as long as diameter of spermatheca. Male genitalia as in figure 1.

Holotype.—Male, Bermuda, from recovery cage at Trott's Pond, 10 June 1955, R. W. Williams (type No. 62919, U.S.N.M., on slide). *Allotype.*—Female, from recovery cage at Spittal Pond, 17-23 June 1955. *Paratypes.*—About 700 males and females, from recovery cages, during June and July from Lovers Lake, Wilkinson Pond, Trott's Pond, Spittal Pond, Warwick Pond, Seymour Pond, Evans Pond, Pilchard Bay and Mid-Ocean Country Club Ponds, and from the light trap at Spittal Pond, 17-23 June 1955.

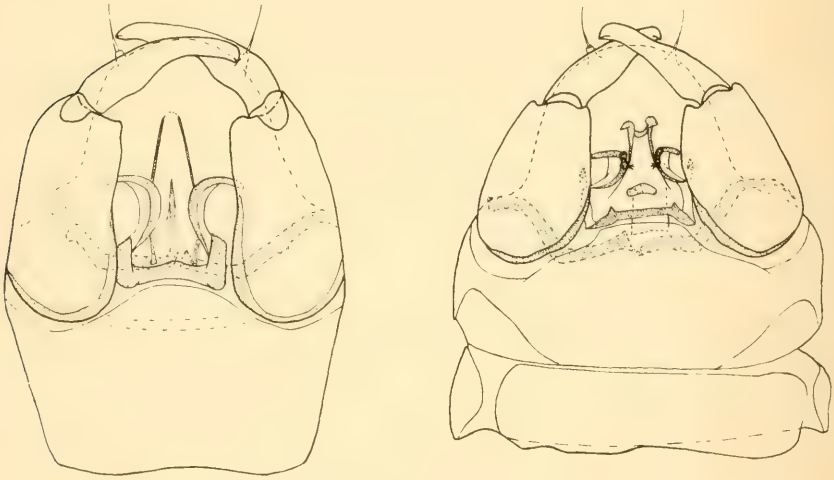
10. **Dasyhelea bermudae,** new species

(Figure 2)

Male, female.—Length of wing 0.65-0.70 mm.

Very similar in color markings to *atlantis,* the shining blackish mesonotum with yellowish humeri and prescutellar spots outstanding. Structurally as in *atlantis,* but differing as follows: Antennal segments slightly shorter, flagellar segments in proportion 15:12:12:12:12:12:12:12:15:15:15:15:20. Wing slightly hairier, second radial cell not quite as long as broad. Spermatheca larger, diameter about 0.06 mm., the base of the duct sclerotized only a short distance. Male genitalia quite different, as in figure 2.

Holotype.—Male, Bermuda, from recovery cage at Warwick Pond, 4 July 1955, R. W. Williams (type No. 62918, U.S.N.M., on slide). *Allotype.*—Female, from recovery cage at Pampas Farm, 21-27 June 1955. *Paratypes.*—50 males, 75 females, from recovery cages during June and July at Pampas Farm, Devonshire Marsh, Paget Marsh, Warwick Pond, Warwick Marsh, Seymour Pond, and Southampton Marsh.



1 2

Fig. 1, male genitalia of *Dasyhelea atlantis;* fig. 2, male genitalia of *Dasyhelea bermudae.* The stippling represents areas of greater sclerotization.

11. **Culicoides floridensis** Beck

Culicoides floridensis Beck, 1951, Florida Ent. 34: 135 (male, female; Florida; fig. male genitalia).

Specimens examined: Only 3 males and 3 females were taken, these in the light trap at Wilkinson Pond.

Culicoides floridensis is somewhat similar to *melleus* of the Atlantic and Gulf Coasts of the United States, in that it is a pale yellowish species with unspotted wings, but the wings of *floridensis* are relatively barer and the female has the spermathecae less heavily sclerotized. The male genitalia of *floridensis* have normal dististyles, conspicuously spinose parameres, and a V-shaped aedeagus, whereas those of *melleus* have the dististyles conspicuously bent, the parameres simple and the aedeagus massive, with high arch and truncate tip.

12. **Culicoides crepuscularis** Malloch

Culicoides crepuscularis Malloch, 1915, Bull. Illinois St. Lab. Nat. Hist. 10: 303 (male, female; Illinois, Michigan, Arizona; fig. wing, mesonotum, male antenna, genitalia); Foote and Pratt, 1954, Pub. Hlth. Monogr. 18: 19 (redescribed, records, fig. wing, mesonotum, palpus, male genitalia).

Specimens examined: 176 females and 74 males from a light trap at Biological Station, Wilkinson Pond, Spittal Pond, Pampas Farm, Paget Marsh, Warwick Marsh, Southampton Marsh, and Evans Pond, and 577 males and 658 females from recovery cages at Pampas Farm, Devonshire March, Paget Marsh, Pembroke Marsh, Warwick Marsh, Seymour Pond, Southampton Marsh, Pilchard Bay, and the larger of the two Mid-Ocean Golf Course Ponds.

This species is a close relative of *canithorax* Hoffman and *alaskensis* Wirth from North America, as well as *bermudensis* with which it was associated in Bermuda. *Crepuscularis* can be distinguished from these species by its conspicuous wing pattern of definite rounded spots and by the prominent mesonotal pattern consisting of a median longitudinal diamond-shaped anterior band and a pair of crescent-shaped lateral bands which are dark brown on a pruinose grayish background.

13. **Culicoides bermudensis** Williams

Culicoides bermudensis Williams, 1956, Jour. Parasit. 42(3): 297-300. (female; Bermuda; fig. wing, palpus).

Specimens examined: 224 females in light trap from Pampas Farm, Paget Marsh and Southampton Marsh, and 111 females in recovery cages from Trott's Pond, Devonshire Marsh, Paget Marsh, Pampas Farm, Warwick Pond, and Southampton Marsh.

Culicoides bermudensis is a small, brownish, poorly marked species. The female is closely related to *canithorax* of North America, but differs from it in possessing 8 or less mandibular teeth instead of 15, the AR is less than 1.2, the distance between the eyes is about 2.5 times as great, the palpus and wing are less than two-thirds as long, macrotrichia are sparse, the first spine of the hind tibial comb is the longest, the long axis of the distal pale spot in cell R_5 lies at a 45° angle to vein M_1 and the single spermatheca is more than 1.5 times as large as in *canithorax*. No males were collected.

14. **Bezzia atlantica,** new species

Male, female.—Length of wing 1.2 mm.

Head brown; antenna and palpus pale brown, basal rings of antennal segments at the verticils whitish; flagellar segments in proportion of 20:18:18:19:20:22:23:24:35:35:30:40:44. Palpal segments in proportion of 8:12:20:12:18. Mandible with ten teeth. Thorax in preserved specimens dark brown, with short dark pubescence, extent of pruinose pattern undetermined; four or five long black bristles above wing base; scutellum yellowish, with four strong black bristles. Legs dark brown; broad yellow bands on middle of hind femur, at base and before apex of fore tibia, on distal half of mid tibia but leaving extreme apex dark, and

on middle third of hind tibia; tarsi yellowish. Legs moderately stout; fore femur with three long, rather slender, black spines on flexor side, fore and mid femora with one apical extensor spine, hind femur with extensor series of three or four bristles; claws black, equal, each with a strong, blunt, basal tooth; TR about 2.0. Wing yellowish hyaline, costa extending to 0.72 of wing length; medial fork sessile. Halter brown. Abdomen dull yellowish brown; female with one pair of gland rods as long as 3.5 segments. Female spermathecae two, pyriform, subequal. Male genitalia as figured by Wirth (1952, fig. 27 f) for *setulosa*.

Holotype.—Male, Bermuda, Devonshire Marsh, from recovery cage, 21-27 June 1955, R. W. Williams (type No. 62920, U.S.N.M. on slide). *Allotype*.—Female, Bermuda, Pampas Farms, from recovery cage, 21-27 June 1955. *Paratypes*.—4 males, 4 females, same data as holotype.

Bezzia setulosa (Loew), a common Nearctic species, is closely related, but differs in having the legs more extensively yellowish, the femora with very broad pale bands at midlength and the fore femur with an additional pale preapical ring, the pale tibial bands are also slightly broader, the female gland rods extend through 4.5 segments and the spermathecae are not distinctly pyriform.

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A REVISION OF THE GENERA OF POEMENIINI AND XORIDINI
(HYMENOPTERA, ICHNEUMONIDAE)

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The ichneumonid tribes Poemeniini and Xoridini belong in the subfamily Pimplinae, which subfamily includes species with usually a rather cylindric body shape, areolet triangular or absent, tarsal claws not visibly pectinate but often lobed or cleft, spiracle of first abdominal tergite at or in front of the middle, and ovipositor long and without a subapical dorsal notch. These characters are rather general in statement and subject to exceptions, but are enough for a correct subfamily placement of the majority of the Pimplinae, including members of the present two tribes. Perhaps the greatest difficulty for the tribes under consideration is to distinguish them from members of the Gelinae belonging to the subtribe Echthrina (tribe Mesostenini). The Echthrina differ from the Poemeniini and Xoridini in having the areolet, when present, rectangular or quadrangular (except in the Ethiopion genus *Gabunia*), and the dorsal valve of the ovipositor somewhat enclosed apically by a dorsal flange of the ventral valves. It is a common mistake of older authors to put some of these echthrine genera in the Xoridini because of a superficial resemblance, but both larval and adult characters show them to be true members of the Gelinae.

The Poemeniini and Xoridini have commonly been included in the single tribe Xoridini (Ashmead, 1900, Proc. U. S. Natl. Mus. 23: 60-62; and Schmiedeknecht, 1907, Opuscula Ichneumonologica, p. 1336) or in the tribes Xoridini and Odontomerini (Cushman and Rohwer, 1920, Proc. U. S. Natl. Mus. 57: 395-396). More recently a division into two tribes approximately as used here has been effected, but heretofore without a statement of the characters on which the division was based (Townes, 1944, Mem. Amer. Ent. Soc. 11: 80-85; 102-115, and Townes and Townes, 1951, U. S. Dept. Agr., Agr. Monog. 2: 198-199; 204-207). In spite of the fact that members of the two tribes have been commonly classified together, they are not closely related. Larval and adult characters seem to ally the Poemeniini with the Rhyssini and seem to relate the Xoridini with the Labenini and Acaenitini. At any rate, they are certainly distinct tribes.

KEY DISTINGUISHING THE POEMENIINI FROM THE XORIDINI

1. Propodeum not areolated, prepectal carina absent; epipleurum of second abdominal tergite very narrow, almost absent; middle tibia of female without oblique grooves. ..... Poemeniini

   Propodeum completely or almost completely areolated; prepectal carina present; epipleurum of second abdominal tergite moderately wide, usually about 0.25 times as wide as long; middle tibia of female usually with one or two oblique grooves that give it a twisted appearance. ..... Xoridini

Tribe **Poemeniini**

As defined in the key, this tribe includes *Poemenia, Deuteroxorides, Neoxorides, Eugalta,* and the new genera *Podoschistus, Cnastis,* and *Ganodes.* In 1944 I included also the genera *Clistopyga* and *Diacritus* (Mem. Amer. Ent. Soc. 11: 80-85). *Clistopyga* was removed to the Polysphinctini in 1951 (Townes and Townes, U. S. Dept. Agr., Agr. Monogr. 2: 192). *Diacritus* has a prepectal carina, and in some other, less definite, characters is a misfit in the Poemeniini. It is hereby removed from the Poemniini and referred provisionally to the Plectiscinae. The genera which I believe are properly referred to the Poemeniini are discussed below.

Key to the Genera of Poemeniini

1. Mandible with two apical teeth, the upper tooth smaller; clypeus evenly convex, about 2.0 times as wide as long; tarsal claws simple. Holarctic. ..... *Poemenia*
   Mandible without two teeth, its apex truncate and chisel-shaped; clypeus basally convex and apically impressed, 1.3 to 1.8 times as wide as long; tarsal claws of middle legs with a subapical tooth except in *Neoxorides*. 2
2. Dorsal half of temple finely and weakly scabrous; clypeus about 1.8 times as wide as long. Palaearctic. ..... *Deuteroxorides*
   Dorsal half of temple coarsely and strongly scabrous; clypeus about 1.5 times as wide as long. 3
3. Outer claw of hind tarsus bent at a sharp angle, the inner claw more weakly curved; apical ungual bristle on outer claw of hind tarsus enlarged and spatulate. Oriental and Japanese. ..... *Eugalta*
   Outer claw of hind tarsus not bent at a sharp angle and not more sharply curved than inner claw; apical ungual bristle on outer claw of hind tarsus not enlarged. 4
4. Tarsal claws simple; second and third tergites impunctate or with a few weak punctures. Holarctic. ..... *Neoxorides*
   Tarsal claws with a subapical tooth, or the hind claws sometimes simple; second and third tergites definitely punctate. 5
5. Hind tarsal claws with a subapical appressed tooth; nervulus opposite the basal vein. Holarctic. ..... *Podoschistus*
   Hind tarsal claws simple; nervulus before the basal vein by about 0.25 to 0.45 times its length. 6
6. Areolet present; first tergite of female about 2.4 times as long as wide. Neotropical. ..... *Ganodes*
   Areolet absent; first tergite of female about 1.5 to 2.0 times as long as wide. Japan, Philippines, Java, and Siam. ..... *Cnastis*

Genus **Poemenia**

Poemenia Holmgren, 1859. Ofvers. Svenska Vetensk. Akad. Forh. 16: 130. Type: *Poemenia notata* Holmgren. Monobasic.

Calliclisis Foerster, 1868. Verh. Naturh. Ver. Rheinlande 25: 169. Type: *Ephialtes hecticus* Gravenhorst. Designated by Viereck, 1914.

Phthinodes Tschek, 1868. Verh. Zool.-Bot. Gesell. Wien 18: 272.
Type: *Ephialtes hecticus* Gravenhorst. Monobasic.
Euxorides Cresson, 1870. Trans. Amer. Ent. Soc. 3: 167.
Type: *Euxorides americanus* Cresson. Monobasic.
Lissonotopsis Habermehl, 1917. Ztschr. Wiss. Ins.-Biol. 13: 234, 306.
Type: (*Lissonotopsis rufa* Habermehl) = *hectica* Gravenhorst. Monobasic.

Clypeus moderately large, about 2.0 times as wide as long, evenly convex, covered with rather long hairs, its apical margin concave; mandible moderately long, with two apical teeth, the upper tooth shorter; temple in profile about 0.53 times as long as eye, its dorsal half sometimes with a weakly scabrous area; mesoscutum moderately trilobed; notauli strong anteriorly, fading out on disc of mesoscutum; areolet present or absent, when absent the intercubitus about 0.8 times as long as second abscissa of cubitus; nervulus usually opposite basal vein, but sometimes before or a little beyond; tarsal claws simple, those of the hind legs sharply curved in a right angle turn; first tergite about 2.0 to 3.5 times as long as wide; second and third tergites with fine dense punctures.

This is a rather small, Holarctic genus. In North America there are four species.

Genus **Deuteroxorides**

Deuteroxorides Viereck, 1914. Bul. U. S. Natl. Mus. 83: 43.
Type: *Xorides albitarsus* Gravenhorst.

Clypeus rather small, about 1.8 times as wide as long, convex basally, the rest impressed and the apical margin concave; mandible of moderate length, its apex chisel-shaped, without teeth; temple in profile about 0.5 times as long as eye, its dorsal half finely and half weakly scabrous; mesoscutum strongly trilobed; notauli strong, almost meeting on disc of mesoscutum; areolet absent; intercubitus about 0.5 to 1.0 times as long as second abscissa of cubitus; nervulus opposite or a little before basal vein; tarsal claws of male simple, the outer claw of hind tarsus more sharply curved than inner claw; female tarsal claws with an internal truncate tooth on front and middle legs, simple on hind leg or with an inner tooth on inner claw, the outer claw more sharply curved than inner claw; first tergite about 2.0 to 4.0 times as long as wide; second and third tergites with rather close, moderate sized punctures.

There are two species: the European *Xorides albitarsus* Gravenhorst, 1829, and the Japanese *Xorides orientalis* Uchida, 1928.

Genus **Eugalta**

Eugalta Cameron, 1899. Mem. & Proc. Manchester Lit. Phil. Soc. 43: 135.
Type: *Eugalta strigosa* Cameron. Designated by Ashmead, 1900.
Pseudeugalta Ashmead, 1900. Proc. U. S. Natl. Mus. 23: 55.
Type: *Engalta spinosa* Cameron. Monobasic.
Baliena Cameron, 1900. Mem. & Proc. Manchester Lit. Phil. Soc. 44: 101.
Type: *Baliena leptopus* Cameron. Monobasic.
Tilgida Cameron, 1900. Mem. & Proc. Manchester Lit. Phil. Soc. 44: 108.
Type: *Tilgida albitarsis* Cameron. Monobasic.

Aethria Tosquinet, 1903. Mém. Soc. Ent. Belgique 10: 114. New synonymy.
Type: *Aethria conspicua* Tosquinet. Monobasic.

Bathymeris Cameron, 1906. Entomologist 39: 251.
Type: *Bathymeris longipes* Cameron. Monobasic.

Formoxorides Uchida, 1928. Jour. Fac. Agr. Hokkaido Univ. 25: 14.
Type: *Achorocephalus pilosus* Szépligeti. Original designation.

Clypeus small, quadrate, about 1.5 times as wide as long, convex basally, apically impressed, the apical margin subtruncate; mandible short, its apex chisel-shaped, without teeth; temple in profile about 0.3 times as long as eye, its upper half coarsely scabrous; mesoscutum strongly trilobed; notauli strong, strongly convergent, and almost meeting on disc of mesoscutum; areolet present or absent, when absent the intercubitus about as long as second abscissa of cubitus; nervulus opposite basal vein; tarsal claws each with a large truncate median tooth; outer claw of hind tarsus bent a little sharper than a right angle, its median tooth obscured within the bend and its apical ungual bristle enlarged and spatulate; first tergite about 2.0 to 4.0 times as long as wide; second and third tergites polished, impunctate or variously punctate.

This is an Oriental genus, with many species. One species, *(Xorides) Eugalta albomarginalis* Uchida, 1928 (new combination), occurs in Japan.

Genus **Podoschistus**, new genus

Clypeus small, quadrate, about 1.2 times as wide as long, basally convex, the rest impressed, its apex truncate or concave; mandible short, its apex chisel-shaped, without teeth; temple in profile about 0.55 times as long as eye, its upper half coarsely scabrous; mesoscutum rather strongly trilobed; notauli strong, convergent and almost meeting on disc of mesoscutum; areolet absent, the intercubitus about 0.5 times as long as second abscissa of cubitus; nervulus opposite basal vein; tarsal claws with a median, appressed, pointed tooth; first tergite about 2.3 to 3.0 times as long as wide; second and third tergites mat, with moderate punctures.

Genotype—Xorides vittifrons Cresson, 1868.

This is a Holarctic genus, including *Xorides vitifrons* Cresson, 1868, from eastern North America; *Xorides scutellaris* Desvignes, 1856, from Europe; and *Xorides alpensis* Uchida, 1928, from Japan.

Genus **Ganodes**, new genus

Clypeus small, quadrate, about 1.5 times as wide as long, convex basally, the rest impressed, its apical margin subtruncate; mandible short, its apex chisel-shaped, without teeth; temple in profile about 0.4 times as long as eye, its upper half coarsely scabrous; mesoscutum strongly trilobed; notauli strong, convergent, meeting on disc of mesoscutum; areolet present; nervulus before basal vein by about 0.3 times its length; claws on front and middle legs of female (the male unknown) with a small median acute tooth; claws on hind tarsus simple, rather strongly curved; first tergite of female about 2.3 times as long as wide; second and third tergites polished, with moderate sized punctures.

Genotype—Ganodes balteatus, new species.

Ganodes balteatus, new species

Female—Fore wing 10 to 15 mm. long. Frons impunctate but with a few setae; scrobe of pronotum impunctate; mesoscutum smooth, with scattered small, indistinct punctures, centrally with some sharp wrinkles; mesopleurum polished, most of it with shallow, moderate-sized, rather close punctures; propodeum transversely wrinkled on its median third, wrinkled on its lower margin, the rest with rather sparse weak punctures; first tergite polished, with a few weak punctures and faint, fine transverse wrinkling; second and third tergites with moderate sized, rather close punctures interrupted by a median impunctate stripe, the stripe a little wider and the punctures a little sparser on the second tergite.

Head white, the mandible, scabrous area on temple, frons medially and connected with upper half of occiput, and antenna except for flagellar segments 8 to 19 black; propleurum brown, whitish near fore coxa; pronotum black, broadly white below and above; mesoscutum black, a lateral spot on front part of median lobe and a pair of discal streaks whitish; scutella white surrounded by black; propodeum whitish, its median third black and with a dark brown pleural stripe extending from spiracle posteriorly; a triangle under hind wing brownish; pleura and sterna rufus, the mesopleurum sometimes mottled with whitish and with black below the subalar tubercle; subalar tubercle of mesopleurum and mesepimeron whitish; tegula white; wings hyaline, their veins dark brown but the costa basally whitish. Legs fulvous, the fore coxa anteriorly, the middle and hind coxae posteriorly, and tinges on front and middle femora and middle trochanters brownish; front and middle tarsi blackish apically; hind femur blackish; hind tibia and tarsus yellow.

Type—♀, Nova Teutonia, Brazil, IX-27-40, Fritz Plaumann (Townes).

Paratypes.—3 ♀♀, same data as the type but with the dates III-24-27, IX-13-40, and X-19-40 (Townes).

Genus **Cnastis**, new genus

Clypeus small, quadrate, about 1.5 times as wide as long, convex basally, apically impressed, the apical margin subtruncate; mandible very short, its apex chisel-shaped, without teeth; temple in profile about 0.67 times as long as eye, its upper 0.6 coarsely scabrous; top of head somewhat flattened; mesoscutum weakly trilobed; notauli sharp but not strongly impressed, almost meeting on disc of mesoscutum; areolet absent, the intercubitus about 1.1 to 1.35 times as long as second abscissa of cubitus; nervulus before basal vein by about 0.3 to 0.4 times its length; tarsal claws of fore and middle legs of female with an acute submedian tooth; tarsal claws of hind leg simple, strongly curved; first tergite of female about 1.5 to 2.0 times as long as wide; second and third tergite polished, with rather coarse, moderately dense punctures. The last tergite of the female is unusual in extending beyond the cerci as a flattened lobe that is longer than wide. In related genera the apex of the female last tergite is shorter and scoop-shaped.

Genotype—Neoxorides longicaudis longicaudis Baltazar, 1955.

The genotype is from Luzon in the Philippines. There is a subspecies of the genotype (*N. longicaudis mindanensis* Baltazar, 1955) in Mindanao, Philippines, an undescribed subspecies of *N. longicaudis*

in Siam, and a specimen of the species is known from Java. *Xorides vulgaris* Uchida, 1928, is a second species of the genus, occurring in Japan.

Genus **Neoxorides**

Neoxorides Clément, 1938. Festschr. Embrick Strand, v. 4, p. 517.

Type: *Xorides nitens* Gravenhorst. Original designation.

Clypeus small, quadrate, about 1.5 times as wide as long, convex basally, the rest impressed, its apical margin subtruncate; mandible short, its apex chisel-shaped, without teeth; temple in profile about 0.6 times as long as eye, its upper half coarsely scabrous; mesoscutum strongly trilobed; notauli strong, approximate on disc of mesoscutum; areolet absent, the intercubitus about 0.4 times as long as second abscissa of cubitus; nervulus interstitial; claws simple, moderately curved; first tergite about 2.0 to 3.0 times as long as wide; second and third tergites microscopically transversely aciculate, impunctuate or with a few weak, inconspicuous punctures.

This is a Holarctic genus, including the European *Xorides nitens* Gravenhorst, 1829, the European *Xorides collaris* Gravenhorst, 1829, and the American *Xorides caryae* Harrington, 1891, and *Xorides borealis* Cresson, 1870.

Tribe **Xoridini**

This tribe includes *Xorides* (=*Xylonomus*), *Ischnoceros*, *Odontocolon*, and *Aplomerus*. *Xorides* is an isolated genus. The other three form a compact group, differing from *Xorides* as indicated in the key to genera and in the ovipositor as described under the genera.

Key to the Genera of Xoridini

1. Mandible without two teeth, its apex chisel-shaped; epomia long and strong, usually projecting dorsally as a tooth; female antenna curved or elbowed subapically, at the curve or elbow with one, two or a series of peg-like setae. Worldwide. ..... *Xorides*
   Mandible with two subequal teeth (as normal); epomia absent or short and weak, not projecting dorsally; female antenna not specialized subapically (as described above). 2
2. Hind femur with a strong median ventral tooth. Holarctic. ..... *Odontocolon*
   Hind femur without a median ventral tooth. 3
3. Frons with a strong median horn or tubercle; body subcylindric. Holarctic. ..... *Ischnoceros*
   Frons without a median horn or tubercle; body flattened. Nearctic ..... *Aplomerus*

Genus **Ischnoceros**

Ischnoceros Gravenhorst, 1829. Ichneumonologica Europaea 2: 949.

Type: *Ichneumon rusticus* Fourcroy. Designated by Viereck, 1914.

Head and body not depressed; apex of mandible with two subequal teeth; frons with a strong median horn or tubercle; female flagellum not specialized as in *Xorides;* epomia absent; hind femur not thickened, without a tooth beneath; first abdominal segment short, stout, rather strongly bent at the middle; second tergite with weak oblique basal grooves; second and third tergites punctate or

transversely aciculate; apical part of ovipositor weakly compressed, the ventral valve with about five ridges, basad of which there is no roughened area.

There are several Palaearctic species, and one in the United States. The United States species is described below.

Ischnoceros clivulus, new species

Female—Forewing 7 to 8 mm. long. Frons with rather fine punctures, and with a large, median, mound-like, weakly compressed tubercle whose apex is weakly grooved vertically; mesoscutum polished, with small punctures whose inter spaces are about 1.5 times their diameter; mesopleurum polished, with moderately large weak punctures whose interspaces are about equal to their diameter; area dentipara with a weak transverse apical tooth; first tergite without a dorsolateral carina beyond the spiracle; second tergite polished, except near the apical margin covered with microscopic transverse aciculation; ovipositor sheath about 0.67 times as long as fore wing.

Black. Tegula, base of fore wing, and base of hind tibia externally, whitish; wings faintly tinged with brown, the veins dark brown; legs ferruginous, the hind tibia with a weak apical infuscation; abdomen brownish ferruginous basally, darkening to brown apically; ovipositor sheath blackish, ferruginous at the apex.

This is the only species of *Ischnoceros* with the abdomen partly ferruginous. Its frontal horn is unexcavated, as in *Ischnoceros sapporensis*, but the abdominal sculpture is aciculate as in *I. rusticus* rather than punctate as in *I. sapporensis*.

Type—♀, Cinder Cone, Lassen National Park, Calif., VI-19-41, P. D. Hurd (Berkeley).

Paratypes—2 ♀♀, same data as type (Berkeley and Townes). ♀, Wright's Lake, Eldorado Co., Calif., VII-2-48, P. D. Hurd (Berkeley).

Genus **Odontocolon**

Odontomerus Gravenhorst, 1829. Ichneumonologica Europaea 3:851.
Name preoccupied by Leach, 1819.

Type: *Ichneumon dentipes* Gmelin. Designated by Westwood, 1839.

Odontocolon Cushman, 1942. Proc. Ent. Soc. Wash. 44: 179. New name.

Head and body not, or weakly flattened; apex of mandible with two subequal teeth; frons without a median tubercle or horn; female flagellum not specialized as in *Xorides;* epomia absent or rudimentary; hind femur thickened, beneath with a strong median tooth; first abdominal segment rather slender basally and enlarged apically, a little bent near the middle; second tergite without oblique basal grooves; first and second tergites polished, smooth or more or less aciculate or punctate; apical part of ovipositor weakly compressed, the ventral valve with about five ridges, basad of which there is no roughened area.

This is a Holarctic genus with numerous species.

Genus **Aplomerus**

Platysoma Provancher, 1885. Canad. Ent. 17: 115. Name preoccupied by Leach, 1817, by Lienard, 1832, and by Brandt, 1835.

Type: *Platysoma tibialis* Provancher. Monobasic.

Aplomerus Provancher, 1886. Addit. Corr. Faune Ent. Canada p. 117. New name for *Platysoma*.

Anodontomerus Ashmead, 1900. Proc. U. S. Natl. Mus. 23: 61.

Type: *Aplomerus tibialis* Provancher. Original designation.

Haplomerus Dalla Torre, 1901. Catalogus Hymenopterorum. 3: 392. Emendation.

Head and body distinctly flattened; apex of mandible with two subequal teeth; frons without a median horn or tubercle; female flagellum not apically specialized as in *Xorides;* epomia absent; hind femur not thickened, without a tooth beneath; first abdominal segment depressed, its spiracle near its basal 0.3; second tergite without oblique basal grooves; first and second tergites polished or with various aciculation or fine wrinkling; apical part of ovipositor weakly compressed, the ventral valve with about five ridges, basad of which there is no roughened area.

This is a Nearctic genus, with five species.

Genus **Xorides**

Xorides Latreille, 1809. Hist. Nat. Crust. Ins. 4: 4.

Type: *Ichneumon indicatorius* Latreille. Monobasic.

Epixorides Smith, 1862. Jour. Proc. Linnaean Soc. London (Zool.) 6: 64. New synonymy.

Type: *Epixorides chalybeator* Smith. Monobasic.

Moansa Tosquinet, 1896. Mem. Soc. Ent. Belgique 5: 345. New synonymy.

Type: *Moansa praestans* Tosquinet. Monobasic.

Neoxylonomus Szépligeti, 1914. Ann. Mus. Natl. Hungarici 12: 421. New synonymy.

Type: *Neoxylonomus australis* Szépligeti. Monobasic.

Other synonyms: *Xylonomus, Sterotrichus, Gonophonus, Moerophora, Sichelia, Rhadina, Perissocerus, Cyanoxorides, Spiloxorides, Macrosterotrichus, Caenostoma, Periceros, Rhadinopimpla, Ahyborhyssa, Lavaudenia, Xylonomimus,* and *Neoxylonomus* Clément, not Szépligeti.

Head and body not, or weakly flattened; apex of mandible chisel-shaped, without teeth; frons without a median tubercle or horn, or sometimes with a horn or lamella between the antennal bases; female flagellum subapically elbowed or curved, on the outer side of the elbow or curve with one to several peg-like bristles; epomia strong, long, dorsally turning forward and usually forming a projecting tooth at the turn; hind femur not thickened, without a tooth beneath; first abdominal segment subcylindric or prismatic basally, expanded apically, stout and rather short to elongate and slender; second tergite nearly always with an oblique basal groove on each side cutting off baso-lateral corners, and often with other grooves or impressions; second and third tergites variously sculptured; apical part of ovipositor cylindric or slightly depressed, the lower valve with about eight ridges, basad of which there is a roughened area.

This is a large genus of worldwide distribution and much structural diversity among its species. The specific diversity has led to the creation of separate genera for reception of some of the structural types. I list these generic names above as simple synonyms, though it is probable that after the specific relations are better understood it will be advisable to use some of the proposed names for subgenera.

BOOK REVIEW

A CLASSIFICATION OF THE FIRST INSTAR LARVAE OF THE MELOIDAE (COLEOPTERA), by J. W. MacSwain. University of California Publications in Entomology, University of California Press, vol. 12, iv plus 181 pp., 29 pls. 1956. $3.00.

The title is perhaps an understatement of the scope of the paper, for in actuality this work represents a carefully analyzed account of both the phylogeny and the classification of the Meloidae of the world. Furthermore, while the author's primary source of data was a comparative study of the morphology of the first-stage larvae, information pertaining to the morphology of the adults and especially biology was integrated and temperately synthesized wherever possible. Since the author's ideas concerning the systematics of the family were based on all these lines of evidence, there is little doubt but that this definitive paper will represent the basic framework of the classification of the Meloidae for years to come, in spite of the fact that small changes will become advisible when more biological data are uncovered, when larvae of other species are collected, and when the adults are more completely studied.

The general outline of the paper is as follows: After the introduction, and acknowledgements, the author briefly but concisely presents the history of the biological and systematic work pertaining to the larvae. He next treats the known biology of the members of the family, summarizing the data at the end in the form of comparative biological diagnoses of three of the five subfamilies. Little is known of the other two subfamilies, which, however, are small. This is followed by a discussion of the morphology of the first instars, with particular reference to an evaluation of the characters of systematic use. The last part of the paper, dealing with systematics of the family, is by far the largest, occupying 127 pages. It is introduced by a treatment of the phylogeny, in which the author's reasons, both biological and morphological, for dividing the family into five subfamilies are presented and discussed. The paper then provides, in a strictly taxonomic arrangement, an account of the subfamilies, tribes, genera, and species based upon the known first-stage larvae. This section includes both keys and comparative descriptions, and lists as well the geographic range of the taxon, the larval food, and the data of the material examined. In addition, the descriptions are often accompanied by some general explanatory remarks pertaining to relationship, nomenclature, and other pertinent information. Also included in the paper is a very extensive selected bibliography covering eight and one-half pages. The study terminates with twenty-nine plates of precisely delineated comparative illustrations of the larvae, drawn mostly by the author.—JEROME G. ROZEN, JR., *Entomology Research Branch, U. S. Department of Agriculture, Washington, D. C.*

FOR EARLY PUBLICATION

A CLASSIFICATION OF THE SIPHONAPTERA OF SOUTH AMERICA

WITH DESCRIPTIONS OF NEW SPECIES

by Phyllis Truth Johnson

Memoir 5
of the
Entomological Society of Washington

The study of South American fleas was begun in 1879 when Weyenbergh published the first descriptions of species from that region, using specimens mounted on cardboard as was usual in that day. These fleas were restudied in balsam by Jordan and Rothschild in England shortly after the turn of the century, and from that time to the present day a large number of siphonapterologists, both in England and the Americas, have contributed to this study. Dr. Johnson's work is the first comprehensive taxonomic treatment of the fleas of the region, which comprises Trinidad and all of the continent and its coastal islands. The contemplated 275 page volume will be indispensable to the serious student of this important order of insects.

Memoir 5 opens with two discussions of morphological characters, one devoted to the terms used in the taxonomic section and the other to their taxonomic validity and possible phylogenetic significance. All the families, tribes and genera known to occur in South America are completely described and illustrated, and the species within each genus have been listed with host and locality data. Descriptions of 17 new species and two new subspecies bring the total number to 170. Keys to families, tribes, genera, and species are included. The discussion of each genus is terminated by a section giving the synonymies of the hosts concerned. The 114 plates are said to contain among the best illustrations of fleas currently available, and are grouped according to family. A section listing hosts, each with the fleas known to occur on it, recapitulates the host-flea information; sections dealing with references, systematic index and list of abbreviations close the volume.

Prepublication orders at the price of $8.00 to members and $9.00 to nonmembers may still be placed with the *Society* for Memoir No. 5. Orders should be addressed to *Mr. Herbert J. Conkle, Custodian, Plant Quarantine Branch, Agricultural Research Service, U. S. Department of Agriculture, Washington 25, D. C.*

SOME SARGINAE COLLECTED IN SOUTH INDIA

(DIPTERA, STRATIOMYIDAE)

MAURICE T. JAMES, *State College of Washington, Pullman.*

The present paper is based on collections made by P. S. Nathan in South India and either purchased by the author or supplied to him for study by the Canadian National Museum through the courtesy of G. E. Shewell. The study of this material has aided considerably in clarifying the taxonomic status of some poorly known species; it has provided material for proposing a new synonymy, previously suspected but not confirmed, involving a well-known and widely distributed species; and, finally, it has revealed two striking generic intergrades, one of which is a species apparently new to science.

Microchrysa flaviventris (Wiedemann)

Sargus flaviventris Wiedemann, 1824, Anal. Ent., p. 31.

The status of the Oriental *Microchrysa* in which the males have a unicolorous yellow abdomen is unsettled, but the common Indian species seems to be *flaviventris*. I have seen a series from Gudalur, Nilgiri Hills, 3500′, April, 1949 (Nathan; James Coll.) and a female from Kodaikanal, Pulney Hills, May, 1953 (Nathan; Canadian National Collection). Information on the types of *M. flaviventris* and *M. fuscistigma* de Meijere furnished to me through the courtesy of S. L. Tuxen and Br. Theowald, respectively, indicates that the discal cell is completely developed in both, contrary to what I had previously thought (James, 1950, p. 254); and in a series from Bangkok, Thailand, Sept. 9, 1952 (M. H. Griffith; Univ. Kansas Collection), two males and one female had the discal cell complete, whereas one male had the vein forming the upper apical portion evanescent. This latter character, therefore, is apparently not of specific value.

Microchrysa dichoptica, new species

A typically appearing *Microchrysa* in all aspects except that the eyes of the male are widely separated. The female might, on first examination, be taken for *M. flaviventris*, but the legs are entirely yellow and the head structure is different, the occipital orbits being more strongly developed below and the inner posterior corners of the eyes, when viewed dorsally, being almost angulate instead of broadly rounded, as in *flaviventris*. In Brunetti's (1923) keys this species would trace to the genus *Sargus* because of the dichoptic males; under *Sargus* it would trace to *inficitus* Walker, from Batjan, a yellowish species marked with black and, as Brunetti remarks, probably a *Microchrysa*, since Walker describes it as having holoptic males (the type is lost); under *Microchrysa* it traces either to *fuscistigma* or to *flaviventris*, depending on whether one considers the stigma as brown or yellow. Both *fuscistigma* and *flaviventris* males are holoptic, with the abdomen at least mostly yellow.

Male.—Eyes broadly separated, the front and face almost parallel sided, the latter but slightly the broader, about one-fifth head width and slightly wider than the ocellar triangle. Occipital orbits narrow, though distinct, along their entire extent. Head metallic, blue green on upper part of front and upper occipital orbits, blackish dulled by whitish pollen on lower third of front, bronze-green on the face, and blackish on the occiput and lower occipital orbits; facial orbits silvery; pile of upper part of front and occiput whitish, that of lower part of front and facial orbits silvery. Antennae yellow, the flagellum orange-yellow; arista black. Proboscis yellow. Thorax metallic bluish green, the pleura slightly more blackish, the humeri and the narrow upper margin of the mesopleura white; pile of pleura silvery, that of mesonotum yellowish-white. Legs wholly yellow and yellow pilose; at most the last last segment of the hind tarsi blackish. Wings hyaline, the stronger veins brownish; venation altogether typical of the genus; stigma brownish; the veins forming the discal cell all strong; M_1 weak; M_3 but little more than a fold in the membrane. Halteres yellow. Abdomen about as broad as thorax; its color blackish green, like that of the thoracic pleura; pile white ventrally, the more conspicuous dorsal pile white to yellowish white but overlying an inconspicuous, short, black pile, especially medially. Genitalia orange-yellow, the capsule large and projecting. Length, 4 mm.

Female.—Front gradually widening from face to vertex; ratio to width of head in allotype 0.24 across oral margin, 0.28 at antennal base, and 0.35 at vertex; viewed from above, the posterior corners of the eyes distinctly angulated. Lower parts of front bluish green, purplish in certain lights. Abdomen distinctly broader than thorax. Otherwise, except sexually, as described for the male.

Types.—Holotype, male, Kodaikanal, Pulney Hills, 6500′; South India, Nov. 9, 1953 (P. S. Nathan). Allotype, same data but May, 1953. Paratypes: male, same data but Oct. 15, 1953; two females, same data but May 28, 1953, and May, 1953. Type in the Canadian National Collection.

Sargus metallinus Fabricius

Sargus metallinus Fabricius, 1805, Syst. Antl., p. 258.

Sargus mactans Walker, 1860, Proc. Linn. Soc. London, 4: 97; Brunetti, 1923, Rec. Indian Mus. 25: 156; James, 1948, Proc. U. S. Nat. Mus. 98: 198 (possible synonymy with *metallinus*); James, 1950, Jour. Washington Acad. Sci. 40: 254. (New synonymy)

Sargus redhibens Walker, 1860, Proc. Linn. Soc. London, 4: 97; Lindner, 1937, Ann. Mag. Nat. Hist. (10)20: 375 (synonymy with *mactans*).

Sargus concisus Walker, 1861, Proc. Linn. Soc. London, 5: 273; Brunetti, 1923, Rec. Indian Mus., 25: 155 (synonymy with *redhibens*).

The references cited in the above synonymy are not intended to be exhaustive, but merely to give authority for the names used, for their synonymy, and for the statements given in this discussion.

Sargus metallinus, as here defined, is a very widespread and variable species, ranging from Southern China and Okinawa through

India to Ceylon, New Caledonia, and the Solomon Islands. Variability exists in color pattern, color of pile and at least one structural detail. Typical *metallinus* has the legs entirely yellow. In *mactans* the hind tibia is black at its base, and Brunetti states that this is the only way in which it differs from *metallinus*. In *redhibens*, all femora are broadly ringed with black or brown; in *concisus*, according to Brunetti, the brown is deeper and more extensive and the "anterior" (fore and middle, by Brunetti's usage) tibiae and the fore and hind tarsi are also distinctly brownish or brown. According to Lindner, Solomon Islands males are *mactans* and females are *redhibens;* James has confirmed this observation but has added that series from Singapore, India, and the Philippine Islands, in the United States National Museum, contain both sexes of both *mactans* and *redhibens*. Leg coloration, consequently, is highly variable. The coloration of the head pile is, also, variable. In the *mactans* and *redhibens* forms, as well as in typical *metallinus*, the pile is usually yellow on the vertex and face but black or blackish on the front; all these areas may have wholly or predominantly black or blackish pile, or certain males, with their subcontiguous eyes, may have the pile color of the front merely gray. The type of *concisus* according to Brunetti, is apparently lost and the specimen (named by Walker) which he described is headless; consequently the color of the head pile in this form is conjectural, but the specimen from Kodaikanal which I am referring to this form has the pile in all the above mentioned areas black. One quite obvious variable structural character is the width of the front in the male. In *metallinus* the front is commonly very narrow, its minimum width being much less than the diameter of the anterior ocellus; this area may be so narrow that the metallic coloration of the front is obscured or lost. In the *mactans* and *redhibens* forms the front may, likewise, be narrow, but it may also broaden to as much as twice the diameter of the anterior ocellus, and the front is distinctly metallic.

It is possible to recognize five more or less indistinctly defined forms of this species: typical *metallinus*, with wholly yellow legs, pale facial and vertical pile, and a very narrow frons in the male, widespread in the Oriental Region but so far not recorded for the Australian Region; *mactans*, indistinguishable from *metallinus* except for the black base of the hind tibia and a tendency toward a broader front in the male, in its distribution extending farther south than *metallinus*, to New Guinea and the Solomon Islands; *redhibens*, in which the femora are banded or marked with black or blackish and the hind tibiae are either black at the base or wholly yellow, in its distribution coextensive with *mactans; concisus*, a melanic form with predominantly black or blackish legs and black facial and frontal pile, that occurs irregularly in the Oriental Region; and the unnamed form with white metapleura, described by James from New Caledonia. It is better, at our present stage of knowledge, to consider these merely forms, rather than subspecies, though I feel that ultimately three sub-

species can be defined: *metallinus, mactans* (*redhibens, concisus*) and the New Caledonia form, the former two intergrading and hybridizing in zones of contact.

Such a zone of contact seems to occur in South India. A series of eight males and females from Kodaikanal, Pulney Hills, 6500′, IV-1953, V-1953, and 28-V-1953 (Nathan; Canadian National Collection) are typical *metallinus* but one female, same data, has the legs entirely black except knees, apices of coxae, and trochanters and has the head pile black, and one male, same data, has black-ringed hind femora and black bases to the middle and hind tibiae, black vertical and predominantly black facial pile, and a widened front. Two males from Walayar Forest, S. Malabar, 1000′, 31-VII-50 (Nathan; James Coll.) are typical *metallinus*, but a female in the same series has black facial pile. Twelve males and seven females from the Nilgiri Hills, Singara, 3400′, V-1954 (Nathan; Canadian National Collection); Gudalur, 3500′, IV-1949, Singara, 3400′, V-1948, and Chirangoda, 3500′, 3-V-1950, X-1950 (Nathan; James Coll.) are intermixed typical *metallinus, mactans,* and *mactans* grading toward *redhibens,* and with varying frontal width and, to an extent, head pile. A series of eight males and females from Ammatti, 3100′, S. Coorg, V-1951, is comparable, with the same three variants and with the extremes of male frontal width present.

Ptecticus cingulatus Loew.

Ptecticus cingulatus Loew. 1855, Verh. Zool.—Bot. Ver. Wien, 5: 143. Brunetti, 1923, Rec. Indian Mus., 25: 143.

The synonymy is given by Brunetti and is not repeated here.

Specimens from South India may not trace readily through Brunetti's key, since the hind femora may be considered wholly yellow, the dark streak mentioned by Brunetti being very obscure or absent. This species is apparently abundant in some localities in South India, as I have seen more than a hundred specimens from Singara in the Nilgiri Hills.

Ptecticus australis Schiner

Ptecticus australis Schiner, 1868, Novara Reise, Dipt., p. 65; Brunetti, 1907, Rec. Indian Mus., 1: 113; Brunetti, 1920, Fauna British India, Diptera Brachycera, I, p. 79; Brunetti, 1923, Rec. Indian Mus., 25: 148.

This species, which looks like a miniature *cingulatus* but is different structurally and in leg coloration, is also apparently common in the Nilgiri Hills. I have seen about 50 specimens from that area, in addition to the following South Indian material in the Canadian National Collection: 1 male, Kodaikanal, Pulney Hills, May, 1953; 1 male, Yercaud, 4500′, Shevaroy Hills, Dec., 1954. In the South Indian specimens which I have examined the hind basitarsus is black only at its extreme base; otherwise, Schiner's description fits quite well.

Ptecticus aurobrunneus Brunetti

Ptecticus aurobrunneus Brunetti, 1920, Fauna British India, Dipt. Brachycera, I, p. 76; Brunetti, 1923, Rec. Indian Mus., 25: 139.

This species was described from a unique male from Cochin State. I have examined 5 males, Singara, 3400′, Nilgiri Hills, V-1948, ex rotting pomelo (Nathan; James Coll.); 1 male, same data but V-1954 (Canadian National Collection); and 3 males, Kodaikanal, Pulney Hills, 6500′, V-1953 (Canadian National Collection). These series agree with Brunetti's description except for the characterization of the golden thoracic and abdominal pile; Brunetti says this is "dense though inconspicuous" on the mesonotum, but this statement depends on the light incidence, the pile being quite conspicuous when viewed from in front; the abdominal golden pile, also, as well as the black patches mentioned by Brunetti, is clearly visible from in front, contrary to Brunetti's statement, but not from behind. The legs may be more extensively blackish than indicated in the original description. Brunetti's statement "genitalia and vertex dark brown" is obviously a lapsus for "genitalia and venter." One of the Kodaikanal specimens has the wings yellow, like the basal part of those of *wulpii*, and with only a little brownish along the lower apical margin. The relationship of *aurobrunneus* and *wulpii* is very close; the male genitalia seem to be identical.

The female of this species has not been described. A female, Tinghawk, Burma, June 4, 1944 (L. C. Kuitert; Univ. Kansas Collection) seems to belong here, but there are no associated males. It is the size and general appearance of *aurobrunneus;* the frons is a little broader, as would be expected in this sex; the abdomen is broader, the first four terga wholly black, the fifth discolored brown, the apical segments rich brown as in the male.

Ptecticus wulpii Brunetti

Ptecticus wulpii Brunetti, 1907, Rec. Indian Mus., 1: 111; 1913, Rec. Ind. Mus., 9: 263; 1920, Fauna British India, Diptera Brachycera I, p. 77; 1923, Rec. Indian Mus., 25: 139

Ptecticus apicalis Wulp, 1885, Notes Leyden Mus., 7: 62; de Meijere, 1916, Tijd. Ent., 58, suppl. 70, note. Not *apicalis* Loew, 1855, Verh. Zool.—Bot. Ver. Wien, 5: 142.

Brunetti described this species from three males and one female from four localities, one of them the Nilgiri Hills. In his 1923 paper he stated that this species was readily recognizable "by the all black 5th and 6th abdominal segments in conjunction with the all orange genitalia," and in his key he includes as an accessory character, couplet 5, "wing tip suffusion beginning at or immediately beyond discal cell." This latter statement conflicts with the Fauna of British India key, which separates *wulpii* partly on the basis of "wings clearly yellow up to half-way between discal cell and wing tip."

I am referring to this species two males from the Nilgiri Hills, Singara, 3400′, V-1948 (Nathan; James Coll.). In both of them, the infumated wing apex starts considerably beyond the apex of the discal cell; in one of them the fifth and sixth abdominal segments are wholly black except for a small, unsymmetrically placed spot on each segment, whereas in the other the sixth segment is wholly brownish orange dorsally and the fifth segment is black only at the base.

Ptecticus cyaneus Brunetti

Ptecticus cyaneus Brunetti, 1912, Rec. Indian Mus. 7: 453; Brunetti, 1920, Fauna Brit. India, Diptera Brachycera, I, p. 75; Brunetti, 1923, Rec. Indian Mus. 25: 151.

Brunetti records but two known specimens of this species, both females: the type from Assam, and a specimen from the Nilgiri Hills. I have a female, Chirangode, Nilgiri Hills, 3500′, May, 1950 (Nathan) that seems to be this species. The appearance is strikingly close to that of a large, rather robust specimen of *Sargus mactans* form *concisus*, but the two characters usually used to distinguish *Ptecticus*, namely the strong projection of the second antennal segment inwardly into the third and the absence of a strap-like prolongation on the lower (thoracic) squama, hold for this species. The venation is not very unlike that of *S. mactans*, and the anterior ocellus, as in most species of *Sargus*, is far removed from the hind pair. A striking character is the slender form and elongation of the hind tarsus, which is 1.5 as long as the hind tibia, the greater part of the length being in the basitarsus, which is seven-eighths the length of the tibia.

This species is probably best retained in *Ptecticus*, but it is obviously an intergrade between this genus and *Sargus*; whether by convergence or phylogenetic relationship is a matter of speculation. It is noteworthy that the second antennal segment of *Sargus mactans* may be convex inwardly, but not strongly prolonged, as in *P. cyaneus*. *Sargus gemmifer* Fabricius, which Brunetti refers to *Ptecticus* in the "Second Revision" (1923) though not in the Fauna of British India, belongs as clearly in *Sargus* as does *S. mactans*.

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MITES FOUND ON MICE OF THE GENUS PEROMYSCUS IN UTAH. II. FAMILY HAEMOGAMASIDAE[1]

(ACARINA)

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To the present time there are few publications which deal specifically with mites collected in Utah. Doane (1916) published on phytophagous mites attacking crops. A check-list of phytophagous and predaceous mites was published by Knowlton and Ma (1950). Other notes on plant mites have been published by Davis and Knowlton (1954) and Knowlton (1955). Keegan (1953) was the first to publish on parasitic mites from Utah. He listed host records of mites belonging to 12 species of seven genera which were taken from 95 individual rodents representing 14 species of nine genera. Included with the 95 rodents were one specimen of *Peromyscus truei*, five *P. crinitus*, and 20 *P. maniculatus*. The collections were restricted to Tooele and Juab counties in Utah. Allred and Beck (1953) made a study of the mites obtained from nests of wood rats in Utah. Most of the 6000 mites collected during that study were identified only to family.

This paper is the second of a series (Allred, ms.) which deals with (1) the kinds of mites found on mice of the genus *Peromyscus* in Utah, (2) their degree of host specificity, (3) their geographic distribution within the territorial limits of Utah as determined by their occurrence on mice of the genus *Peromyscus*, and (4) other biological aspects pertaining to the mites.

Brevisterna utahensis (Ewing), 1933

(Figures 25, 28, 29, 30, 31)

Ewing (1933) described *B. utahensis* from a single female collected from a wood rat, *Neotoma lepida*, from Salina, Sevier County, Utah, March 21, 1929, by J. S. Stanford. Mites taken in the present study differ somewhat from the discussions of Ewing (op. cit.) and Keegan (1949). These mites possess a dorsal plate which is narrower and more pointed than was indicated by Ewing and Keegan. The paired anal setae are situated behind the anterior level of the anus rather than at the anterior level. The numbers of accessory setae of the genitoventral plate are 4, 4, 4, 4, 4, 5 and 6 in seven specimens examined. In specimens examined by Keegan, the numbers of setae vary from eight to eleven. Specimens in this study have two small pairs of accessory metapodal plates. These differences probably are within the limits of specific variation.

This species has been collected from wood rats and their nests in Arizona, California and Utah. Keegan (1953) listed collection records from a grasshopper mouse, *Onychomys leucogaster*, a wood rat,

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[1]Part 2 of an abstract from a thesis for the PhD degree, University of Utah, June, 1954. This work supported (in part) by a research grant awarded to the Brigham Young University by the Microbiological Institute, National Institutes of Health, United States Public Health Service.

Neotoma sp., and nests of wood rats from Utah. Allred and Beck (1953) found this species in wood rat nests from Juab and Utah counties. *Brevisterna utahensis* probably is state-wide in distribution. It is known to occur at elevations between 2500 and 5000 feet in the Lower and Upper Sonoran life zones.

Only seven females were collected from white-footed mice in this study. These mites are associated more commonly with wood rats and their nests than with mice of the genus *Peromyscus*. It is likely that infestations of mice accidentally occur when mice wander into wood rat houses. These mites were collected from grasshopper mice and from wood rats and their nests in Utah during June, August, October and November. In this study, mites were found on mice only during April and June. One of the four times that it was collected, *B. utahensis* was the only kind found on its host. At other times, it was associated with the following species the number of times indicated:: *Hirstionyssus* spp., 3; *Eubrachylaelaps hollisteri*, 2; *Haemolaelaps glasgowi*, 1; *Dermanyssus* sp., 1.

Euhaemogamasus ambulans (Thorell), 1872
(Figures 17-24, 26, 27, 31)

This species was described from mites from Europe. Specimens from North America are extremely variable with regards to the numbers of setae and the length-width ratios of the sternal shield. Keegan (1951) discussed these variations and synonymized several species with *E. ambulans*. With one exception, the mites collected in this study agree with Keegan's redescription. The differences in the numbers of setae and the shape of the sternal plate occur within the limits of variation of western specimens. However, a single female collected in this study in Utah differs from typical *E. ambulans* in the length-width ratios of the tarsi, and the middle pair of sternal setae are barbed.

Accordng to Keegan (op. cit.), *E. ambulans* has been taken from birds and mammals at many localities in the northern hemisphere. In North America, mites have been collected in Alaska and Canada, and in most states from California to New York. Keegan (op. cit.) reported records of this species from a wood rat, *Neotoma cinerea*, collected in Logan Canyon, Cache County, Utah in July, 1933. Allred and Beck (op. cit.) found this species in wood rat nests collected in Juab and Utah counties in October and November, 1951. These mites probably are statewide in distribution in Utah at elevations between 6000 and 10,000 feet. They are known to occur principally in the Transition and Canadian life zones.

In Utah, *E. ambulans* probably is associated with wood rats, *Neotoma* spp., and squirrels, *Citellus* spp., and occurs most frequently in high mountain areas. In this study, these mites were found only

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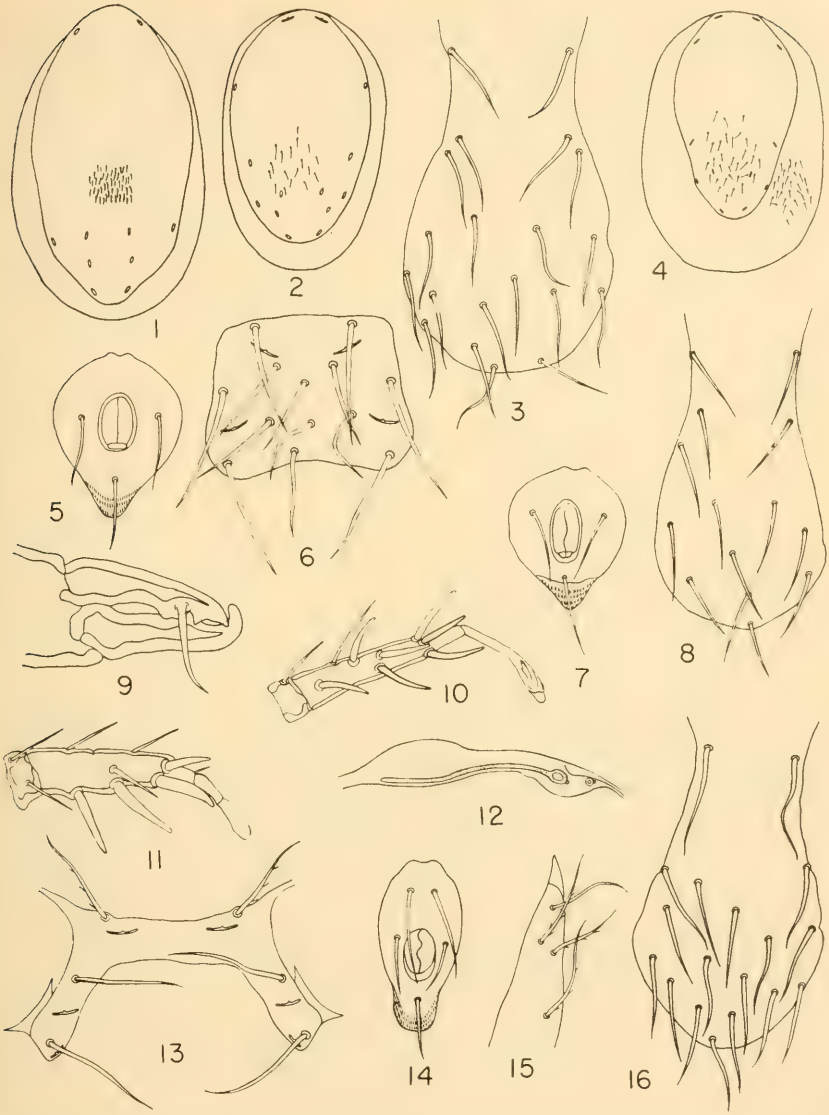
Euhaemogamasus barberi: Fig. 1, dorsal plate of female showing density of setae. *Euhaemogamasus oudemansi* (typical): Fig. 4, dorsal plate of female showing density of setae; fig. 7, anal plate of female; fig. 8, genitoventral plate of female; fig. 12, left peritreme of female. *Euhaemogamasus oudemansi* (vari-



ant): fig. 2, dorsal plate of female showing density of setae; fig. 3, genitoventral plate of female; fig. 5, anal plate of female; fig. 13, sternal plate of female; fig. 15, ventral view of left cornicula of female. *Ischyropoda armatus:* Fig. 6, sternal plate of female; fig. 9, chelicera of female; fig. 10, ventral view of left tarsus III of female; fig. 11, ventral view of left tarsus II of female; fig. 14, anal plate of female; fig. 16, genitoventral plate of female.

on male mice. It is likely that the male mice wander more extensively than do the females, possibly becoming infested when they enter the nests or houses of other animals such as wood rats and squirrels. Eighteen female mites were collected from 18 mice in May, June, July and August. Infestation of mice during these months only may be attributable to the wandering habits of the mice or the mites during the summer.

Four of the 18 times that it was collected, *E. ambulans* was the only mite found on its host. At other times, it was associated with the following species the number of times indicated: *Haemolaelaps glasgowi*, 11; *H. megaventralis*, 1; *Trombicula harperi*, 2; *Eubrachylaelaps debilis*, 5; *Ischyropoda armatus*, 2; *Hirstionyssus* sp., 1; *Bdellonyssus sp.*, 1; *Poecilochirus* sp., 1; *Hypoaspis* sp., 1; Ascaidae sp., 1; Gamasolaelaptidae sp., 2; Pachylaelaptidae sp., 1; Parasitidae sp., 1.

Euhaemogamasus barberi (Ewing), 1925
(Figures 1, 31)

Ewing (1925) described *E. barberi* from two females taken from a "nest of small mammal" from Maryland, and *E. microti* from two females taken from a meadow mouse, *Microtus pennsylvanicus* from New York. Keegan (1951) synonymized these two species as *E. barberi*. The single female taken in this study is similar to Keegan's redescription. However, specimens examined by Keegan all have over 100 setae on the genitoventral shield; the mite from Utah has only 67.

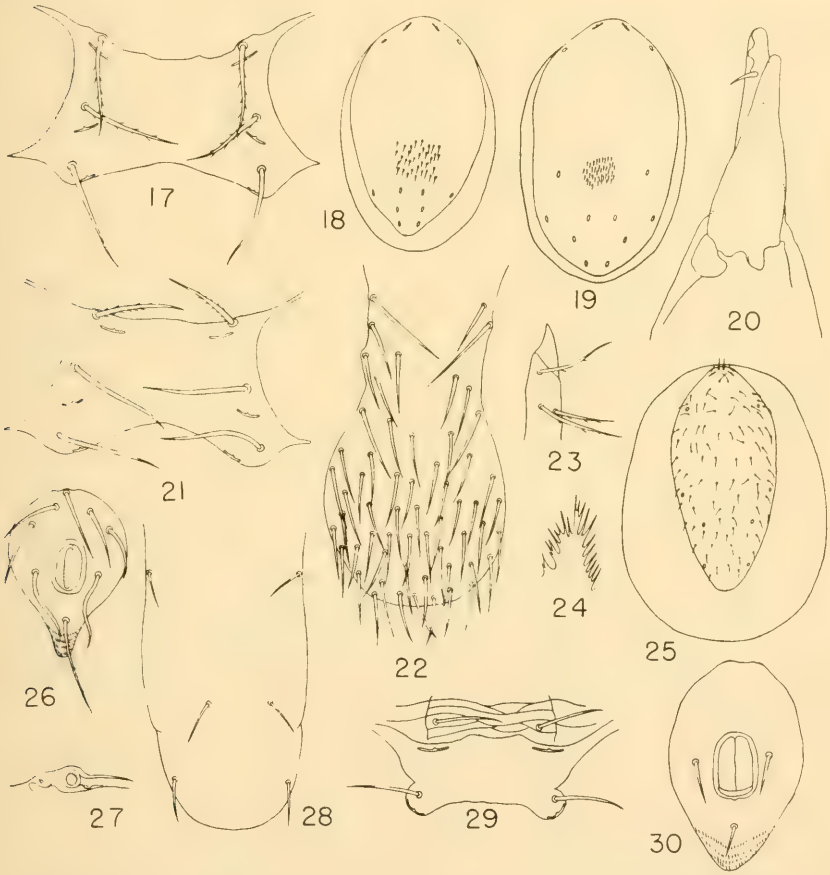
Mites of this species commonly are associated with rodents that live in meadows or marshy areas, such as meadow mice and shrews. According to Keegan (op. cit.), this species is known only from eastern United States and southeastern Canada. The collection in Utah considerably extends its range westward. The mite was taken from an immature female mouse from Diamond Fork Canyon, Utah County in June, 1951. The mouse was trapped in a grove of cottonwood trees by a small stream where grasses and willows formed a marshy area.

The following species were found on the same host with *E. barberi*: *Eubrachylaelaps debilis*, *Hirstionyssus occidentalis*, and *Haemolaelaps glasgowi*.

Euhaemogamasus oudemansi (Hirst), 1914
(Figures 2-5, 7, 8, 12, 13, 15, 31)

Five females of this species were collected in this study. All of these differ slightly from Keegan's (1951) redescription. One differs by having a genitoventral plate which is not as bulbous and expanded as described by Keegan. The plate extends only half the distance between coxae IV and the anal shield in contrast to more than two-thirds the distance as discussed by Keegan. On the specimen from Utah, the length-width ratios of the tarsi are: leg I, 6:1; leg II, 4.5:1; leg III, 4.5:1; leg IV, 6.6:1. In Keegan's discussion these ratios are:

leg I, 8:1; leg II, 6:1; leg III, 7:1; leg IV, 9:1. The dorsal plate is not as broad anteriorly as Keegan illustrated, and covers considerably less dorsal surface. The arrangement of the pores on the dorsal plate varies slightly. Keegan did not mention the third pair of pores which occurs on the sternal shield. These are located on the most posterior edge of the plate. He illustrated the second pair of pores as being closer to the second sternal setae than to the third setae. In the specimen from Utah, the second pores are midway between the second and third sternal setae.



Euhaemogamasus ambulans (typical): Fig. 19, dorsal plate of female showing relative density of setae; fig. 21, sternal plate of female; fig. 22, genitoventral plate of female; fig. 26, anal plate of female. *Euhaemogamasus ambulans* (variant): Fig. 17, sternal plate of female; fig. 18, dorsal plate of female showing relative density of setae; fig. 20, ventral view of chelicera of female; fig. 23, ventral view of left cornicula of female; fig. 24, tectum of female; fig. 27, right peritreme of female. *Brevisterna utahensis:* Fig. 25, dorsal plate of female; fig. 28, genitoventral plate of female; fig. 29, sternal plate and presternal area of female; fig. 30, anal plate of female.

In the other four mites, the dorsal plate is broader anteriorly than posteriorly and covers more of the dorsal surface than Keegan illustrated, and there are seven pairs of pores instead of six. The terminal portion of the cornicula is more pointed than Keegan shows in his illustrations, and the genitoventral plate is not as bulbous. The posterior invagination of the sternal plate is very broad, although this width varies between specimens. Further collections and study may indicate that these differences are specific variations.

Keegan (op. cit.) designated this species as a facultative parasite of cosmopolitan distribution. The type specimens were taken from wild rats. More recent collections have shown hosts of many kinds from many areas. In Utah, Allred and Beck (1953) found this species in wood rat nests. These mites probably are state-wide in distribution. They are known to occur at elevations from 2500 to about 10,000 feet in all of the life zones from the Lower Sonoran to the Canadian.

These mites are not frequently found on mice of the genus *Peromyscus*. They probably are restricted to the nest, or are consorts of animals of other species. Two of the mites collected each contained one egg. These eggs were in a "granular" stage of development and were of large size, occupying almost one-half the space of the idiosoma. The mites were collected from mice in March, April, May and July.

Mites of the following species were found on the same hosts with *E. oudemansi: Euhaemogamasus ambulans, Haemolaelaps glasgowi, Eubrachylaelaps debilis*, Parasitidae sp., and Pachylaelaptidae sp.

Haemogamasus alaskensis Ewing, 1925

Ewing (1925) described this species from a single female taken from a mouse of the genus *Microtus* from Alaska. Keegan (1951) redescribed *H. alaskensis* from specimens taken from animals of several species and genera from the United States, Canada and Alaska. In the same paper (op. cit.) he listed records from shrews of the species *Blarina brevicauda* (probably *Sorex* vagrans) taken at Morgan, Morgan County, Utah in August and September, 1932.

In this study a single female mite of this species was collected from *Peromyscus* sp. in Millcreek Canyon, Salt Lake County in September, 1948.

Ischyropoda armatus Keegan, 1951

(Figures 6, 9-11, 14, 16, 31)

Type specimens of this species were collected in California and Arizona from a pocket gopher, *Thomomys* sp., kangaroo rats, *Dipodomys* sp., and a wood rat, *Neotoma* sp. The mites collected in this study in Utah agree with Keegan's (1951) description of the type. They differ in the dimensions of the plates and arrangements of the setae, but these characters are within the limits of variation of the species.

Rodents of many kinds serve as hosts for these mites. These include pocket gophers, kangaroo rats, wood rats, squirrels and native mice. These mites have been found in Arizona, California, Colorado and

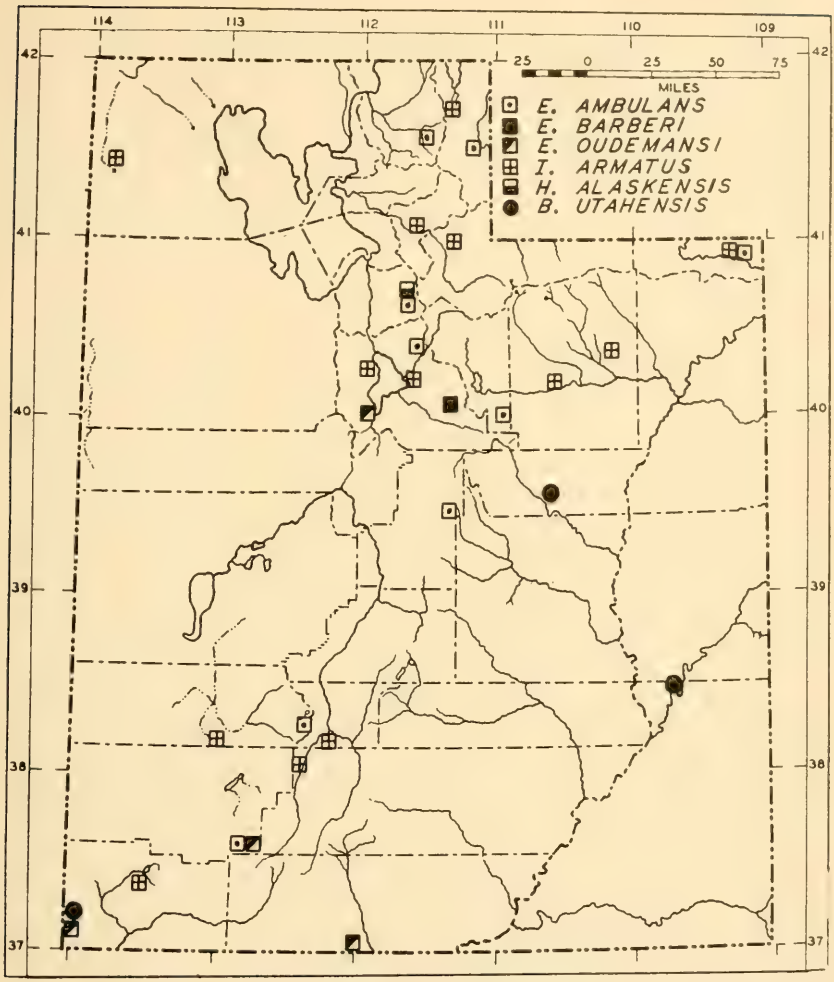


Fig. 31. Collection localities of *E. ambulans, E. barberi, E. oudemansi, I. armatus, H. alaskensis,* and *B. utahensis* in Utah.

New Mexico (Keegan, op. cit.). Keegan (1953) records the occurrence of these mites in Utah from two kinds of kangaroo rats, *Dipodomys ordii* and *D. microps,* pocket mice, *Perognathus parvus,* and grasshopper mice, *Onychomys leucogaster.* In Utah, mites of this species probably are state-wide in distribution. They occur principally at elevations between 3000 and 6500 feet in the Upper Sonoran and Transition life zones.

Three male and 27 female mites of this species were collected from 11 mice during the periods from May through September, and in

November. The greatest numbers were taken in May. During the five-year period, they were collected only in 1952 and 1953. Six of the 11 times that it was collected, *I. armatus* was the only kind found on its host. At other times, it was associated with mites of the following species the number of times indicated: *Bdellonyssus bacoti*, 1; *Haemolaelaps glasgowi*, 6; *H. megaventralis*, 1; *Eubrachylaelaps circularis*, 1; *E. debilis*, 2; *Hirstionyssus* spp., 4; *Dermanyssus* sp., 1; *Euhaemogamasus ambulans*, 1; Pachylaelaptidae sp., 1; Antennophoridae sp., 1.

Discussion

Most mites are not so host specific that their geographic distribution is determined entirely by the range of their host. Nevertheless, mites of some species were associated more frequently with one kind of mouse than with another, such as *Euhaemogamasus ambulans* and *Ischyropoda armatus* which were found most frequently on *Peromyscus maniculatus*. Mites of these species apparently occur only in the Middle Rocky Mountain Faunal Area (see Durrant, 1952:480), yet their deer mouse host is state-wide in distribution.

In the Upper Sonoran and Transition life zones in Utah, mites are active usually from May through September; this applies to *Ischyropoda armatus*. In the Lower Sonoran Life Zone and areas of the Upper Sonoran where climatic conditions approach those of the Lower Sonoran, mites are most active during the period from May to July. This applies to *Euhaemogamasus oudemansi*, found most commonly in these areas. Mites of the species *Euhaemogamasus ambulans* generally occur only at the higher elevations in the montane forest areas where they were most commonly found during the period from June through August.

Population cycles of mites occur independently of one another in different geographic localities and may act as barriers which allow subspecies to develop rapidly. Mites of the species *Ischyropoda armatus* are both northern and southern in distribution, and may be divided into two groups on the basis of seasonal activity. The northern mites were commonly found on mice during the period from May through November, whereas the southern mites were found only from May through July.

Although the numbers of mites of this family that were collected from *Peromyscus* are not large, they were sufficient to indicate certain trends in seasonal population fluctuations and geographic distribution. However, it is evident that these species are not regularly associated with mice of the genus *Peromyscus* in Utah. Further collections of other animals may disclose the preferred hosts, although it is possible that many of these species, such as *Brevisterna utahensis*, are primarily nest dwellers, and get onto the host only to feed.

TABLE I. Check-list and host correlation of the numbers and kinds of mites of the family Haemogamasidae taken from each of four species of *Peromyscus*. No mites of this family were found on *Peromyscus boylii*.

Species of Mite	No. Mites Taken From Each *Peromyscus* Species			
	P. crinitus	*P. eremicus*	*P. maniculatus*	*P. truei*
Brevisterna utahensis	4	2	1	
Euhaemogamasus ambulans			17	
Euhaemogamasus sp. near *ambulans*			1	
Euhaemogamasus barberi			1	
Euhaemogamasus oudemansi		1	3	
Euhaemogamasus sp. near *oudemmansi*			1	
Haemogamasus alaskensis			1	
Ischyropoda armatus			28	2

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TAXONOMIC NOTES ON NORTH AMERICAN APION
(COLEOPTERA, CURCULIONIDAE)

The complete reference to the following species may be found in Wagner, 1912, Genera Insectorum, fasc. 130, Apioninae, or Wagner, 1911, Junk Coleopterum Catalogus, pars 6, Apioninae.

Apion arizonae Fall (1898) = *A. segnipes morrisoni* Wagner (1911). *New synonymy.*

Apion disparatum Sharp (1890) = *A. nasutum* Fall (1898). *New synonymy.*

Apion disparipes Fall (1898) = *A. brunneotibiale* Wagner (1912). *New synonymy.*

Apion erythropterum Sharp (1890) = *A. pyriforme* Smith (1884), *nec.* Kirsch (1874), *new synonymy. A. falli* Wagner (1909), *new synonymy.*

Apion hastifer Sharp (1890) = *A. poeticum* Sharp (1890). *New synonymy.*

Apion luteirostre Gerstacker (1845) = *A. acarinum* Sharp (1890); *A. argentinum* Beguin-Billecocq (1909); *A. cydoniae* Bondar (1950). *New synonymy.*

Apion pleuriticum Sharp (1890) = *A. fraudulentum* Sharp (1890). *New synonymy.*

Apion punctulirostre Sharp (1890) = *A. spectator* Sharp (1890). *New synonymy.*

Apion simile Kirby (1811) = *A. superciliosum* Gyllenhal (1813); *A. triste* Germar (1817); *A. lanuginosum* Walsh (1867), *nec* Gerstacker (1854), *new synonymy; A. walshii* Smith (1884), *new synonymy; A. vicinum* Smith (1884), *new synonymy; A. eppelsheimi* Faust (1887).

Apion fraternum Smith (1884) is a good species and is distinct from *A. griseum* Smith (1884) with which it has been synonymized by Fall (1898). Lectotype of *A. fraternum* is hereby designated as the female specimen labeled Columbus, Texas, U.S.N.M. Cat. No. 1252. Lectoparatypes are in the J. L. Leconte collection. Lectotype of *A. griseum* is here designated as the male specimen labeled New Jersey, U.S.N.M. Cat. No. 1253.

A. fraternum Smith is the more abundant and widely spread species of the two. The larvae develop in beans of the genus *Strophostyles;* series were examined that were reared from seed pods of *S. helvola* and *A. umbellata. A. griseum* Smith occurs along the Atlantic seaboard from New York to Florida. It has been reared from the seeds of *Phaseolus polystachys.*

The following summarizes the principal distinguishing characters:

A. griseum Smith, front tibia of male with an elongate, flattened, polished, striate area on inner anterior face extending one-half length of tibia; beak of female in dorsal view parallel sided in apical third. *A. fraternum* Smith, front tibia of male with slight flattened area on inner anterior surface devoid of scales, but not polished and at most feebly striate, extends not more than one-third length of tibia; beak of female in dorsal view distinctly expanded at tip.

—D. G. KISSINGER, *Department of Entomology, University of Maryland, College Park.*

SOLUBEA BERGROTH, 1891, A SYNONYM OF OEBALUS STÅL, 1862, AND A NOTE CONCERNING THE DISTRIBUTION OF O. ORNATUS (SAILER)

(HEMIPTERA, PENTATOMIDAE)

R. I. SAILER, *Entomology Research Branch, U. S. Department of Agriculture, Washington, D. C.*

Dr. W. E. China of the British Museum has brought to my attention the fact that *Oebalus* Rafinesque 1815 was and still is a *nomen nudum*. Hence Bergroth's 1891 proposal of *Solubea* as a new name for *Oebalus* Stal, 1862, was without justification and *Solubea* Bergroth must be treated as a synonym of *Oebalus* Stål.

This change of generic name is of importance since the economically important rice stink bugs are involved. Fortunately, the name *Solubea* did not come into general use in economic literature until after 1920, though it became established in taxonomic literature 15 years earlier.

In the following check list of trivial names that must now be placed under the generic name of *Oebalus*, those names currently recognized as valid are in bold face type and synonymous names are in italics. The genus in which the trivial name was originally described is shown in brackets.

CHECK LIST OF TRIVIAL NAMES ASSIGNED TO THE GENUS OEBALUS

augur (Say), 1831 [Pentatoma] = **pugnax** (F.)
exigua (Berg), 1891 [Mormidea] = **poecilus** (Dallas)
geographica (Guérin-Méneville), 1857 [Pentatoma] (preoccupied) = **insularis** Stål
grisescens (Sailer), 1944 [Solubea] **New combination.**
guerini (Lethierry and Severin), 1893 [Mormidea] (new name for *geographica* G.-M.) = **insularis** Stål
inscriptus (Fabricius), 1803 [Cimex] = **ypsilon-griseus** (DeG.)
insularis Stal, 1872 [Oebalus]
linki (Heidemann), 1917 [Mormidea] **New combination**
litteratus (Gmelin), 1789 [Cimex] = **ypsilon-griseus** (DeG.)
mexicanus (Sailer), 1944 [Solubea] **New combination**
ornatus (Sailer), 1944 [Solubea] **New combination**
orthocantha (Palisot de Beauvois), 1805 [Pentatoma] = **pugnax** (F.)
poecilus (Dallas), 1851 [Mormidea] **New combination**
postposita (Bergroth), 1914 [Solubea] = **poecilus** (Dallas)
pugnax (Fabricius), 1775 [Cimex]
rufescens Haglung, 1868 [Oebalus] = **poecilus** (Dallas)
similis Kuhlgatz, 1902 as variety of *insularis* [Oebalus] = **poecilus** (Dallas)
torridus (Sailer), 1944 [Solubea] as subspecies of *pugnax* = **pugnax torridus** (Sailer) **New combination**
typhoeus (Fabricus), 1803 [Cimex] = **pugnax** (F.)
vitripennis (Burmeister), 1835 [Cimex] = **pugnax** (F.)
ypsilon-griseus (DeGeer), 1773 [Cimex]
ypsilonoides Berg, 1879 [Oebalus] = **ypsilon-griseus** (DeG.)

Except for Rafinesque, 1815, references to the literature mentioned above may be found in Sailer, R. I., 1944, The Genus Solubea (Heteroptera: Pentatomidae). Proc. Ent. Soc. Wash. 46(5): 105-127. The reference to Rafinesque's work is as follows: Analyse de la Nature, ou Tableau de l'Univers et des Corps Organises. Palerme, 1815, page 140. (*See* Complete Writings of C. Z. Rafinesque on Recent and Fossil Conchology, edited by Wm. G. Binney and G. W. Tryon, Jr., Bailliere Brothers, New York, 1864, 96 pages.)

At the time I described *ornatus* it was known from the islands of Puerto Rico and Hispaniola, where the species is common. In addition, I reported three specimens from Cali, Colombia, which I thought might have been mislabeled, since I had no other records from either Central or South America. Subsequently, specimens of *ornatus* were sent to me from a locality 47 kilometers from Rio de Janeiro, Brazil, along the highway to Sao Paulo, where they were collected by Dr. Petr Wygodzinsky on November 12, 1943.

The discovery of *ornatus* so far south in Brazil raises a question concerning the identity of *Mormidea exigua* Berg. Using Berg's description and the distribution of *poecilus* as guides, I concluded that *exigua* could be only a synonym of *poecilus*. Since *poecilus* and *ornatus* can be distinguished only by differences found in the male and female genital structures, the certain identity of *exigua* must be decided by an examination of the genitalia of the type specimen. Should these prove identical with *ornatus* (Sailer, 1944), this name will fall as a synonym of *exigua* Berg, 1891.

NORMAN EUGENE McINDOO

1881-1956

The profession of entomology lost a valued and highly respected member with the passing of Norman Eugene McIndoo on September 7, 1956, while hospitalized at the Washington Sanatarium, Takoma Park, Maryland. Previous to his death, due to slowly failing heart action, he had been partially incapacitated by a stroke for a considerable period.

Dr. McIndoo was born at Lyons, Indiana, April 11, 1881. After completing his early education, he entered the University of Indiana from which institution he received a degree of A.B. in 1906. Following his graduation, he taught in high school in Wisconsin, 1906-08.

He then reentered the University of Indiana and received an A.M. degree in 1909. As a Harrison fellow, he matriculated in the same year at the University of Pennsylvania and was awarded the degree of Doctor of Philosophy in Zoology in 1911. In addition to the foregoing educational pursuits and practices, Dr. McIndoo assisted at the University of Indiana, 1905-06, and in the summer of 1905 collected blind fishes in caves of western Cuba as well as other fishes indigenous to the fresh and salt waters of the island. He also attended the Biological Station of the University of Indiana, the Woods Hole Biological Station, the George Washington University, and the United States Department of Agriculture Graduate School.

Dr. McIndoo's later interests in and researches on the sense organs and responses of insects to various stimuli were largely initiated by his studies at the University of Pennsylvania which resulted in the publication of his thesis entitled "The Lyriform Organs and Tactile Hairs of Araneads."

The Bureau of Entomology of the United States Department of Agriculture appointed Dr. McIndoo to its staff in 1911 and assigned him to the Division of Fruit Insect Investigations. After serving in this and other divisions for a period of 34 years, he retired as a senior entomologist in 1945. During his long and distinguished career, Dr. McIndoo's researches received world-wide recognition, particularly in the field relating to the olfactory and other sense organs of insects belonging to the orders Hymenoptera, Coleoptera, Lepidoptera, Diptera, and Orthoptera. He developed the well-known McIndoo olfactometer, which instrument was extensively used in his studies on insect attractants and repellents.

In addition to Dr. McIndoo's researches in the science of osmics, he made extensive investigations of derris, cubé, and other rotenone-bearing plants to evaluate their usefulness for the destruction of insect pests.

Dr. McIndoo was the author or coauthor of 84 publications and was particularly adept in making detailed pen and ink drawings to illustrate the text.

Dr. McIndoo was a past president of the Entomological Society of Washington, a fellow in the Entomological Society of America, and a member of the American Society of Zoology and of the Insecticide Society of Washington. In addition, he participated actively in many civic organizations of the Washington area.

Dr. McIndoo will always be remembered as a modest man, a conscientious worker and a gentleman in every respect. He will be greatly missed by all who had the good fortune to know and associate with him. He is survived by his widow, Emma P. McIndoo, two children, Thomas M. and Mary, and two grandchildren.

E. H. SIEGLER

SOCIETY MEETING

The 657th regular meeting of the Entomological Society of Washington was held on Thursday, November 1, 1956, in room 43 of the U. S. National Museum. There were 54 members and 52 visitors present. President R. A. St. George called the meeting to order at 8:00 p.m. and the minutes of the previous meeting were read and approved.

The following new members were elected:

Fred A. Morton, Entomology Branch, Office of the Chief of Engineers, Department of the Army; *Dr. Lafe R. Edmonds*, Engineering Research and Development Laboratory, Fort Belvoir, Va.; *William L. Downes, Jr.*, Insect Identification and Parasite Introduction Section, U. S. National Museum, Washington 25, D. C.; *Robert V. Travis*, U. S. Department of Agriculture, Plant Industry Station, Beltsville, Md.; *John Knox Clagett*, 6909 Carleton Terrace, College Park, Md.; and *Max W. McFadden*, 2040 Eye St. N.W., Washington 6, D. C.

F. W. Poos, in behalf of the nominating committee, reported on the proposed officers for 1957. (Note: Officers for the year 1957 are presented on the inside front cover.—Ed.) President St. George thanked Dr. Poos for presenting the report in behalf of chairman W. H. Anderson, and thanked the committee, of which the third member was W. D. Reed, for preparing the slate of nominations.

Some corrections offered by members to the proposed constitutional change presented at the previous meeting were discussed by President St. George. Voting on the proposals was deferred until the annual meeting in December, because of the large number of visitors present.

Randall Latta brought greetings to the Society from the American Entomological Society, which he addressed at its regular meeting in the Academy of Natural Science in Philadelphia in September.

H. H. Stage exhibited a pendant of amber containing several fossilized insects.

W. E. Bickley announced that the "woolly-bear" prediction this year was for a mild winter, and that this is to be his final observation on the subject. President St. George recalled seeing the statement that woolly-bears are unreliable forecasters.

R. H. Foote exhibited "*Aquatic Insects of California*," edited by Robert L. Usinger. Jerome G. Rozen reviewed "*A Revision of the Genus Pselaptrichus Brendel*," by Robert O. Schuster and Gordon A. Marsh, and "*A Classification of the First-Instar Larvae of the Meloidae*," by J. W. MacSwain.

C. F. Rainwater gave a note on the status of the Mediterranean fruit fly prepared by the Plant Pest Survey Section. In Florida 11 new infestations were found during September in known infested counties. The last infested county was Osceola found two months ago. By the end of September, 168 infestations were known in 27 counties. There were 38,825 traps in the field, 36,000 in 39 counties in Florida. The remainder were in Alabama, California, Georgia, Louisiana, Mississippi, and Texas. No flies have been found outside of Florida. A total of 3,853,674 acres have been treated with bait spray and 26,673 acres have received surface treatment with granular insecticides.

Of the area treated by aircraft with bait spray, 1,331,735 acres were covered under Federal contract and 2,249,270 acres under State contract. Aircraft was used to treat 3,167 acres with granular insecticides, and ground equipment to spray 17,442 acres with bait spray and 22,446 acres with granular insecticide. Treatment is still being applied to 246,000 acres, which is a reduction of some 65 percent from the original spray area. The fly has exhibited a marked ability to build up rapidly when controls have not been properly timed. On September 26 certification was waived on all regulated vegetables produced in all Federally regulated counties except Pinellas. (Speaker's abstract.)

The principal paper of the evening, "*Malaria Control Problems in Indo-China,*" was given by Harry H. Stage, Malaria and Vector Control Specialist (until retirement October 31, 1956), International Cooperation Administration, Vietnam. Dr. Stage introduced Dr. Louis Williams, Jr., Pan American Sanitary Bureau, regional office of the World Health Organization.

The problems encountered in efforts to control malaria in Indochina are many and varied. Some of them are concerned with lack of trained personnel. Such problems can be resolved, although that requires time and local interest. Others are more complicated because they are closely associated with the very life of the people—their habits, their ideology, and their security. These latter problems do not yield easily to western ideas of organization and management, and they should not be subjected completely to our kind of logic. Rather, we foreigners must bend to unaccustomed lines of approach and emphasis. These latter problems—indefinite, in some cases unmentionable—are no less vital to us who undertake a disease-control project than problems having to do with the insect vector itself. In Vietnam the problem is especially complicated because there are some 700,000 tribal Indonesians living in remote mountain areas and who contribute little to the economy of the country. The Vietnamese are therefore inclined to disregard them in health programs and social welfare. The problems of military insecurity, transportation, trained personnel, and customs, require special consideration and thought. The problems having to do with finances are not those involved in inadequacy of funds; rather, they are concerned with procedures for getting the money to the end point. The steps are many and tortuous, and sometimes there are leakages enroute. There are 22 species of *Anopheles,* probably only three of which, *A. minimus, A. jeyporiensis,* and *A. sundiacus,* are effective vectors. These have very definite habitat requirements, however, and so cause a "spotted" incidence over the nation. Emphasis should be placed on one of the greatest problems—and weaknesses—in the Indochinese Malaria Control Programs, that of inadequate supervision. Without it anopheline resistance will be promoted and this in turn will make the task of eventual malaria eradication difficult indeed. (Speaker's abstract.)

Dr. Stage's slides were an excellent complement to his talk, which was followed by questions and comments by Doyle Reed, Margaret Walton, Louis Williams, Reece Sailer, and others.

Two new members were introduced, Lafe Edmonds and Fred Morton. The visitors introduced were Frederico and Anna Lane of Brazil, Major Tibor Lépes of Yugoslavia (where his name would be given as Lépes Tibor), Mrs. Stage, Mrs. Lucie C. Timberlake, and Dr. J. Bonne-Wepster, of the Netherlands. The meetink adjourned at 9:48 p.m.—KELLIE O'NEILL, *Recording Secretary.*

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of the
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[1]Miss Alice V. Renk, Entomology Research Division, ARS, U. S. Department of Agriculture, Room 3151, South Building, Washington 25, D. C.

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AMERICAN SPECIES OF LEDERMUELLERIA AND LEDERMUELLERIOPSIS, WITH A NOTE ON NEW SYNONYMY IN NEOGNATHUS

(ACARINA, STIGMAEIDAE, CALIGONELLIDAE).

F. M. SUMMERS, *University of California, Davis*

The mites that Oudemans (1923) referred to his genus *Ledermuelleria* comprise a homogeneous group of stigmaeids having globate bodies almost completely encased in an ornamented exoskeleton. They occur as thinly dispersed inhabitants of ground litter, leaf mold, moss, and meadow land. Three of the four *Ledermuelleria* species and the one species of *Ledermuelleriopsis* collected principally in California are species described from Europe. Redescriptions of the named species are needed because existing descriptions do not clearly indicate their distinguishing features.

A distinctive feature of these two genera is the extensive encasement of the hysterosoma by one (*Ledermuelleria*) or two (*Ledermuelleriopsis*) dorsal plates. These plates constitute a carapace-like covering over the entire dorsum and sidewalls of the hysterosoma. The humeral (scapular) plate on each side is displaced to a pleuro-ventral position.

LEDERMUELLERIA Oudemans

Ledermülleria Oudemans, 1923, Ent. Ber. 6(130):150.

Globate, red or straw-colored mites with stubby legs and mouthparts. Palpus 5-segmented, thickset, longer than extended chelicera by two distal segments; overall length not greater than combined lengths of genu, tibia, and tarsus of leg I. Primary claw of palptibia well-developed, with a very small accessory claw anchored medially at its base. Palptarsus a slender cylinder, equal to or slightly longer than primary claw; equipped with five acicular setae, a peglike sensillum, and a stubby, trifid sensillum at its apex. Chelicerae independently movable, with retractile stylets much shorter than inflated basal segments. Idiosoma arched dorsally, its posterior end with a shallow sulcus which delimits a "caudal protuberance," on the inferior surface of which is located a pair of ano-genital valves. Dorsum almost wholly shielded with three sculptured plates: one covering propodosoma, one covering hysterosoma to lateral margins of venter, and one caudal plate covering posteriormost protuberance and part of ventral opisthosoma. Humeral (scapular) plate large, triangular, displaced ventrally with apex intruding between coxae II and III. All of these plates tessellated or uniformly dimpled. Two or four sternal plates; the two between opposite

coxal groups on propodosoma may unite in midventral line to form a single "prosternum"; the two on metaposososoma may be separate or joined into a "metasternum." Sternal and genital plates delicate, not usually sculptured. Eyes: apparently one on each side with a clearly discernible refractile body. Twenty-six dorsal setae, including two ventrally displaced humerals and four on caudal plate. Ventral setae simple, four to six pairs, not including three pairs on anal portion of ano-genital valves. Anal and genital apertures not separated externally. Setae and special sensilla of appendages closely follow pattern described for Stigmaeidae (Grandjean, 1944) with but minor variations between species. Empodia I to IV each with three pairs divergent, capitate tenent hairlets.

Ledermuelleria segnis (Koch)
(Figs. 1-4)

Caligonus segnis Koch, 1836, Deutschlands Crustaceen, Myriapoden und Arachniden, Fasc. 5, No. 10.

Raphignathus ruber Koch, 1842, Uebersicht des Arachnidensystems 3(3):56, Pl. V, Fig. 38.

Raphignathus piger (Schrank). Berlese, 1885, Acari, Myriapoda et Scorpiones hucusque in Italia Reperta. Ordo Prostigmata, Fasc. XXII, No. 1, Pl. 84.

Ledermülleria segnis (Koch). Oudemans, 1923, Ent. Ber. 6(130):150.

The mite described by Koch (1836) as *Caligonus segnis* is a distinctive species, such that his figure of this species permits recognition beyond reasonable doubt. Also described and illustrated in the same monograph were *Caligonus piger* and *C. ruber*. The nomenclature of these three species became confused in Koch's synoptic work of 1842. This time he illustrated *C. segnis* but applied to it the name *Raphignathus ruber* (Fig. 28). In like manner, another mite which he first named *C. ruber* is again illustrated but under the name of *C. piger*. At a later date, Berlese (1885) redescribed the animal here considered to be conspecific with *C. segnis*, but he called it *Raphignathus piger* (Schrank). Sample specimens of this mite from California were sent to Dr. G. Lombardini, Florence, Italy, who found them to be identical with specimens identified by Berlese as *R. piger* (Schr).

The synonymy of the three species as given by Oudemans (1923) does not clarify the nomenclature. According to Oudeman's belief, *Caligonus ruber* Koch belongs in the genus *Nicoletiella* (= *N. cornuta* Can. et Fanz.). Another complication appears in *Podaia*. *Acarus ruber* Schrank, 1776 (= *A. rubens* Schr., 1781) was made the type of *Podaia* by Oudemans (1923). Oudemans also believed that *A. rubens* Schr. = *Caligonus piger* Koch. Although *Podaia* is a genus of doubtful status at the present time, it is clear that Schrank's figure of *Acarus ruber* (1776) does not depict a species which should be included in *Ledermuelleria*.

Female.—Sculpturing of dorsal plates appears as numerous, deeply indented pits, oval to circular in outline, closely and evenly spaced, of uniform size; each approximately 11 μ in diameter. Lining of each pit coarsely granular. Dorsal setae bowed or curved, sickle-like, with alveoli on elevated tubercles; all denticu-

late, with serrations bilateral; axes tapering to finely pointed tips. Tubercles of first dorso-medians (verticales) located forward, in an inferior position on part of propodosoma overhanging cheliceral bases. Setae of dorso-median rows as long or longer than distance between alveolus of any one and that next behind; second dorso-median setae (adjacent to eyes) slightly longer (ca. 75 μ) than others on propodosoma but not longer than dorso-medians on hysterosoma; four shortest on caudal plate. Two sternal plates of propodosoma continous across mid-ventral line to constitute a prosternum. Sternal plates of metapodosoma incompletely fused in mid-ventral line. Genital plate not distinctly separated from caudal plate surrounding ano-genital area. Genital plate expanded to cover a broad area of opisthosoma close behind sternal plates of metapodosoma, bearing but one pair of widely spaced genital setae. Genu I bears three setae of common type plus a minute spiniform sensillum (épine κ of Grandjean); corresponding sensillum absent on genu II; each genu III and IV has but one seta of common type. Measurements (10 ♀ ♀): idiosoma, 300 μ long, 250 μ wide; leg I, 170 μ from base of trochanter to tips of claws.

Male.—Not observed.

Collection Data.—Green Valley, Solano County, Calif., Dec. 1, 1948 (H. E. Cott and S. F. Bailey), *ex* manzanita leaf mold. Mount Diablo, Contra Costa County, Calif., Dec. 30, 1948 (H. E. Cott and S. F. Bailey), *ex* manzanita leaf mold. Smithfield Canyon, Utah, Mar. 16, 1949 (G. F. Knowlton and Shi-Chun Ma), *ex* maple leaves. Cobb Mountain, Lake County, Calif., May 5, 1950 (W. J. Wall and S. F. Bailey), *ex* oak and pine leaf mold. Torrey Pines Park, San Diego County, Calif., Dec. 28, 1950 (R. M. Bohart), *ex* pine leaf mold. Auburn, Calif., Mar. 11, 1951 (E. I. Schlinger), *ex* pine leaf mold. Quincy, Calif., Forest Range and Experiment Station, Apri. 1, 1951 (F. M. Summers), *ex* manzanita leaf mold. Altadena, Calif., Dec. 24, 1951 (E. I. Schlinger), *ex* leaf mold, *Quercus agrifolia*. Mount Pinos, East Ventura County, Calif., May 2, 1952 (S. F. Bailey), *ex* manzanita leaf mold. Said Valley, Lassen County, Calif., July 30, 1952 (W. C. Bentlinck), *ex* ground litter.

Ledermuelleria clavata (Can. e Fanz.)
(Figs. 5-6)

Caligonus clavatus Canestrini e Fanzago, 1876, Atti d. Soc. Veneto-Trentina di Sci. Nat. 5 (1): 135. *Id.*, 1877, Atti R. Inst. Veneto di Sci. Lett. ed Arti 4 (5): 154, Pl. 4.

Raphignathus clavatus, G. Canestrini, 1889, Ibid. 7 (ser. 6): 508, Pl. 11, Figs. 41, 43. A. Berlese, 1885, Acari, Myr. et Scorp. Ital., Fasc. XXII, No. 2, Pl. 86, Figs. 1-8.

[?] *Raphignathus sphagneti* Hull, 1918, Trans. Nat. Hist. Soc. Northumberland, Durham, Newcastle-upon-Tyne 5:30, Pl. 3, Figs. 70-72. NEW SYNONYMY.

Ledermülleria clavatus, Oudemans, 1923, Ent. Ber. 6 (130): 151.

Female.—Dorsal plates sculptured with pits or dimples so closely set that their elevated margins are polygonal in outline, producing a netlike appearance. Lining of pits membranous, appearing as a circular depression in center of each polygon.

Dorsal setae stubby, bayonet-like, evenly tapered from base to greatest thickness near tips; bluntly pointed; axial core differentiated from hyaline sheath, the latter showing few incipient denticulations. Setae of dorso-median rows much shorter than distance between alveolus of any one and that next behind, their alveoli not on conspicuous tubercles. First dorso-median pair (verticales) on upper surface; second dorso-median pair (nearest to eyes) longer (60 μ) than others on propodosoma; shortest of dorsal setae about two-thirds the length of the longest ones. Plates on venter of idiosoma, integumental covering of gnathosoma and basal segments of legs faintly show sculpturing as on dorsum. Two sternal plates of propodosoma and two of metapodosoma not united with each other across mid-ventral line. Genital plate discrete, narrow, its anterior margin semi-circular; with three pairs subequal setae bordering genital area. Caudal protuberance pendant beneath opisthosoma, its hindermost margin not visible from above. Each genu I and II has three setae of common type plus a minute spiniform sensillum; each genu III and IV has but one seta of common type. Measurements (3♀♀): Idiosoma, 430 μ long, 340 μ wide; leg I, 210 μ from base of trochanter to tips of claws.

Male.—Not observed.

Collection Data.—Millie Spring, Allen Canyon, Utah, July, 1950 (G. F. Knowlton and S. L. Wood), *ex* moss. Garden City, Utah, Mar. 16, 1950 (G. F. Knowlton and Shi-Chun Ma), *ex* poplar humus.

Ledermuelleria pectinata (Ewing)

(Figs. 7-8)

Raphygnathus pectinatus Ewing, 1917, Bull. Amer. Mus. Nat. Hist. 37:151, Pl. I, Fig. 23.

Ledermülleria pectinatus, Oudemans, 1923, Ent. Ber. 6 (130):152.

Eustigmaeus granulosus Willmann, 1951, Sitzungsb. der Osterr. Akad. Wissensch., Mathem.-naturw. Kl., Abt. I, 160 (1-2): 137, Fig. 20. NEW SYNONYMY.

Female.—Dorsal plates sculptured as in *L. segnis*, with pits oval to circular in outline, evenly spaced, of uniform size, each 7 to 9 μ in diameter. Lining of each pit coarsely granular. Dorsal setae short (to 27 μ long), straight or slightly curved, club-shaped, with numerous whorls of coarse spinules. Alveoli set in small tubercles. Sternal plates comprise an integral prosternum and an integral metasternum; prosternum covers sternal area to base of gnathosoma. Genital plate well-separated from caudal plate widest at its anterior third, narrowed behind to width of ano-genital valves; with three pairs genital setae as illustrated. Caudal protuberance sub-terminal, tip visible from above. Each genu I and II has three setae of common type plus a minute, spiniform sensillum; each genu III and IV has but one seta of common type. Measurements (4♀♀): Idiosoma, 310 μ long, 230 μ wide; leg I, 160 μ from base of trochanter to tips of claws.

Male.—Not observed.

Collection Data.—East Layton, Utah, Oct. 19, 1949 (G. F. Knowlton and Shi-Chun Ma), *ex* oak leaves. Mount St. Helena, Napa County, California, May 10, 1951 (S. F. Bailey), *ex* manzanita leaf mold.

The species here identified as *L. pectinata* (Ewing) is identical with the type specimen in the U.S. National Museum. However, it appears

that it may be one of G. Canestrini's (1889) species, possibly that which he named *Raphignathus anauniensis*. The suspected synonymy cannot be further clarified at the present time.

Ledermuelleria lacuna, n. sp.

(Figs. 9-10)

Female.—Dorsum of propodosoma with three plates: an extensive median plate having three pairs of setae and two small lateral plates, one on each side, each with one seta. Lateral plates of propodosoma overlie the ventrally displaced humeral plates. Dorsal plates sculptured with very shallow dimples best observed in profile at curved margins but not readily apparent in face view on middle of dorsum. Dorsal setae acicular, faintly denticulate; second dorso-median pair (near eyes) longest of body setae (48 μ), approximately twice as long as shortest pair next nearest to eyes. Venter mostly unarmored, integument striated. Two sternal plates on propodosoma and two on metapodosoma occur as narrow flanges adjoining opposed coxal groups, hindermost pair with net-like sculpturing (probably noticed only because iodine in mounting medium stained these plates of type specimen in an unusual manner). Genital plate small, narrow, front margin truncate, with three pairs of genital setae. Caudal protuberance sub-terminal, posterior tip visible from above. Genu I bears three setae of common type plus a minute spiniform sensillum; genu II similarly equipped; no setae present on genua III and IV. Measurements (type ♀): idiosoma, 280 μ long, 260 μ wide; leg I, 180 μ from base of trochanter to tips of claws.

Male.—Not observed.

Holotype.—Female, Bassetts, Sierra County, California, Aug. 21, 1952 (S. F. Bailey), *ex* sweepings from Lilliacese and willow. Type specimen deposited in the U. S. National Museum, No. 2226.

The distinctive characters of this species are: (1) simple architecture of the dorsal setae, (2) presence of two small lateral plates, one on each side of the large median propodosomal plate, (3) feeble dimpling on the median regions of the dorsal skeleton, and (4) absence of setae on genua III and IV. The description is based on a single adult specimen which is slightly folded on the left side. The characters ascribed to the species are also evident on two deutonymphs obtained from the same sample.

LEDERMUELLERIOPSIS Willmann

Ledermülleriopsis Willmann, 1953, Sitzungsb. der Osterr. Akad. Wissensch., Mathem.-naturw. Kl., Abt. I, 162(6):487.

This genus was created by Willmann (1951) to accommodate two new Austrian species, *L. triscutata* and *L. plumosa*. The genus and first named species, *L. triscutata*, were not formally described until 1953. *L. triscutata* was designated as genotype in the later publication (Willmann, 1953).

The diagnostic feature of *Ledermuelleriopsis* is the presence of a

dorsal suture across the mid-section of the hysterosoma. The two hysterosomal plates separated by this suture are about equal in size, and each bears three pairs of setae.

Ledermuelleriopsis plumosa Willmann
(Figs. 11-15)

Ledermülleriopsis plumosus Willmann, 1951, Stitzungsb. der Osterr. Akad. Wissensch., Mathem.-naturw. Kl., Abt. I, 160 (1-2):140, Fig. 24.

Female.—Dorsal plates with shallow, rounded dimples or pits closely resembling those described for *Ledermuelleria pectinata.* Dorsal setae very short (12-25 μ), 24 of which are clavate, with numerous whorls of coarse spinules; 2 scapular setae acicular, firmly plumose, length equal to longest of other dorsal setae. Sternal plates comprise an integral prosternum and an integral metasternum; prosternum occupies venter to base of gnathosoma. Genital plate covers opisthosoma almost to metasternal plate, widest in front, with 3 pairs of genital setae. Caudal protuberance terminal, well-exposed to view from above. Each genu I and II has 3 setae of common type plus a minute spiniform sensillum; each genu III and IV has but one seta of common type. Measurements (9 ♀♀): Idiosoma, 270 μ long, 190 μ wide; leg I, 150 μ from base of trochanter to tips of claws.

Male.—Closely resembles female in size and proportions of ganthosoma and legs; idiosoma slightly smaller in size, more tapered from shoulders to caudal protuberance. Dorsal setae finely plumose, slender, not noticeably clavate; three posterior pairs longer (27 μ) than other dorsals. Genital and caudal plates evidently not separate—this composite plate covers caudal protuberance and entire venter of opisthosoma to margin of metasternum. Two pairs of genital setae, posterior pair approximately twice as long as anterior pair. Anus terminal, overlying genital aperture immediately beneath. Three pairs anal setae closely clustered on anal valves; two most dorsal pairs diminutive, spurlike, both pairs situated on one pair of "paranal" papillae; third pair longer, acicular, located below and external to bases of papillae. Intromittent organ observed only in retracted condition, within body; it comprises a slender, sinuous, slightly tapered tubular or grooved sclerite, with proximal end between bases of coxae IV; distal tip associated with or ensheathed by an expanded, barblike plate as illustrated (Fig. 12). Posterodorsal wall of genital atrium provided with paired sclerites in juxtaposition, each of which has an upwardly directed, toothlike apodeme. Chaetotaxy and sensilla of legs I-IV essentially as in opposite sex, except that each tarsus bears an additional specialized sensillum; this "male tarsal organ" ("grand solénidion mâle," Grandjean, 1944) is conspicuously long, inflated, cross-striated, arising above near proximal end of each tarsus. Male tarsal organ longest on tarsus I (38 μ), slightly shorter but similar on successive tarsi. Measurements (2 ♂♂): idiosoma, 240 μ long, 150 μ wide; leg I, 140 μ from base of trochanter to tips of claws.

Collection Data.—Nine females, two males, Alturas, Modoc County, California, Oct. 11, 1952 (E. I. Schlinger), *ex* juniper leaf mold. Insofar as this is the first description of the male, one of the male specimens has been deposited in the collection of the U. S. National Museum.

New Generic Synonymy in the Caligonellidae

Dr. Carl Willman, Bremen, Germany, was kind enough to call to the author's belated attention a description of *Neognathus* Willmann, 1952, which antedates an identical genus, *Stigmagnathus*, proposed by Summers and Schlinger (1955). The latter is therefore a synonym of *Neognathus*, and the status of the several species is as follows:

Genus **NEOGNATHUS** Willmann

Neognathus Willmann, 1952. Verofftl. Inst. Meeresforsch. Bremerhaven 1:162-63, Pl. 28, Fig. 19.

Stigmagnathus Summers and Schlinger, 1955, Hilgardia 23(12): 546. New Synonymy.

Species.—*N. insolitus* Willm. 1952, type species by original designation.
N. spectabilis (Summ. and Schl.), 1955. New Combination.
N. terrestris (Summ. and Schl.), 1955. New Combination.

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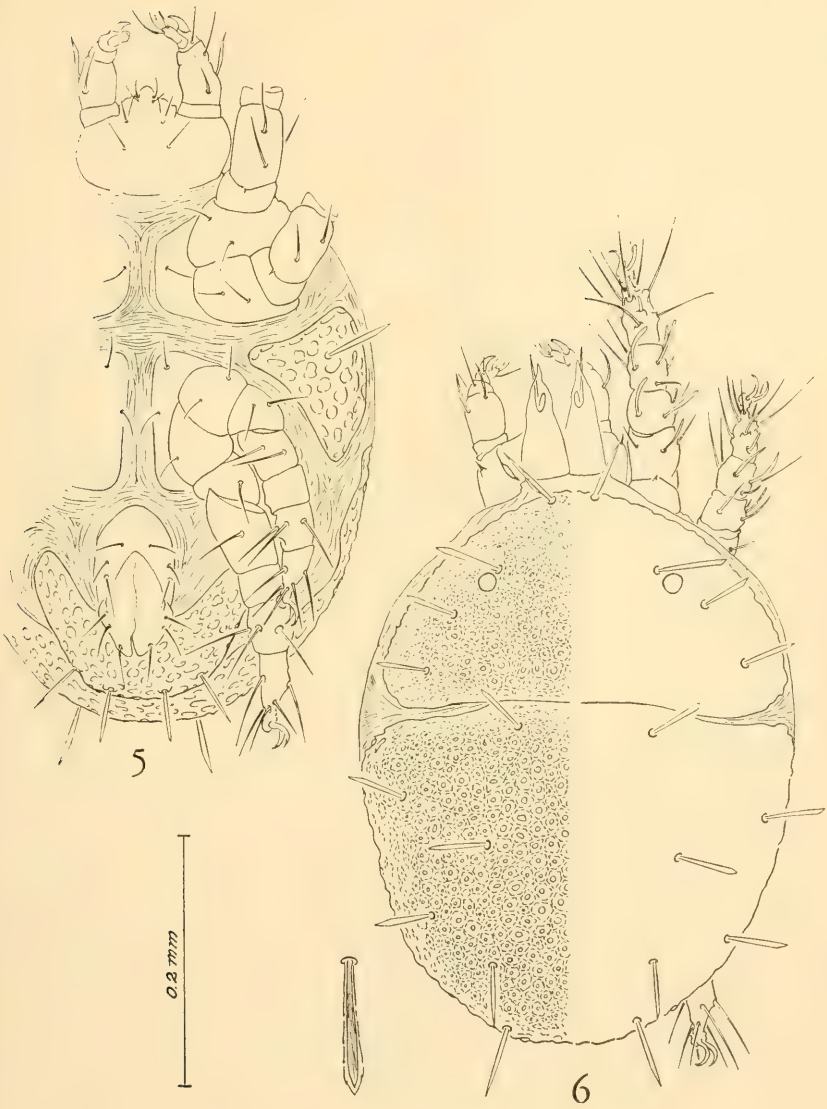
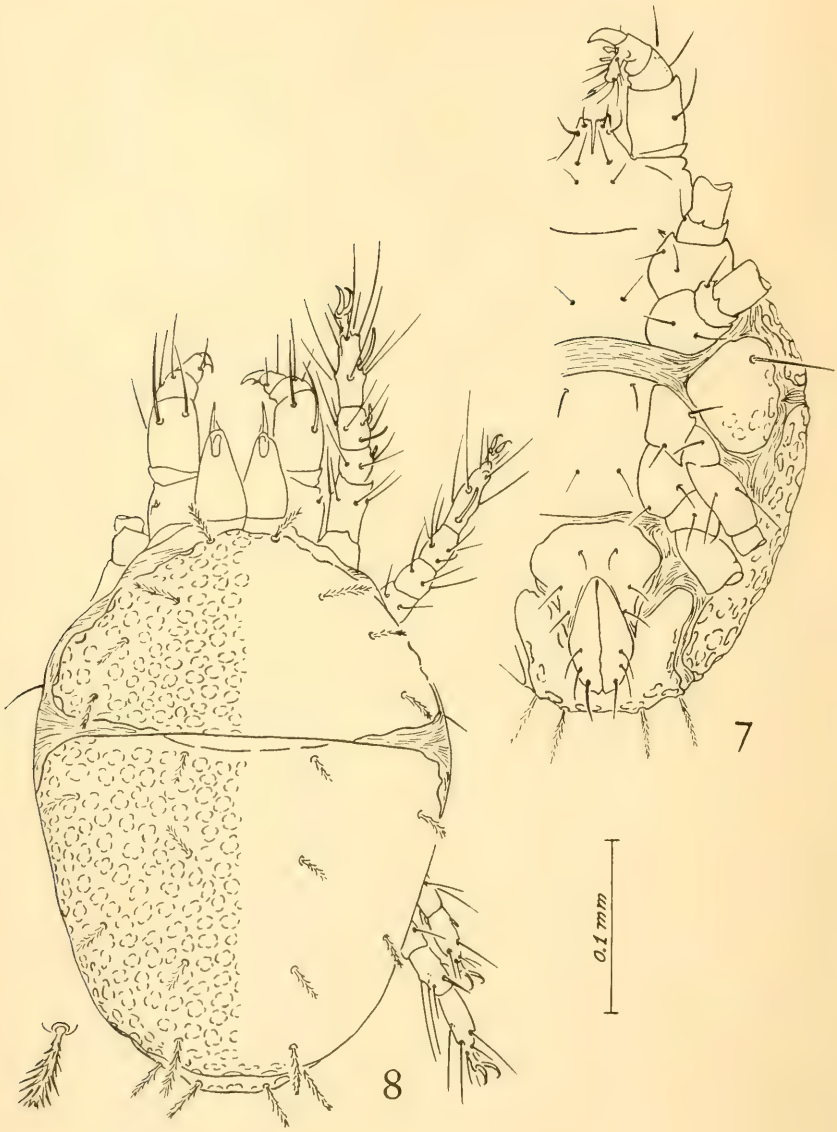
Ledermuelleria segnis. Fig. 1, Ventral aspect of female; fig. 2, right palpus; fig. 3, dorsal surface; fig. 4, first leg of right side. (Millimeter scale applicable only to the two large figures.)

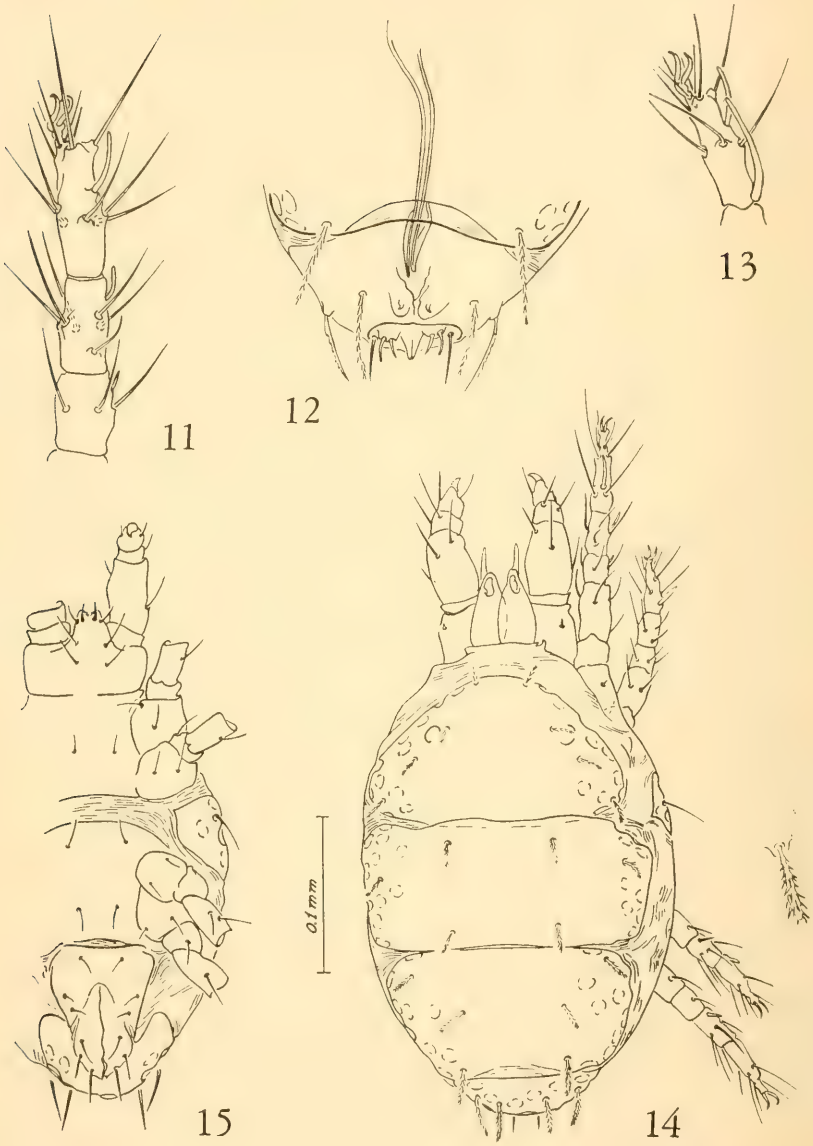


Ledermuelleria clavata. Fig. 5, Venter; fig. 6, dorsum of female.



Ledermuelleria pectinata. Fig. 7, Venter; fig. 8, dorsum of female.

Ledermuelleria lacuna n. sp. Fig. 9, Venter; fig. 10, dorsum of female.



Ledermuelleriopsis plumosa. Fig. 11, Right leg I of female; fig. 12, opisthosoma of male drawn from above; fig. 13, right tarsus I of male; fig. 14, dorsum of female; fig. 15, venter of female.

OBSERVATIONS ON THE BREEDING HABITATS OF SOME HELEIDAE OF THE BERMUDA ISLANDS (DIPTERA)[1]

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As indicated by Wirth and Williams (1956) only two species of Heleidae had been reported previously from the Bermuda Islands. These were *Pterobosca fusicornis* (Coquillett), called *Ceratopogon fur* by Johnson (1913), and an unknown species he designated as *Ceratopogon* sp.

During June and July 1955, light-trap and recovery-cage studies were conducted in each of the several parishes (*see* Williams 1956 for map giving exact location of each study area) and breeding habitats were observed.

Four recovery cages, modified from that described by Dove *et al.* (1932) in that they had a solid wooden top instead of a muslin top covered by hardware cloth, trapped the majority of positively phototropic insects that emerged from the 4-square-foot area of soil covered by each cage. Two cages were placed in each of 15 trapping areas for a period of 1 week and then moved to the next trapping locale. Most of the cages were placed at the edge of ponds and the margins of marsh drainage ditches. If possible the 2 cages were placed in a single trapping area in different types of habitats with different flora. The jars from the recovery cages and light trap were examined daily for heleids.

A Beckman pH meter was used for determining the pH of soil samples from each area studied (the figures in Table I represent an average of three readings from each area) and a set of hydrometers calibrated for determining the salt content of water at 15.4°C. was used for ascertaining the salinity of the water from each habitat. These water samples were cooled to about 12°C. in a large cold-storage room, brought outdoors, and as they warmed up to 15.4° the readings were taken. Soil temperatures were determined at each area studied.

In some areas the use of a solid top on the recovery cages increased the temperature of the soil covered by a cage as much as 8°C. over

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[1]Contribution No. 227 of the Bermuda Biological Station. This study was supported by a National Science Foundation grant-in-aid and a Childs Frick Fellowship granted by the Bermuda Biological Station for investigations on the *Culicoides* of the Bermudas.

[2]I wish to express my sincere thanks to Dr. Wm. Sutcliffe, Jr., director of the Biological Station for his kind assistance; to members of the Bermuda Agriculture Experiment Station—Gordon R. Groves, director; Idwal Wyn Hughs, assistant director; J. Hubert Jones, assistant horticulturist; and C. A. Baker, horticulturist—for their helpful assistance in transporting equipment and identifying plants; and to Dr. W. W. Wirth, entomologist, Entomology Research Division, U. S. Department of Agriculture, Washington, D. C., for his identification of previously described species of heleids and for ascertaining that other species were new to science.

TABLE I. Ecological observations on heleid breeding habitats — Bermuda Islands, June-July, 1955.

Location	Date (1955)	pH	Salt (parts per 1,000)	Temperature ° C. Water	Temperature ° C. Soil	Vegetation	Species recovered
Lover's Lake	6/4-10	7.0	33.5	27.5	28	*Sesuvium portulacastrum* Seaside Purslane *Salicornia perennis* Woody glasswort	*Dasyhelea atlantis* Wirth & Williams
Wilkinson's Pond	6/7-14	6.45	36.5	27	28.2	*Borrichia frutescens* Salt marsh ox-eye *Salicornia perennis* Woody glasswort	*Dasyhelea atlantis*
Trott's Pond	6/10-17	6.6	31.5	26.3	24.3	*Rhizophora mángle* Mangrove	*Culicoides bermudensis* Williams *Dasyhelea atlantis* *D. luteogrisea* Wirth & Williams
Spittal Pond	6/14-21	7.4	26.5	28	25.3	*Rhynchospora* sp. Beaked rush	*Dasyhelea atlantis* (approx. 100) *D. luteogrisea*—(8)
		7.6		1		*Sporobolus virginicus* Seashore rush grass	*Dasyhelea atlantis*—(24) *D. lueogrisea* (approx. 100)
Pampas Farm (South Shore Marsh)	6/21-27	7.68	15.0	1	25.5	*Eleocharis interstincta* Knotted spike rush *Mariscus jamaicensis* Prickly sedge	*Dasyhelea bermudae* Wirth & Williams
		7.0	15.0	1	25.0	*Scirpus validus* Matrush *Lippia nodiflora* Cape weed *Sporobolus virginicus*	*Bezzia atlantica* Wirth & Williams *Culicoides bermudensis* *C. crepusclaris* Malloch *Dasyhelea bermudae* *Forcipomyia ingrami* Carter

TABLE I.—Continued.

Devonshire Marsh Drainage Ditch	6/21-27	6.97	1.2	1	24	*Commelina longicaulis* Chicken grass *Lippia nodiflora*	*Culicoides crepuscularis* *Forcipomyia ingrami*
		7.01	1.2	1	24	*Eichornia crassipes* Water hyacinth *Paspalum distichum* Joint grass	*Bezzia atlantica* *Culicoides bermudensis* *C. crepuscularis* *Dasyhelea bermudae* *Forcipomyia ingrami*
Paget Marsh Drainage Ditch	6/27-7/4	6.4	3.9	1	28	*Eleocharis capitata* Capitate spike rush *Polypogon littoralis* Perennial beard grass *Sesuvium portulacastrum*	*Culicoides bermudensis* *C. crepuscularis* *Dasyhelea bermudae* *D. cincta* (*Coquillet*) *D. luteogrisea* *Forcipomyia ingrami*
Pembroke Marsh Drainage Ditch or Marsh Folly	6/27-7/4	6.60	1.5	26	25.5	*Sporobolus virginicus*	*Culicoides crepuscularis* *Forcipomyia ingrami*
Warwick Pond	7/4-11	6.47	25.0	34	31	*Sporobolus virginicus* *Eleocharis praticola* Meadow spike rush	*Culicoides bermudensis* *Dasyhelea atlantis* *D. bermudae* *D. luteogrisea* *Forcipomyia variipennis* Wirth & Williams
Warwick Marsh Drainage Ditch	7/4-11	6.88	2.4	37	31	None—sandy soil	*Dasyhelea bermudae* *D. cincta* *D. grisea* (*Coquillet*) *D. luteogrisea* *Forcipomyia variipennis*
		6.46	2.4	35	31	*Typha* sp. *Lippia nodiflora*	*Culicoides crepuscularis* *Dasyhelea cincta* *D. bermudae* *D. grisea* *D. luteogrisea* *Forcipomyia ingrami*

TABLE I.—Continued.

Seymor Pond	7/11-18	7.01			24	*Tamarix gallica* Tamarisk	*Culicoides crepuscularis* *Dasyhelea atlantis* *D. bermudae*
		7.50	13	27	27	*Sporobolus virginicus*	*Culicoides crepuscularis*
Evans Pond	7/11-18	6.49	36.4	[1]	26	None-muck soil	*Dasyhelea luteogrisea*
		6.73	36.4	[1]	24.5	*Sesuvium portulacastrum*	*Dasyhelea atlantis*
Southampton Marsh Drainage Ditch	7/18-25	6.32	4.8	32	28	*Typha* sp.	*Culicoides bermudensis* *C. crepuscularis* *Dasyhelea bermudae* *D. luteogrisea*
In Marsh Proper		6.34	4.8	30	28	*Sporobolus virginicus*	*Culicoides crepuscularis* *Dasyhelea cincta* *D. bermudae* *Forcipomyia ingrami*
Pilchard Bay (Direct ocean tides covered trapping area twice a day)	7/18-25	6.46	36.2	28.2	28	*Nerium oleánder* Oleander *Rhizophora mángle*	*Culicoides crepuscularis* *Dasyhelea atlantis*
		6.73	36.2	28.4	28	*Sesuvium portulacastrum*	*Culicoides crepuscularis* *Dasyhelea atlantis*
Mid-Ocean Golf Club Ponds	7/25-31						
Large Pond		6.70	10.7	28	26	*Typha* sp. *Sporobolus virginicus*	*Culicoides crepuscularis* *Dasyhelea atlantis* *D. luteogrisea*
		7.0	10.7	28	26	*Sporobolus virginicus*	*Dasyhelea atlantis* *D. luteogrisea*
Small Pond		6.75	10.9	27	25.5	*Sporobolus virginicus*	*Dasyhelea luteogrisea*

[1] Recovery cages were placed in moist soil and not in standing or tide waters.

TABLE 2.—EXTREMES IN SOME ECOLOGICAL CONDITIONS IN BREEDING HABITATS OF CERTAIN HELEIDAE OF THE BERMUDAS.

Species	Number of areas (out of 15) in which collected	Range in pH	Range in salinity (parts per 1,000)	Comments on vegetation
Culicoides bermudensis	6	7.0–7.01	1.2–15	Considerable variation in species of plants.
Bezzia atlantica	2	6.32–7.01	1.2–31.5	Do.
C. crepuscularis	9	6.32–7.50	1.2–36.2	Areas of dense vegetation to shaded areas with no small vegetative growth.
Dasyhelea atlantis	9	6.45–7.60	10.7–36.5	Do.
D. bermudae	7	6.34–7.68	1.2–25	In sandy soil with no vegetation, to soil with various types of vegetation.
D. cincta	3	6.34–6.88	2.4–4.8	Do.
D. grisea	1	6.46–6.88	2.4	In sandy soil with no vegetation to muck soil with cat-tails and cape weed.
D. luteogrisea	8	6.32–7.60	2.4–31.5	In sandy soil with no vegetation to muck soil with various types of vegetation.
Forcipomyia ingrami	6	6.34–7.0	1.2–15	In soil with various types of vegetation.
F. variipennis	2	6.47–6.88	2.4–25	Sandy soil with no vegetation to loam soil with various types of vegetation.

that of exposed soil next to the cage, with the result that emergence may have been considerably stimulated.

The results of these studies are given in Tables 1 and 2.

Three species, *Culicoides floridensis* Beck, *Dasyhelea scissurae* Macfie, and *Forcipomyia raleighi* Macfie were taken in the light trap but never in the recovery cages, and *Pterobosca fusicornia* (Coq.), which had been collected by Johnson in 1913, was not collected at all.

In the United States *Culicoides crepuscularis*, a pest of man in some parts of the country, is associated with fresh water, but in the Bermuda Islands it displayed a great tolerance for salt, being found in areas ranging from 1.2 to 36.2 parts of salt per thousand.

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PREPUBLICATION NOTICE

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A COMPARATIVE STUDY OF THE METATHORACIC WING IN THE FAMILY LYGAEIDAE

(HEMIPTERA: HETEROPTERA)

JAMES A. SLATER AND HENRY W. HURLBUTT, *Department of Zoology and Entomology, University of Connecticut, Storrs*

The present study was undertaken in an attempt to ascertain whether or not the venation of the hind wing of members of the family Lygaeidae might possess characters important to a better understanding of the systematic relationships existing within this large and heterogeneous family.

Although the taxonomic importance of wing venation is well established in many orders of insects, the wings have been used only sparingly in the Heteroptera. Recent studies by Leston (1953a and b) in the Pentatomoidea and Usinger (1943) in the Reduvoidea have indicated that the wing has considerable taxonomic value in these groups. There has, to our knowledge, been no systematic attempt to utilize these structures within the family Lygaeidae.

We have not attempted to investigate the tracheation nor the homologies of the wing veins, and have adopted the terminology introduced by Leston (1953a), as modified from Tanaka (1926), as presenting an intelligible system that has the advantage of accounting for all the structural parts present in the lygaeid wing without doing violence to the origin of the various veins. Students more familiar with the system of Hoke (1926) may readily compare the two systems by utilizing the illustrations of the various species discussed in the following pages.

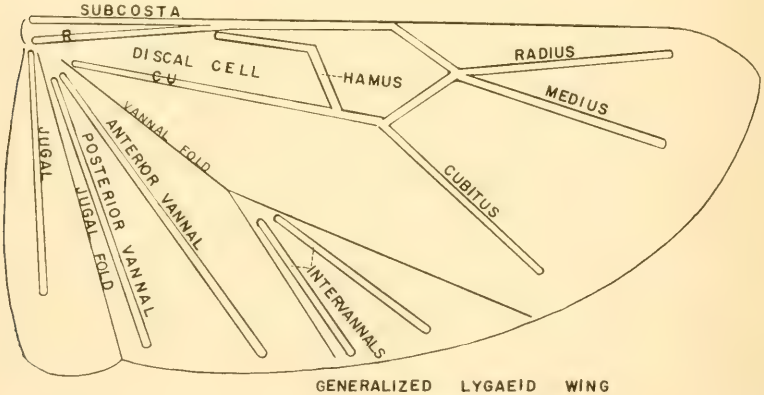
Technique: For purposes of the present study the majority of the wings were studied from dried specimens. A small number of species were studied from living specimens taken in the field. Wing mounts from dried or fresh material were obtained by the following technique. With a dissecting microscope and forceps the wings were removed and placed on a drop of water. Care was taken at this point to unfold the jugal lobe. The wing was then drawn onto the top of a drop of glycerine and a coverslip added for protection. To keep the coverslip from touching the glycerine a drop of fingernail polish was placed under each corner of the coverslip. Venation is most apparent if no glycerine is allowed to cover the upper surface of the wing. Additional glycerine may readily be placed under the wing if the original glycerine supply dries out. In some cases it was necessary to relax the insect in ethyl acetate for several hours before removal of the wing.

Where one is not greatly concerned with the nature of the jugal area, or where comparison only is desired, it is useful to work with dried specimens. With care one may readily remove the front wing and carefully pull the hind wing laterally until the venation is clearly exposed. This method has the advantage of allowing the investigator to check over many species in a relatively short period of time.

Generalized lygaeid wing: (Text figure)

It may safely be said that the lygaeid wing is never of a completely primitive nature within the suborder. However, it is in many species still rather generalized and close to a pentatomoid pattern. The only important specialization uniformly found in the Lygaeidae as contrasted with the Pentatomoidea is the loss of the antevannal vein. The presence of this vein is apparently characteristic of the latter group.

The generalized lygaeid wing may be summarized as follows: 1, Subcosta present and separated from radius in basal wing area; 2, hamus well developed as a complete vein in the discal cell, the anterior portion bent strongly toward the wing base; 3, radius and media fused only at a single point distad of the discal cell; 4, vannal fold bifid for nearly its entire length; 5, antevannal vein absent; 6, intervannals present, short, and not fused at base; 7, vannals separate for nearly entire length (Tanaka notes a single trachea, thus the primitive condition may have been a single vein); 8, jugal vein single and extending throughout most of jugal lobe.



GENERALIZED LYGAEID WING
DIAGRAMMATIC

The principal modifications from this generalized scheme are the loss of the hamus, subcosta, and intervannals, fusion of the vannal folds, basal fusion of the vannals, reduction or loss of the second vannal and the jugal, and fusion of radius and media for some distance beyond the discal cell.

Of these modifications two appear to be very important at higher group levels within the family. These are the loss of the hamus and the intervannals. Frequently the reduction of these veins is correlated, although in the Lygaeini (fig. 7) the hamus is well developed while the intervannals are entirely lacking. The presence basally of the subcosta and the reduction of the posterior vannal also are useful modifications at subfamily and tribal levels.

Other modifications must be interpreted with much caution as they generally are the result of vein fusion and appear to have arisen independently in very different groups. This may be illustrated in the case of the radius and the media, which often are fused for some distance beyond the discal cell in some genera of such diverse groups as Cleradini, Blissinae, Cyminae, and Pachygronthinae.

Subfamily **LYGAEINAE**

The most generalized wing condition within the subfamily is found in the genera *Nysius*, *Ortholomus*, and *Rhypodes*, where both hamus and intervannals are present and the intervannals may be either fused basally or separate (figs. 6 and 8). This very generalized condition indicates that this group of genera is near the primitive lygaeid line.

Such orsilline genera as *Belonochilus* and *Orsillus* show a more specialized condition in that the intervannals are absent. It seems probable, upon the basis of this as well as other features, that two well defined groups are present in what we now call the Orsillini.

The Lygaeini resemble the *Orsillus-Belonochilus* group by virtue of the loss of the intervannals. However, this tribe possesses a short distinct basal subcostal vein. This feature is unique within the family (fig. 7).

Species examined: LYGAEINI.—*Lygaeus kalmii* Stal, *Melanocoryphus bicrucis* (Say), *Graptostethus servus* (F.), *G. argentatus* (F.), *Caenocoris neri* Germar, *Oncopeltus fasciatus* (Dallas). ORSILLINI.—*Nysius ericae* (Schill.), *N. californicus* Stal, *Ortholomus scolopax* (Say), *Belonochilus numenius* (Say), *Orsillus reyi* Puton, *Rhypodes clavicornis* (F.).

Subfamily **CYMINAE**

It is evident that the present division of this subfamily into two tribes, the Ischnorhynchini and the Cymini, is untenable. As Mr. H. G. Barber will treat the systematic groupings in this subfamily in a forthcoming publication, we will confine ourselves to the observation that the Ischnorhynchini wing is very generalized, whereas in the Cymini and in *Ninus* and its allies the hind wing shows the most specialized condition in the entire family.

In the Ischnorhynchini[1] all species examined have a completely developed hamus and intervannals. *Polychisme* (fig. 1) is perhaps the most generalized by virtue of separate intervannals. In *Kleidocerys* (fig. 3) and *Rhiobia* the intervannals are fused basally and these two genera also have in common a distinctive bend midway along the distal portion of radius. A stridulatory structure is present in some members of this group.

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[1]The correct usage here is as above, for although the genus *Ischnorhynchus* Fieb. is a junior synonym of *Kleidocerys* Stephens, type genera in synonymy are valid as the stem for family group names under action of the International Commission at the 1953 Copenhagen meetings.

In the Cymini and the "ninines" the hind wings show a very much reduced venation (fig. 4). The hamus and the intervannals are completely lost. Radius and medius are usually fused together for a distance beyond the discal cell. The second vannal is always at least partially reduced.

The Australian genus *Ontiscus* (fig. 2) is less reduced in that a hamus remnant is present on the posterior portion of the discal cell.

Species examined: ISCHNORHYNCHINE.—*Kleidocerys resedae* (Panz.), *K. franciscanus* (Stål), *Polychisme hyalinatus* (Spinola), *Rhiobia chinai* (Esaki), *Ninus insignis* Stål, *Cymoninus flavipes* (Mats.), new genus near *Cymoninus*.

CYMINI.—*Cymus discors* Horvath, *C. angustatus* Stål, *Arphnus coracipennis* Stål, *Ontiscus australicus* Stål.

Subfamily **BLISSINAE**

The wing venation of members of this subfamily is highly specialized. The intervannals are absent, the hamus is either completely absent (fig. 15) or represented by a vestige on the posterior margin of the discal cell (fig. 16). Radius and media are sometimes fused for a distance beyond the discal cell. The jugal and posterior vannals are reduced. The radius reaches the anterior wing margin in *Blissus* as in many myodochines and in the Pamphantinae.

The relationships of the subfamily are obscure and other evidence than the wings is needed to clarify its systematic and phylogenetic position within the family.

Species examined: *Ischnodemus falicus* (Say), *I. sabuleti* (Fall.), *Blissus leucopterus* (Say), *Dimorphopterus spinolae* Sign.

Subfamily **OXYCARENINAE**

This subfamily is unique in the Lygaeidae in that the species studied have intervannals present but lack a hamus. Radius and media are fused for some distance beyond the discal cell. The intervannals are separate in *Crophius* (fig. 13), basally fused in *Oxycarenus*. The second vannal and the jugal are somewhat reduced.

It seems likely that the subfamily represents a side branch in its development and not an intermediate stage in a main line of descent. However, it is certainly speculative whether the oxycarenines have arisen from an Artheneinae-like stock or from the Orsillines.

Species examined: *Crophius scabrosus* (Uhler), *Oxycarenus* sp. (S. Africa).

Subfamily **GEOCORINAE**

The condition of the hind wings in members of this subfamily is most interesting. The wing venation (fig. 10) shows considerable specialization by reason of the loss of intervannals and the loss or reduction of the hamus. However, it is evident that the condition

is less specialized than in such a group as the Cymini for the hamus stub is retained in many species of *Geocoris* (i.e. *pallens* and *bullatus*), *Hypogeocoris*, and *Ninyas*. It is, however, absent in *Geocoris uliginosus* Say and *G. flaviceps* Burm. Furthermore, although the intervannals are absent the vannal folds are in most cases separate for most of their length.

The genus *Germalus* has a completely developed hamus and basally fused intervannals. It seems doubtful whether this genus represents a true geocorine (note also the fully developed claval commissure), and the relationship appears to be largely with the henestarine stem.

Species examined: *Geocoris pallens* Stål, *G. bullatus* (Say), *G. uliginosus* (Say), *G. flaviceps* Burm., *Hypogeocoris piceus* (Say), *Ninyas deficiens* (Leth.), *Germalus samoanus* China.

Subfamily **HETEROGASTRINAE**

This well defined subfamily possesses a unique feature in that the hamus, as discussed above, has migrated distally so that it reaches the posterior portion of the discal cell distad of the point where cubitus diverges from the discal cell as a free vein. This condition frequently creates a triangular cell in the anterior portion of the wing formed by the hamus, media, radius, and the point of fusion of radius and media (figs. 12 and 14).

The intervannals are present and either separate (*Heterogaster*, *Dinomachus*, *Hyginus*) or basally fused (*Tamasanka*, *Platyplax*).

It is evident that in general the wing is generalized with an independent specialization of the hamus.

The genus *Artemidorus* (fig. 12) has in the past been the subject of much debate as to its systematic position. Distant, Bergroth, and Horvath all have discussed the relationships. The hind wing indicates that the continental workers are correct in considering the genus as a heterogastrine. The wing though specialized by the loss of the intervannals nevertheless possesses the hamus in the same characteristic position as do the other members of the subfamily.

Species examined: *Heterogaster urticae* (F.), *Dinomachus marshalli* Dist., *Tamasanka limbata* Dist., *Platyplax salviae* (Schill.), *Hyginus* sp. (S. Africa), *Artemidorus pressus* Dist.

Subfamily **PACHYGRONTHINAE**

The hind wing is generalized. Both hamus and intervannals are present and fully developed.

In all members of the tribe Pachygronthini investigated the intervannals are free throughout, whereas in all Teracrini (fig. 9) they are fused at the base. It appears that this distinction may well supplement other characters as a tribal character in the subfamily.

As noted above we consider this subfamily to represent the generalized condition from which the Heterogastrinae have evolved.

Species examined: PACHYGRONTHINI—*Oedancala dorsalis* (Say), *Pachygrontha bipunctata* Stål, *P. oedancalodes* Stål, *P. saileri* Slater; TERACRINI—*Teracrius namaquensis* Stål, *Phlegyas abbreviatus* (Uhl.),

Opistholeptus pallidus (Hesse), *Stenophyella macreta* Horv.

Subfamily **HENESTARINAE**

The hind wing of this subfamily is rather generalized (fig. 27). However, there are subtle evidences of reduction present in the reduced hamus and jugal and the basal fusion of the intervannals. It is apparent that this group and *Germalus* are closely allied; indeed the latter may well prove to be a henestarine. The highly specialized geocorines may have developed from a stock very similar to that represented by this small subfamily. Species examined: *Henestaris laticeps* (Curt.)

Subfamily **ARTHENINAE**

The wing is somewhat generalized in that hamus and intervannals are present. However, evidences of specialization are the partial reduction of the hamus, basal fusion of the intervannals, and reduction of the posterior vannal (fig. 26).

In some respects this subfamily appears to represent an intermediate stage between the generalized Ischnorhynchini and the highly modified Cymini. Here again supporting evidence is needed to ascertain whether this is more than a superficial resemblance.

Species examined: *Chilacis typhae* Perr., *Artheneis foveolata* Spin.

Subfamily **CHAULIOPINAE**

The systematic position of this peculiar subfamily is not substantially clarified by the condition of the hind wings. A degree of specialization is evidenced by the loss of the intervannals and the fusion of the vannal fold (fig. 24). The hamus is present although apparently not completely developed.

There is some habitus resemblance between this group and the Malcinae, and the venation of the latter could well represent a specialization from that of the Chauliopinae. Again supporting evidence is needed. There is no evidence to support a Heterogastrine relationship as intimated by some authors. Indeed the characteristic nature of the hamus in that subfamily would seem to rule out the inclusion of this group as even representing a closely related group.

Species examined: *Chauliops fallax* Scott.

Subfamily **MALCINAE**

The hind wing is highly specialized with loss of hamus and intervannals, fusion of the vannal fold, and reduction of the vannal veins (fig. 5).

The venation is almost exactly as in the Cymini and represents with this latter group the most strongly reduced situation found in the entire family. Whether these taxa are closely related or we are dealing with parallelism must await additional evidence. Our feeling is that probably parallel development has occurred.

Species examined: *Malcus flavidipes* Stål.

Subfamily **PAMPHANTINAE**

The affinities of this peculiar subfamily are obscure. The venation is specialized (fig. 23) with loss of hamus and intervannals and partial fusion of the vannal folds. Radius curves forward to reach the leading edge of the wing in the distal area as in many myodochines. It may well be that these ant-mimics represent extremely specialized myodochine forms whose subfamily identity is masked by the fusion of the basal abdominal sternites. The nature of the wing in *Blissus* is also much as in this subfamily.

The relationship of the Pamphantinae to the Mediterranean subfamily Bledionotinae should be investigated. Unfortunately representatives of the latter subfamily have not been made available for study.

Species examined: *Pamphantus elegantulus* Stål.

Subfamily **MEGALONOTINAE**

The hind wing has proven somewhat disappointing as a diagnostic character for subgroups within this large and varied subfamily. There is little to observe in the hind wings that will separate the genera into the traditional tribal units. This is chiefly due to the generalized wing venation found in most species. It seems obvious for many reasons that this subfamily has diverged from the remaining lygaeid subfamilies at an early period and that such specializations as do occur in the hind wings are independent variations of the main megalonotine line.

Tribe—MYODOCHINI:

In many genera of this tribe radius beyond the discal cell curves forward to reach the leading edge of the wing (fig. 18). This occurs so frequently as to be a useful although not infallible diagnostic feature. Radius reaches the anterior wing margin in the following genera: *Myodocha*, *Heraeus*, *Pachybrachius*, *Ligyrocoris*, *Paromius*, *Zeridoneus* and *Prosomaeus*. In *Exptochiomera*, *Ptochiomera*, *Kolenetrus*, and *Cnemodus*, radius curves strongly forward but does not reach the wing margin.

Many myodochines also have a rather characteristic vannal condition where the two vannals are completely fused on the basal half and then curve strongly apart to assume a rather "wishbone" like appearance (fig. 18). This condition, however, is also found in some other genera within the subfamily.

In *Prosomaeus* the intervannals are absent; otherwise they are present and usually separated.

Species examined: *Myodocha serripes* (Oliv.), *Heraeus plebejus* Stål, *Pachybrachius basalis* (Dallas), *Ligyrocoris diffusus* Uhler, *Exptochiomera* sp., *Paromius longulus* (Dallas), *Ptochiomera nodosa* Say, *Kolenetrus plenus* (Dist.), *Cnemodus mavortius* (Say), *Zeridoneus costalis* (V.D.), *Prosomaeus brunneus* Scott.

Tribe MEGALONOTINI:

The venation is usually of a generalized nature (fig. 17). However, in *Megalonotus* (fig. 21) the radius is vestigial beyond the discal cell. *Ozophora* (fig. 25) is highly specialized in lacking both hamus and intervannals. This is the greatest degree of vein reduction found in the entire subfamily.

Species examined: *Peritrechus fraternus* Uhl., *Megalonotus chiragrus* var. *californicus* (V.D.), *Ozophora picturata* Uhl., *Lamprodema maurum* (F.), *Neocattarus* sp.

Tribe BEOSINI:

Wing venation of generalized nature. In *Sphragisticus* the intervannals are separate; in *Rhyparochromus* (fig. 28) and *Dieuches* (fig. 20) they are fused basally.

Species examined: *Sphragisticus nebulosus* (Fall.), *Rhyparochromus umbrosus* (Dist.), *Dieuches* near *placidus* (Stal).

Tribe LETHAEINI:

The wing venation as in most other Megalonotinae is generalized in nature. The intervannals are fused in *Eremocoris* (fig. 22) and *Paragonatus*, and separate throughout in the other genera studied. In *Scolopostethus* the intervannals appear rather obsolete.

In *Eremocoris* there are peculiar veinlike stubs present on cubitus and media midway along their length in the distal portion of the wing. The vein stub of cubitus may conceivably represent the remnant of the antevannal vein so characteristic of the Pentatomoidea.

Species examined: *Cryphula parallelogramma* Stål, *Drymus unus* (Say), *Eremocoris ferus* (Say), *Lethaeus cribratissimus* Dohrn, *Paragonatus divergens* (Dist.), *Scolopostethus thomsoni* Reut., *Gastrodes grossipes* (D.G.) *Rhaptus quadricollis* (Spin.).

Tribe GONIANOTINI:

The species investigated in this tribe, *Emblethis vicarius* Horvath, shows a completely generalized wing pattern throughout (fig. 19).

Tribe CLERADINI:

The venation of this tribe (fig. 11) is rather specialized in lacking intervannals, having the vannal folds fused for a considerable distance and in having radius and media fused for a short distance beyond the discal cell. From this as well as other features it is evident that the tribe is a rather specialized unit within the subfamily. Species examined: *Clerada apicicornis* Sign.

Phylogenetic Considerations.—The generalized lygaeid wing, as discussed above, is retained in several tribes and subfamilies. We find a typical condition in many Megalonotinae, Ischnorhynchini, Orsillini, and Pachygronthinae. The first modification to appear is the basal fusion of the inter-intervannals, both free and basally fused intervannals being found in all of the above groups and sometimes within the same genus (i.e. *Nysius*).

The next important modification after intervannal fusion is loss of the intervannals. This is frequently concurrent with reduction and subsequent loss of the hamus. However in the Lygaeini, Chauliopinae, Cleradini, and *Prosomaeus* of the Myodochini, the intervannals are absent whereas the hamus is completely developed. The Lygaeini are also unique in retaining the basal portion of the subcosta. In the Oxycareninae exactly the reverse situation is found, for here the intervannals are present whereas the hamus is lost. In all other cases, however, where the intervannals are absent the hamus is also either absent, or reduced to a short stub on the posterior portion of the discal cell.

In the otherwise generalized Heterogastrinae the hamus has migrated toward the apex of the wing so that its posterior connection with the discal cell lies distad of the separation of cubitus from the discal cell (figs. 12 and 14).

The most specialized condition of the wings within the family is found in the Cymini (together with the genera related to *Ninus*) and the Malcinae. Here both intervannals and hamus are lost and the posterior vannal and jugal veins are reduced or absent.

Our conclusions are that lines of descent within the family cannot be determined by the venation of the hind wings alone. However, the following discussion is an attempt to indicate probable trends and we hope it will be further elaborated in the near future by a study to integrate the information from various sources into a reconstruction of the phylogeny of the family.

Using primarily the wing veins, but supplementing at times with additional characters, we present the following situation.

Five main lines of descent which we will call the Pachygronthine line, the Orsilline line, the Geocorine line, the Ischnorhynchine line, and the Megalonotine line.

Pachygronthine line.—The situation here is quite simple. We have first the completely generalized tribe Pachygronthini. The Teracrini are obviously closely related, the only basic difference being the basal fusion of the intervannals. From the generalized form the Heterogastrinae arise through *Heterogaster*, *Dinomachus*, and *Hyginus* to the slightly more specialized condition of *Tamasanka* and *Platyplax*. The most highly specialized condition of this line is in *Artemidorus* with the absence of intervannals and the distal shift of the hamus beyond the cubital origin on the discal cell.

Orsilline line.—Generalized venation in this line is shown by such genera as *Nysius, Ortholomus,* and *Rhpodes.* From this condition develop the more specialized orsillines where the intervannals are absent (i.e. *Belonochilus, Orsillus*). The Lygaeini by virtue of retention of the subcosta and loss of the intervannals present an anomalous condition. It is difficult to interpret this condition until more study has been made of the relationships of the tribal units within the subfamily.

Geocorine line.—A completely generalized form has not been found for this group. However the genus *Germalus* is generalized in all but the basal fusion of the intervannals and may be considered as representative of the generalized type (this is not to state that *Germalus* itself is necessarily primitive). From this condition a slight advance is evident to the Henestarinae where the hamus is reduced; there is basal fusion of the intervannals and the vannal fold is fused for a considerable distance. It may well be that the Blissinae are an offshoot from a similar ancestor. The main line of descent however is to the Geocorinae through subsequent stages of reduction and ultimate loss of the hamus and the loss of the intervannals.

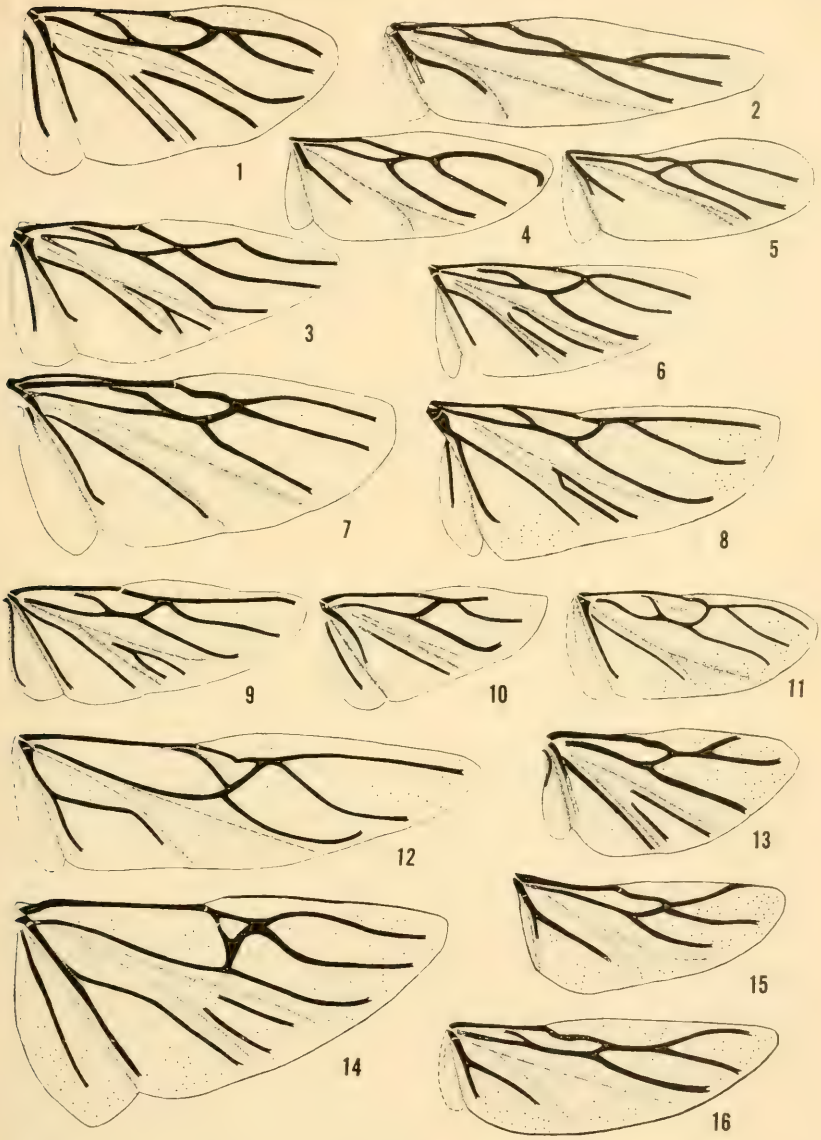
Ischnorhynchine line.—This complex presents an interesting and complex situation, with the genera *Kleidocerys, Rhiobia,* and *Polychisme* illustrating generalized conditions. It seems possible that by independent loss of the hamus the Oxycareninae have diverged from this line. The main trend within the group is often indicated by a tendency toward loss of the posterior vannal. We find in the Artheneinae a partial reduction of the hamus, basal fusion of the intervannals, and partial posterior vannal reduction. It seems feasible to consider this as the next evolutionary step from the generalized Ischnorhynchini. It is possible that the line now diverged into two groups, one to the Chauliopinae and to the Malcinae, the other through such cymine genera as *Ontiscus* to the highly specialized Cymini and the "ninine" genera.

Megalonotine line.—This line has obviously diverged from the remainder of the Lygaeidae at a very early stage in their evolution. In general the whole group is generalized. The myodochines seem to show a slight specialization by virtue of the strong anterior curvature of radius in the distal portion of the wing. The genus *Ozophora* is also highly specialized. It is possible that the specialized Pamphantinae may well have arisen from a myodochine ancestry.

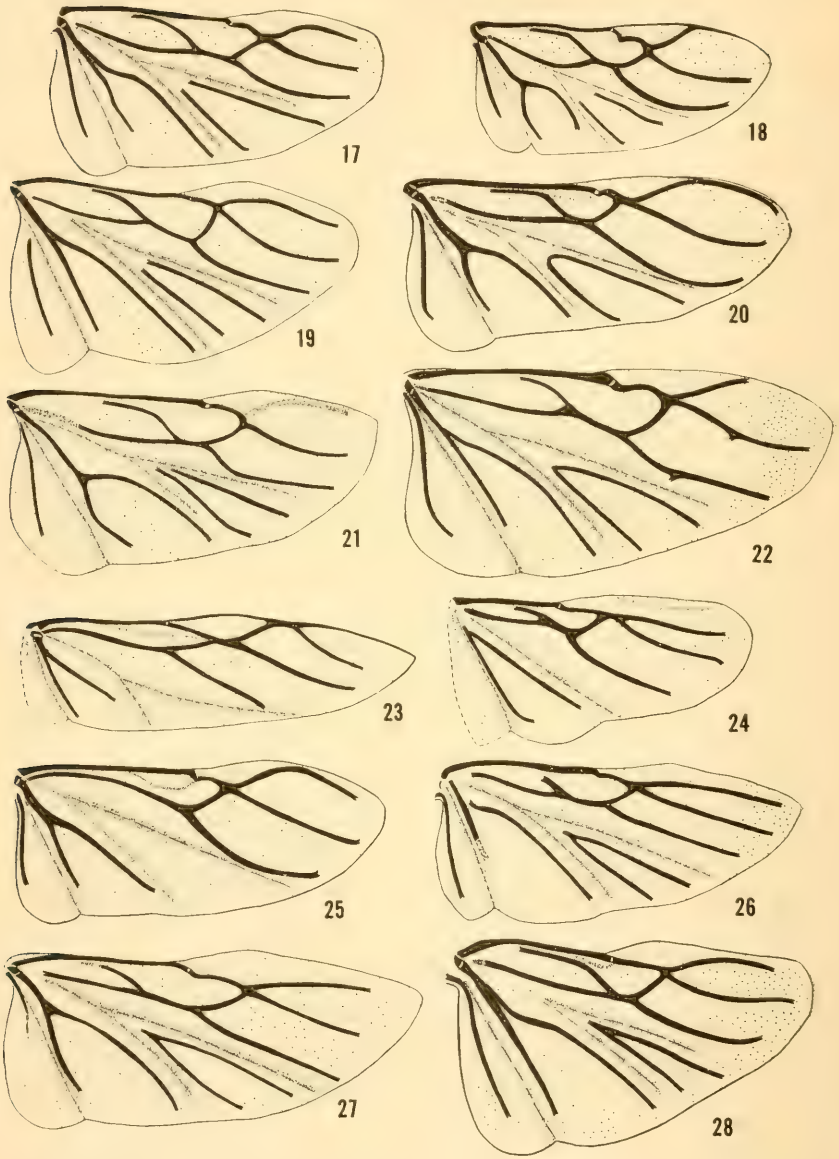
Obviously there are a number of highly speculative interpretations in the above discussion. We propose to analyse interrelations within the family more fully in a later paper.

ACKNOWLEDGEMENTS

We should like to extend our sincere thanks to Dr. Norman T. Davis and Mr. P. D. Ashlock, of the Department of Zoology and Entomology of the University of Connecticut, for aid given during the course of this study.



Metathoracic wings of Lygaeidae.—Fig. 1,—*Polychisme hyalinatus* (Spinola); fig. 2,*Ontiscus australicus* Stål; fig. 3, *Kleidocerys resedae* (Panz.) fig. 4, *Cymus discors* Horv.; fig. 5, *Malcus flavidipes* Stål.; fig. 6, *Nysius ericae* (Schill.); fig. 7, *Lygaeus kalmii* Stal; fig. 8, *Nysius californicus* Stal. fig. 9, *Teracrius namaquensis* Stål; fig. 10, *Geocoris uliginosus* (Say); fig. 11, *Clerada apicicornis* Sign.; fig. 12, *Artemidorus pressus* Dist.; fig. 13, *Crophius scabrosus* (Uhl.); fig. 14, *Heterogaster urticae* (F.); fig. 15, *Blissus leucopterus* (Say); fig. 16, *Ischnodemus falicus* (Say).



Metathoracic wings of Lygaeidae.—Fig. 17, *Peritrechus fraternus* Uhl.; fig. 18, *Pachybrachius basalis* (Dall.); fig. 19, *Emblethis vicarius* Horv.; fig. 20, *Dieuches* nr. *placidus* Stål.; fig. 21, *Megalonotus chiragraus var. californicus* (V.D.); fig. 22, *Eremocoris ferus* (Say); fig. 23, *Pamphantus elegantulus* Stål; fig. 24, *Chauliops fallax* Scott; fig. 25, *Ozophora picturata* Uhl.; fig. 26, *Chilacis typhae* Perr.; fig. 27, *Henestaris laticeps* (Curt.); fig. 28, *Rhyparochromus umbrosus* (Dist.).

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THE SPIDER, CONOPISTHA TRIGONA HENTZ, FAMILY THERIDIIDAE, AS A COMMENSAL OF ALLEPIERA LEMNISCATA WALCKENAER, FAMILY ARGIOPIDAE, IN PRINCE GEORGES COUNTY, MARYLAND

In the literature *Conopistha trigona* is recorded as a commensal spider. Muma (1945, Md. Agr. Expt. Sta. Bull. A-38) reported that this species is found most frequently in the webs of *Metepeira labyrinthea* Hentz. Comstock (1948, The Spider Book) stated that it lives as a commensal, feeding on the smaller insects caught in the web but neglected by its host.

During the course of regular observations on a basilica spider, *Allepiera lemniscata*, at Greenbelt, Md., from May to July 6, and from August 26 through October 1956, I observed *Conopistha trigona* as a frequent commensal of this basilica spider on June 20, 21, and 25; on August 30; and on September 23 and 25. On the last 5 days the commensal was in the dorsal or ventral labyrinth strands of the basilica spider's web. On four occasions, the host was present in the web with the commensal, and on two other occasions the commensal was in a deserted web of the basilica spider. On August 30 the commensal was feeding beside its own cocoon, which it had fastened to a strand of the dorsal labyrinth of the web of its host. The latter was present in its normal waiting position under the center of the snare.

On June 20 I recorded one specimen of *Conopistha trigona* under the center of the snare of a young basilica spider in the position normally occupied by the host. The basilica spider was above and near the perimeter of the snare on one of the strands of the dorsal labyrinth facing the intruding spider, which was the larger of the two.—DONALD LAMORE, *2C Gardenway, Greenbelt, Md.*

SYSTEMATICS OF THE SUBORDER TUBULIFERA (THYSANOPTERA) IN CALIFORNIA, by H. Edwin Cott, Univ. California Pub., Entomology, 13:1-216, plates 1-4. Univ. Calif. Press, Berkeley and Los Angeles, 1956. $3.50.

At long last here is an analysis of a portion of the thrips fauna of our continent. Not since Hinds reported on the then known thrips in 1902 has an American treatment of sizeable scope been published, Watson's annotated list (Synopsis) of 1924 notwithstanding.

Cott's work deals only with the suborder Tubulifera of California and is presented more as a local faunal survey than as a monograph. The knotty problem of supergeneric categories and generic limits are mentioned, but no over-all solution is attempted, principally because the study does not take into consideration many of the critical species and related genera that occur outside California.

In a fresh and candid style, Cott summarizes the morphological and biological features of the Tubulifera and points out how these characteristics may be used to best advantage. His classification is conservative in that it follows the system set up by Priesner in 1927. The genera and species are keyed with a modicum of the specialists' jargon. What appear to be complete citations are listed under each category. Type species of the genera are indicated with mention of the way they were designated and who was responsible for their designation. Remarks on the status of the genus and the problems in need of further attention are included after each generic definition. The species are described in detail. Although many characteristics of a "typical" specimen, arbitrarily selected by Cott, are fully measured down to the nearest micron, the range of variation exhibited by the species is not recorded, thereby minimizing the precise value of such measurements. Type localities, hosts so far as are known, specimens studied, and Californian and extralimital distributions are given and documented.

In all, this work covers 29 genera embracing 60 species of which 12 are described as new. The genus *Liothrips* is reported to contain the largest number of species (9) in California. Even though *Liothrips* and *Rhynchothrips* are bridged by intermediates, Cott tentatively separates the two taxa by the characteristic of the length of the head compared with the length of the pronotum. Similarly, *Haplothrips*, the next largest genus treated (7 species) grades into *Lepthothrips* in most respects in California, but by the feature of the presence or absence of a tooth on each tarsi, Cott is able to maintain these 2 genera as units in his State at least. *Acanthothrips* and *Hoplandrothrips* are regarded as subgenera of *Phlaeothrips*, and *Stephanothrips* and *Trachythrips* are placed in a separate family, the Urothripidae, following an old custom. The remaining genera treated contain 1 to several species each. Two species, *Stictothrips maculatus* and *Neurothrips magnafemoralis*, formerly supposed to be strictly eastern in distribution, are reported as members of the Californian fauna for the first time.

Although limited geographically, Cott's efforts clear a trail in the jungle of thrips taxonomy. His viewpoints and presentation will be appreciated by thysanopterists and by other interested entomologists. But most important, his work will serve as a sound guide to newcomers venturing into the study of one of the least known groups of insects, the Tubulifera.—LEWIS J. STANNARD, JR., *Illinois Natural History Survey, Urbana.*

A NEW RUGITERMES FROM BOLIVIA

(ISOPTERA, KALOTERMIDAE)

THOMAS E. SNYDER, *Washington, D. C.*

Twelve species of *Rugitermes* have been described, 11 from Middle and South America and 1 from the Marquesas, an aberrant species as to its wing venation. Many species are bicolored, the head being much darker than the pronotum. A new species found in the National Museum collection is described as follows:

Rugitermes laticollis, n. sp.

Winged female adult.—Head dark castaneous-brown, smooth, shining, longer than broad, sides rounded, with scattered long and short hairs. Post-clypeus white tinged with yellow. Labrum light yellow-brown, with long hairs. Eye black, not round, projecting, separated from lateral margin of head by a distance slightly greater than the long diameter of the eye. Ocellus hyaline, suboval, at oblique angle to eye from which it is separated by a distance less than the short diameter of the ocellus.

Antenna light yellow-brown, segments not all present, second segment slightly longer than third or fourth, which are subequal, with long hairs.

Pronotum same color as head, broader than long, shallowly concave anteriorly and posteriorly, sides rounded, with scattered long hairs.

Wings yellow-brown, coarsely punctate. In forewing, median vein soon (in first quarter) unites with radial sector; radial sector close to and parallel to with 5 branches to costal vein. Cubitus above middle of wing, parallel to radial sector, with 16 branches to apex of wing. In hind wing median vein absent, radial sector with 4 branches to costal vein. Cubitus above middle of wing, with 16 branches to apex.

Legs light yellow-brown, femora darker, with long hairs.

Abdomen with tergites dark castaneous-brown, with dense long and short hairs.

Measurements (in millimeters):

Length of entire winged female adult	10.50
Length of entire dealated female adult	5.50
Length of head (to tip of labrum)	1.80
Length of pronotum (to anterior corner)	1.20
Length of forewing	8.00
Length of hind tibia	1.10
Diameter of eye (long diameter)	0.35
Width of head (at eyes)	1.50
Width of pronotum	1.80
Width of forewing	2.20

Rugitermes laticollis is not bicolored; is smaller than *arthur-muelleri* (von Rosen) and *costaricensis* (Snyder); is darker colored than *unicolor* Snyder and *rugosus* (Hagen); the median vein unites with the radial sector sooner in *occidentalis* (Silvestri) and in *rugosus* (Hagen); the latter has a shorter wing.

Type locality.—La Paz, Bolivia. Described from 6 winged adults, 4 males and 2 females, collected at the type locality by R. Pérez Alcalá, 1947.

Types.—Holotype, winged female adult. U.S. National Museum. No. 63342; paratypes female and male winged adults deposited at same institution.

A BIBLIOGRAPHICAL NOTE ON CERATOPOGON YEZOENSIS MATSUMURA

(DIPTERA: HELEIDAE)

Different years of publication and different orthographies have been used by various authors to refer to *Ceratopogon yezoensis* Matsumura 1911. Edwards [1939, *In* Edwards, Oldroyd, and Smart, *British Blood-sucking Flies*, p. 143], Vargas [1949, *Rev. Soc. Mexicana Hist. Nat.* 19 (1/4) : 203, 208], and Arnaud [1956, *Microentomology* 21 (3) : 116, 149] have followed Tokunaga [1937, *Tenthredo* 1 (3) : 235] in accepting a 1915 paper by Matsumura as containing the original description. The correct reference to this species given by Takahashi [1941, *Insecta Matsumurana* 15 (3) : 84], attributing *yezoensis* [*yesoensis* of Edwards 1939, and Vargas 1949] to a publication by S. Matsumura (p. 60) entitled "Erster Beitrag zur Insekten-Fauna von Sachalin," published in 1911 in *The Journal of the College of Agriculture, Tohoku Imperial University, Sapporo, Japan* 4:1-145 Plates I and II was overlooked by certain of these authors. The original description is provided below because of its general non-availability.

"212. *Ceratopogon yezoensis* n. sp.

"Graulichbraun. Antennen und Palpen blassgelblich. Rückenschild grau, ohne längsstriemen, nahe Vorderrande jederseits mit einem Grübchen. Kopf schwarz, Rostrum bräunlich. Flügel subhyalin, weisslich getrübt, dritte Längsader durch eine Querader mit der ersten nicht verbunden, Unterrandzelle daher einfach, Randmal bräunlich, vor und hinter diesem je mit einem undeutlichen weisslichen Fleckchen, Unterrandzelle die Mitte des Flügels erreicht, dritter Längsnerv weit hinter der Flügelspitze mündend. Halters weisslich. Beine weisslichgelb, Schenkel an der Spitze etwas bräunlich. Abdomen bräunlich, unten etwas heller.

"Länge: 1 mm.

"Fundort: Korsakoff, gesammelt in 3 Examplaren von Herrn *Y. Ikuma* (in der Sammlung von Herrn *Y. Nawa*).

"S. F.: Hokkaido (häufig).

"T. N.: *Nukaka.*

"Der Färbung nach *C. bicolor* Pz. etwas ähnlich."—PAUL H. ARNAUD, JR., *Entomology Research Division*, U. S. Department of Agriculture.

A NEW SPECIES OF MITE, HIRSTIONYSSUS BISETOSUS, FROM THE NESTS OF THE DESERT WOOD RAT, NEOTOMA LEPIDA LEPIDA THOMAS[1]

(ACARINA: DERMANYSSIDAE),

DORALD M. ALLRED, *Ecological Research, University of Utah, Dugway.*[2]

During a seasonal study of the parasitic mites associated with the nests of the desert wood rat *Neotoma lepida lepida* Thomas in Utah, Allred and Roscoe (unpublished manuscript) found mites representing a new species to be very abundant in the nests. These mites are described in this paper. The dimensions given for the sternal plate of the female refer to the shortest distances between two margins. Length and width figures for other plates refer to the greatest distance, exclusive of the very narrow projections such as the intercoxal projections on the holoventral plate of the male. All measurements are given in microns.

Acknowledgment is given to Dr. R. W. Strandtmann, Texas Technological College, Lubbock, and Dr. E. W. Jameson, Jr., University of California, Davis, for checking some of the specimens.

HIRSTIONYSSUS BISETOSUS, new species

(FEMALE)

(Figs. 5-10)

Idiosoma.—494 long, 306 wide.

Gnathosoma.—Width near the base 93; length from tip of idiosoma to base of palpal trochanter 105. Hypostomal setae all nude; basal pair 24 long, middle internal pair 19 long, middle external pair 9 long, distal pair 9 long. Length of palps from base of trochanter to tip 91. Chelicerae chelate, both digits of about equal length and without teeth. Digitus fixus slightly curved, with striated flange-like tip; a microseta at base of striation. Digitus mobilis slightly sinuous with a blunt point.

Venter.—Base of tritosternum grooved ventrally; lacinae reaching to base of palpal trochanter. Presternal area reticulate. Sternal plate faintly reticulate, two and one-fourth times as wide as long at narrowest points (50 by 112); anterior edge slightly convex; concavity of posterior edge extending to a level about midway between the second and third sternal setae; anterior edge of plate more heavily sclerotized than central portion of plate; heavy sclerotization most evident between the first pair of sternal setae where it extends one-third the length of the plate; posterior edge of plate also more heavily sclerotized. Three pairs of sternal setae about equal in size, 38 long; distance between first pair of sternal setae equal to length of plate. Genitoventral plate broadly rounded posteriorly; with usual pair of setae opposite posterior edge coxae IV, and a pair of accessory setae near the tip of the plate; plate widest at point midway

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[1]This work was supported by U. S. Army Chemical Corps contract, No. DA-18-064-CML-2639, with the University of Utah.

[2]Now with Department of Zoology and Entomology, Brigham Young University, Provo, Utah.

between usual setae and accessory setae; usual genitoventral setae 31 long; accessory setae 28 long. Anal plate long oval, slightly less than twice as long as wide (100 by 57); reticulate near lateral margins; anus in anterior half of plate; paired anal setae 24 long, situated slightly behind middle of anus; postanal seta 26 long, situated behind the anus by a distance equal to the length of the anus. Anal plate separated from the genitoventral plate by a distance less than the length of the anus; cribum with 4 rows of teeth. Unsclerotized portion of venter with approximately 31 pairs subequal setae 24 to 28 long; those along posterior margin barbed. Stigma at level between coxae III and IV. Peritreme sinuous, extending to middle of coxa I. Legs I and II thicker than III and IV; leg I, 304 long; leg II, 247 long; leg III, 228 long; leg IV, 299 long. Coxa I with two regular setae. Coxa II with regular dorso-anterior spur and a small, sharply pointed accessory spur located below the distal edge of the segment and directed posteriorly. Coxa III with two small, sharply pointed accessory spurs situated near posterior edge of coxa, the internal spur situated directly internal to the marginal seta and directed posteriorly; the external spur situated on postero-distal edge of the coxa and directed at almost a right angle to the internal spur. Coxa IV without an accessory spur. Tarsus II without clawlike spurs.

Dorsum.—Dorsal plate reticulate, covering most of dorsum, extending almost to posterior tip of idiosoma; 480 long, 268 wide; widest part just posterior to coxae IV. Antero-lateral margins of plate sinuous; postero-lateral margins slightly convex. With 26 pairs nude setae; anterior pair setae smallest, 12 long; second pair setae largest, 36 long; other setae on anterior half of plate longer (24 to 31) than posterior setae (19 to 21). Unsclerotized portion of dorsum with approximately 22 pairs nude setae, 21 to 26 long.

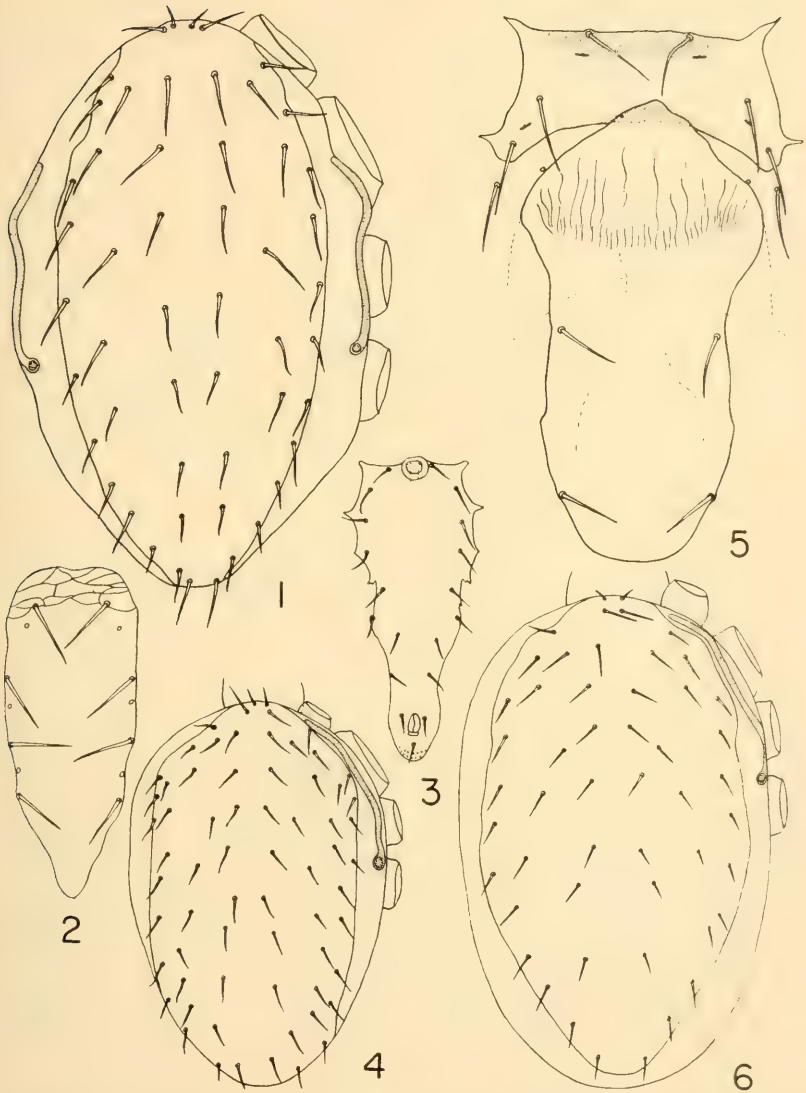
Male

(Figs. 3, 4, 11-13)

Idiosoma.—387 long, 255 wide.

Gnathosoma.—Width 76; length from tip of idiosoma to base of palpal trochanter 43. Hypostomal setae all nude; basal pair 19 long, internal middle pair 14 long, external middle pair 7 long, distal pair 9 long. Palps 76 long from base of trochanter. Chelicerae chelate, without teeth; digitus fixus fingerlike, straight, slightly shorter than digitus mobilis, which is thicker, curved toward the transparent tip.

Venter.—Base of tritosternum grooved ventrally; lacinae extending well past base of palpal trochanter. Presternal area reticulate. Holoventral plate faintly reticulate, widest anteriorly; 304 long, 117 wide; with usual 5 pairs setae plus anal setae and 3 pairs accessory setae; anterior 5 pairs setae 26 long; accessory setae 16 to 24 long; paired anal setae 19 long, situated opposite anterior half of anus; postanal setae equal in length to paired anal setae. Cribum with 2 rows teeth. Three pairs sternal pores present, indistinct. Unsclerotized portion venter with approximately 30 pairs subequal setae, 16 long; posterior marginal setae barbed. Stigma at level between coxae III and IV. Peritreme sinuous, extending to middle half or coxa I. Legs I and II thicker than III and IV; leg I, 261 long; leg II, 214 long; leg III, 199 long; leg IV, 261 long. Coxae I, II, and III as in female; coxa IV with accessory spur on distal margin near posterior edge. Tarsus II without clawlike spines.



Hirstionyssus bisetosus, n. sp. Fig. 1, Dorsal plate and peritremes of deutonymph; fig. 2, sternal plate of deutonymph; fig. 3, holoventral plate of male; fig. 4, dorsal plate and peritreme of male; fig. 5, sternal and genitoventral plates of female; fig. 6, dorsal plate and peritreme of female.

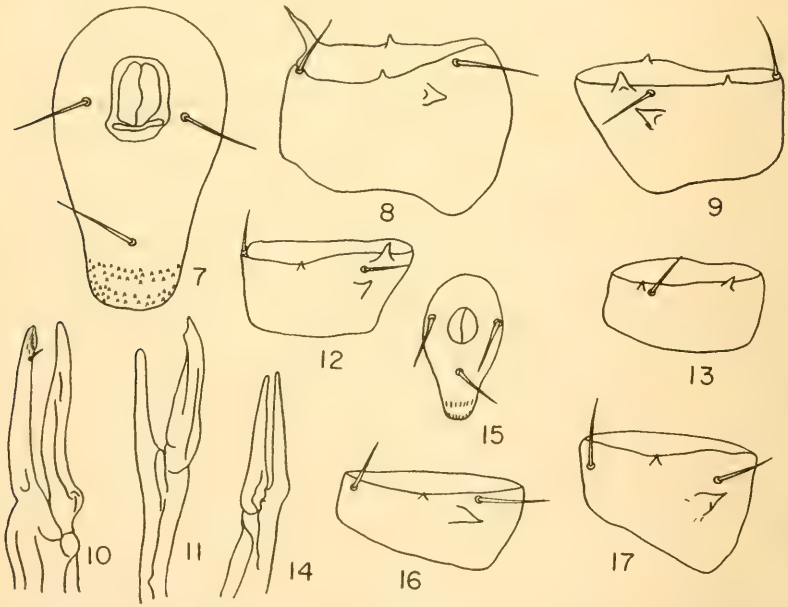
Dorsum.—Dorsal plate reticulate, covering all of dorsum except lateral margins; 378 long, 208 wide; lateral margins almost straight. With 33 pairs nude setae; anterior pair smallest, 9 long; second pair longest, 28 long; other setae on anterior half of plate longer (16 to 21) than posterior setae (14 to 16). Unsclerotized portion of dorsum with approximately 7 pairs nude setae, 16 to 19 long.

Deutonymph
(Figs. 1, 2, 14-17)

Idiosoma.—295 long, 185 wide.

Gnathosoma.—Width at middle 76; length from tip of idiosoma to base of palpal trochanter 24. Hypostomal setae all nude; basal pair 19 long, middle internal pair 12 long, middle external pair 7 long, distal pair 7 long. Palps 69 long from base of trochanter. Chelicerae chelate, both digits almost straight, fingerlike, about equal in length and lacking teeth.

Venter.—Base of tritosternum grooved ventrally; lacinae extending past base of palpal trochanter. Sternal plate extending from base of tritosternum to a point slightly posterior to coxae IV; anterior edge of plate distinctly reticulate, 165 long, 69 wide; widest part opposite coxae II; with 4 pairs setae; first and



Hirstionyssus bisetosus, n. sp. Fig. 7, Anal plate of female; fig. 8, left coxa II of female; fig. 9, right coxa III of female; fig. 10, right chela of female (ventral view); fig. 11, left chela of male (ventral view); fig. 12, left coxa III of male; fig. 13, left coxa IV of male; fig. 14, chela of deutonymph; fig. 15, anal plate of deutonymph; fig. 16, right coxa II of deutonymph; fig. 17, right coxa III of deutonymph.

second pairs 31 long; third pair 28 long; fourth pair 21 long. Three pairs sternal pores; first pair situated behind first sternal setae about 12 microns from lateral edge of plate, second pair on edge of plate directly posterior to second setae, third pair on edge of plate midway between third and fourth setae. Anal plate pyriform, with anterior edge rounded; 52 long, 28 wide; anal opening situated slightly anterior of middle of plate; paired anal setae 19 long, situated opposite middle of anus; postanal seta equal in size to paired anal setae. Unsclerotized portion of venter with approximately 38 pairs nude setae, 21 to 24 long. Stigma at level of coxae III and IV; Peritreme sinuous, extending to about middle of coxa II. Legs I and II slightly thicker than III and IV; leg I, 228 long; leg II, 190 long; leg III, 185 long, leg IV, 228 long. Coxa I with 2 regular setae. Coxa II with single accessory spur as in female. Coxa III with only the internal accessory spur present. Coxa IV without an accessory spur. Tarsus II without clawlike spines.

Dorsum.—Dorsal plate faintly reticulate, long oval in shape, covering all of dorsum except lateral margins; 283 long; 139 wide at level of coxae II and III. With 26 pairs nude setae; anterior pair setae smallest, 9 long; posterior pair longest, 33 long; setae on anterior part of plate longer (24 to 28) than setae on posterior part of plate (16 to 21). Unsclerotized portion of dorsum with approximately 15 pairs nude setae, 19 to 28 long.

Collection and Disposition

Holotype.—Female, in collection of the U. S. National Museum, No. 2227, collected from a nest of desert wood rat, *Neotoma lepida lepida* Thomas, 2 miles southeast of White Rock, south end of Cedar Mountains, Tooele County, Utah, July 22, 1954, by Dorald M. Allred and Stanley Mulaik.

Allotype.—Male, in collection of U.S. National Museum, collected from the same kind of nest and same locality as holotype, June 24, 1954, by Ernest J. Roscoe.

Paratypes.—30 females, 17 males, and 13 deutonymphs collected from same kind of nests in same locality as holotype and allotype, during various times from April to August and in November, 1954. An additional 912 females, 257 males, and 319 deutonymphs not designated as paratypes were collected in the same habitat as the types between April 1954 and April 1955. Deposited in the collections of Dorald M. Allred, R. W. Strandtmann, E. W. Jameson, Jr., Harvey B. Morlan, R. B. Eads, F. da Fonseca, University of Utah Entomological Museum, U. S. National Museum, British Museum of Natural History, and National Museum of Natural History of Paris.

Discussion

Fonseca (1948:263), among other characters, used the number of setae of the genital plate in females to separate the genera of Macronyssidae Oudemans, 1936 (synonym: Dermanyssidae Kolenati, 1859; Liponissidae Vitzthum, 1931). In his key (p. 273), he used the characters of one and three pairs of setae on the genital plate to sepa-

rate females of the genus *Hirstesia* from those of *Lepronyssoides*, and females of *Liponysealla* from those of five other genera, including *Hirstionyssus*. *Hirstionyssus* falls in the group possessing only one pair of genital setae. In his species diagnoses (p. 265-266), *Echinonyssus* was the only genus possessing two pairs of genital setae. In no case did the numbers of genital setae vary within the genus. With this as a basis, there seems to be sufficient justification to create a new genus for *Hirstionyssus bisetosus*. However, in *H. bisetosus* the other generic characters are so similar to other species of the genus *Hirstionyssus* that the author does not deem it wise to erect a new genus until the genera of this family can be more thoroughly studied. According to Jameson (correspondence), in many of the *Hirstionyssus* there is a second pair of setae just off the genitoventral plate. A slight expansion of the posterior part of this plate often results in these two setae being within its lateral margins. Strandtmann and Morlan (1953) state that this situation exists in *H. breviseta*. In *H. bisetosus*, the extra pair of setae apparently got too close and was completely enclosed by the plate.

The presence of the extra pair of setae on the genitoventral plate separates *bisetosus* from all other species of the genus *Hirstionyssus*. In many respects, *bisetosus* is similar to four other species (*obsoletus*, *isabellinus*, *breviseta*, and *neotomae*), but differs as follows: In Jameson's (1950:163) key to the females of North American *Neoichoronyssus* (synonym, *Hirstionyssus* Fonseca 1948), *bisetosus* runs to *obsoletus*, but differs from that species by having a smaller dorsal plate of different shape, spurs on coxae II and III that are pointed, a shorter sternal plate, and almost twice as many ventral setae. In the key by Strandtmann and Morlan (1953:630), *bisetosus* runs to *isabellinus* from which it differs by the absence of a thickened margin on the anal plate and posterior thickened margin of the genitoventral plate; the sternal plate of *bisetosus* is shorter than in *isabellinus*. However, in *bisetosus* the anterior and posterior margins of the sternal plate are thickened. This species resembles *breviseta*, but differs from it by having two spurs on coxa II, lacking a spur on coxa IV, having almost twice as many setae on the venter, and possessing a slightly shorter sternal plate. The new species, *bisetosus*, differs from *neotomae* by lacking a spur on coxa IV, having a slightly shorter sternal plate, and possessing more setae on the unsclerotized portions of the venter and dorsum.

Allred and Roscoe (unpublished manuscript) found *bisetosus* to be the second most abundant parasitic mite in the nests of the desert wood rat, in which nests it was found each month of the year (Fig. 18). The ratio of males to females over a period of a year was 1:3.4. Gravid females, each with one egg, were found in May, July, and August. There is little doubt that this species is a nest-dwelling form, getting onto a host only to feed.

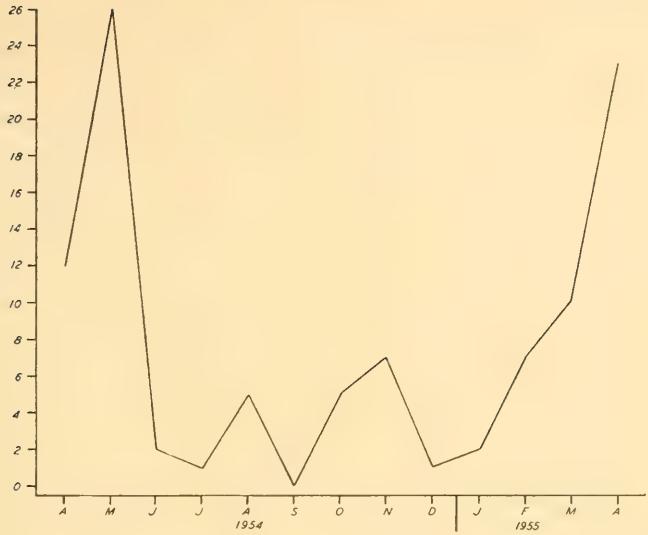


Fig. 18. Average numbers of *Hirstionyssus bisetosus* found in each of 160 nests of the desert wood rat, *Neotoma lepida lepida,* from April 15, 1954, to April 14, 1955.

References

Fonseca, F. da. 1948. A monograph of the genera and species of Macronyssidae Oudemans, 1936 (synon.; Liponissidae Vitzthum, 1931) (Acari). Proc. Zool. Soc. 118(2):249-334.

Jameson, E. W., Jr. 1950. Notes on mites of the genus *Neoichoronyssus,* with the description of a new subgenus and three new species of the subgenus *Hirstionyssus.* Proc. Ent. Soc. Wash. 52(4):161-172.

Strandtmann, R. W., and H. B. Morlan. 1953. A new species of *Hirstionyssus* and a key to the known species of the world. Texas Rpt. Biol. Med., 11(4):627-637.

Short scientific articles, not illustrated, two double-spaced typewritten pages or less in length, are welcome and will usually receive prompt publication. References to literature should be included in the text.

THE DATE OF PUBLICATION OF BEZZI'S STUDIES IN PHILIPPINE DIPTERA, II

Mario Bezzi's second "century" of Diptera collected by C. F. Baker in the Philippine Islands, generally cited as published in the Philippine Journal of Science, (D) 12 (3): 107-161, pl. 1 (May, 1917), seems to have actually been published on November 15, 1916, in another printing with different pagination. I possess a copy with the same text as the 1917 publication, with the following information on page 2: Department of the Interior, Bureau of Science, Manila. Publication No. 10. Actual date of publication November 15, 1916.

It is paged 1-59 plus Plate 1. The plate is headed "Bureau of Science Publication No. 10." The page numbers with the species numbers, etc., appearing thereupon are as follows:

P. 7: title, etc.; p. 8: nos. 101-104; p. 9: key to *Pselliophora,* no. 105; p. 10: nos. 106-107; p. 11: nos. 108-110; p. 12: no. 111, key to *Eriocera;* p. 13: nos. 112-114; p. 14: nos. 115-119; p. 15: no. 120, key to *Libnotes,* p. 16: nos. 121-124; p. 17: nos. 125-127; p. 18: gen. *Schizella* nov.; p. 19: no. 128; p. 20: nos. 129-130; p. 21: nos. 131-133; p. 22: no. 134; p. 23: nos. 135-137; p. 24: nos. 138-144; p. 26: nos. 145-147; p. 27: nos. 148-149; p. 28: nos. 150-157; p. 29: nos. 158-163; p. 30: nos. 164-168; p. 31: no. 169, gen. *Tylopterna* nov.; p. 32: no. 170; p. 33: nos. 171-173; p. 35: nos. 174-175; p. 36: nos. 176-177; p. 37: no. 178; p. 38: no. 179; p. 39: nos. 180-183; p. 41: key to *Pterogenia,* no. 184; p. 43: no. 185; p. 44: no. 186; p. 45: no. 187: p. 46: no. 188; p. 48: no. 189; p. 49: key to *Euprosopia,* no. 190; p. 51: no. 191; p. 52: no. 192; p. 53: no. 193; p. 54: nos. 194-195; p. 55: nos. 196-197; p. 57: no. 198; p. 59: nos. 199-200.—GEORGE C. STEYSKAL, *Grosse Ile, Michigan.*

SOCIETY MEETING

The 658th regular meeting of the Society was called to order by President R. A. St. George at 8 p.m., December 6, 1956, in room 43 of the U. S. National Museum. There were 32 members and 10 visitors present. The minutes of the preceding meeting were read, corrected, and approved.

The following new members were elected: **Robert L. Wallis,** Truck Crop and Garden Insects Section, Agricultural Research Center, Beltsville, Md.; **Donald H. Lamore,** 2C Gardenway, Greenbelt, Md.; and **Dr. Oswaldo Paulo Forattini,** Faculdade de Higiene e Saude Publica, Universidade de Sao Paulo, Avenida Dr. Arnadlo, 715, Sao Paulo, S. P., Brazil, Caixa Postal 8099.

President St. George gave the summary report on the state of the Society. He remarked that the Society has three honorary mmbers (see names on inside front cover—Ed.), and acknowledged the presence of Honorary President R. E. Snodgrass.

In the absence of other nominations, members on the slate presented by the nominating committee were elected officers for 1957 by acclamation. (Officers listed on inside front cover—Ed.) President St. George congratulated the new President, F. L. Campbell.

It was voted to replace Article II, Section 3 of Article III, and Article VI of the Constitution with the following:

ARTICLE II.

The objects of the Society shall be to promote the study of entomology in all its bearings; to publish a periodical to be known as the Proceedings of the Entomological Society of Washington, which shall contain the proceedings of the Society and such papers as are accepted for publication in it; to publish a series of Memoirs, and a miscellaneous series of handbooks or other special publications; and to cultivate mutually advantageous relations among those in any way interested in entomology. To further these objectives dues shall be collected from the members.

ARTICLE III, Section 3.

Each member shall be entitled to one copy of each issue of the "Proceedings" and shall be privileged to vote on all questions. Members shall be given preference over non-members in the publication of manuscripts.

ARTICLE VI.

The Society shall maintain a separate fund to be known as the Special Publication Fund. At the discretion of the Executive Committee, any unrestricted portion of the Special Publication Fund may be used for publishing memoirs, handbooks, or other special publications. In any one year, a sum not exceeding the previous five years' income from interest on the Special Publication Fund monies may be taken from this Fund and applied toward the publication of the Proceedings; such sum to be returned to the Special Publication Fund at the discretion of the Executive Committee. The Special Publication Fund will be derived from bequests and gifts, from the sale of complete sets of the Proceedings of the Entomological Society of Washington, from the sale of memoirs, handbooks, or other special publications, from the fees of life and sustaining members, and from the sum of fifty cents from the annual dues of each member.

F. L. Campbell reviewed the "Handbook of Biological Data," edited by William S. Spector, and exhibited both this and volume 1, "Acute Toxicities," of the 5-volume "Handbook of Toxicology," a companion book prepared by the same editor.

Max Day told about the ecology of the adult Bogong moth, *Agrotis infusa* (Boisduval), Phalaenidae (Noctuidae of authors), describing recent work by Mr. I. F. B. Common, of the Division of Entomology, Commonwealth Scientific & Industrial Research Organization, Canberra, Australia. The moths occur in large assemblages in granite caves at altitudes above about 4,500 feet in the Australian Alps, where the Australian Aborigines formerly feasted on them. The fat content of the moths averages more than 50 percent of their dry weight. They rest on the walls of the caves, about 1,500 per square foot.

Moths of the spring generation migrate to the mountains and in late summer they migrate back to the breeding grounds, which are pastures covering wide areas of New South Wales.

A small proportion of the aestivating moths become intensely active for about an hour after sunset and before sunrise, when they indulge in random flight over the mountain tops. During aestivation the moths neither feed nor mate, although they do ingest moisture from rain or dew.

The migration and aestivation enables part of the adult population to avoid

the breeding grounds during the summer when pastures are dominated by unpalatable perennial grasses. [Author's abstract.]

A note on "Subterranean Termites and Ships" was given by T. E. Snyder. In 1927 a coal barge was found to be infested by subterranean termites in the harbor at Honolulu, Hawaii. Much moisture was present and some dirt was lodged along the bottom. Probably the infestation by this introduced oriental termite, *Coptotermes formosanus* Shiraki, was by winged adults. Such a vessel would be a source of danger at ports of call.

This same destructive termite has established itself in the woodwork of steamships plying between Hawaii and California. So far Federal inspectors have intercepted and prevented its introduction to the mainland.

In July 1956 another destructive subterranean termite, *Coptotermes crassus* Snyder, was found damaging the woodwork of a large floating dry dock at Houston, Tex. This termite occurs in Spanish Honduras, Guatemala, and West Mexico (Lower California). It is larger than the native subterranean species of *Reticulitermes*, and the soldier has a short tube in the front of the more oval head from which a white liquid is ejected.

As soon as Dr. Snyder identified the termite, Federal inspectors surveyed along the waterfront to determine whether this tropical termite had become established in buildings on shore. (Winged adults from a large colony could fly from the dock and infest woodwork on shore.) Surveys made in August showed no infestation in waterfront structures. Evidently the dock became infested from ships from tropical ports. Owners of the dock have attempted to eradicate the termites.

In August 1956 another dry dock at New Orleans, La., was found to be infested by the native subterranean termite *Reticulitermes flavipes* (Kol.). [Author's abstract.]

President St. George recalled similar instances, one of an infestation of termites in a houseboat anchored above Key Bridge and another in the oak beams of a church steeple four stories above the ground.

Paul Arnaud exhibited a Japanese delicacy, a can of "child hornets"—the larvae, pupae, and occasional adults of *Vespula lewisi* Smith—which are served on rice, principally in central Japan. The can was a product of Nagano Prefecture.

A. B. Gurney discussed the growing trend, especially among entomologists working in applied fields, toward using the word "roach" instead of "cockroach." In the current Common Name List certain species are called cockroaches, others roaches, a somewhat distressing lack of uniformity. Dr. Gurney explained the origin of cockroach from the Spanish *cucaracha*, and cited support for the view that the abbreviated "roach" is etymologically incorrect and loose English. Furthermore, various species of fish, as well as one or more groups of fish, have the common name of roach. Some confusion has occurred in abstracting journals because of uncertainty whether "roach" referred to fish or to cockroaches. Nevertheless, the trend continues and it is desirable that entomologists understand the situation and act to promote uniformity and avoid confusion. [Author's abstract.]

Honorary President Snodgrass commented that he was in favor of doing away with the name "roaches" for insects, as, in behalf of his son-in-law Roach, he preferred that the name bring to mind the popular fish rather than the unpopular insect.

The principal paper of the evening was an illustrated lecture on the "Mating Behavior in Australian Dragonflies," by Mr. A. F. L. O'Farrell.

Field observations, mainly from the New England Tableland area of New South Wales, suggest that in several species of Australian Odonata the behavior and pattern of distribution of adult individuals of differing age and sex tends to be rather characteristic for a given species and habitat. The diverse phenomena observed seem to have a similar end-result, ensuring ready discovery of a mate and of a suitable oviposition site while retaining for the species the ability to colonize and exploit new habitats arising as the result of flooding, dam construction, stream diversion, and so forth.

Patterns vary from the apparently indiscriminate aggregations of individuals of all ages and both sexes, seen in the primitive damselfly *Synlestes weyersi weyersi* Selys, to the seemingly highly organized male territorial systems of the rather specialized dragonfly *Tramea loewii tillyardi* Lieftinck. An adequate study will be possible only when a satisfactory field marking technique is available for each species. Disturbance of the normal behavior pattern by any procedure involving capture and release is a major problem here. [Author's abstract.] Mr. O'Farrell's slides showed the variety of dragonfly habitats in Australia.

Visitors introduced were Dr. Nicholaus Obraztsov, of the American Museum of Natural History; Dr. Harvey I. Scudder, of the Public Health Service, and Dr. C. D. Michener, of the University of Kansas.

The meeting adjourned at 9:50 p.m.—KELLIE O'NEILL, Recording Secretary.

Date of publication, Vol. 59, No. 1, was March 15, 1957.

Vol. 59 Insects JUNE 1957 No. 3

PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY
of
WASHINGTON

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CONTENTS

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884

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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Members shall be persons over 18 years of age who have an interest in the science of entomology. Annual dues for members are $4.00; initiation fee is $1.00 (U. S. currency).

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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 59 JUNE 1957 NO. 3

A NEW SPECIES OF EPICAUTA FROM THE GULF COAST OF TEXAS

(COLEOPTERA, MELOIDAE)

FLOYD G. WERNER, *Department of Entomology,*[1] *University of Arizona, Tucson.*

The first specimen of the new species described here has been in the Cornell collection for some time and was examined during previous studies. However, it is a specimen lacking most of the segments of the antennae and is otherwise in poor condition. There was some doubt that the color was normal. Three additional specimens, from nearby localities, show that the Cornell specimen is normal in color and that it represents an undescribed species.

Epicauta ennsi sp. n.

Black, densely clothed with rufous pubescence, except for yellowish cinereous pubescence narrowly at the suture and on a median line on each elytron. General appearance similar to that of a well-marked specimen of *E. strigosa* (Gyll.), except for the very different color of the pubescence.

Holotype male: Length 9 mm. with head deflexed; maximum width of elytra 3.3 mm. Head subtriangular, widest just behind the eyes, 2.01 mm.; the width across the moderately protuberant eyes is the same. Length to base of clypeus 1.64 mm. Surface densely and finely punctured and densely decumbent-pubescent. The setae on the back of the head are longer, more erect, and paler than the rest. Median impressed line fine and indistinct and antennal calluses not evident. Clypeus separated from the front by a deep suture. It, and the labrum especially, have sparser and longer pubescence than the front. The eyes are moderately narrow, 0.93 x 0.61 mm., excavated, and separated across the front by 1.32 mm. Palpi normal, with sparse black pubescence. Antennae 3.7 mm. long, reaching to about the basal sixth of the elytra, about 2.2 times as long as an anterior tibia. They are of almost uniform thickness. Except for a few pale setae on segments I to III, they are entirely black. Segment I reaches half-way across the eye and is moderately stout; segments IV to X are truncate at the apex, V to X slightly obliquely so. Segment XI is almost uniform in width, rounded at apex. Measurements (Length/Width, to a total length of 1,000 units, from base to apex): 151/60, 65/48, 139/55, 79/55, 76/59, 76/60, 76/59, 76/59, 76/55, 69/55, 117/55.

Pronotum subquadrate, 1.98 mm. long, 1.85 mm. wide. Basal impressed line dis-

[1]Arizona Agricultural Experiment Station Technical Paper No. 401.

tinct; median impressed line absent. The disc is slightly elevated just behind the middle and a moderately deep impression extends from the elevation to the basal impressed line, flanked by distinct but shallow lateral impressions. Anteriorly from the elevation there extends a feeble median impression. Surface and pubescence as on head. There is some pale pubescence across the very base and apex; in addition there is a pale suffusion on the sides of the disc before the middle; the paler markings on the pronotum are not evident without magnification. Scutellum rufous-pubescent. Elytra almost parallel, 7.31 mm. long, 2.6 mm. wide across the humeri and ca. 3.3 mm. at their widest. Surface and pubescence almost as on pronotum and head. Suture narrowly elevated and pale-pubescent. A pale-pubescent line about 0.25 mm. wide extends from the humeri to about 0.8 mm. from the apex of each elytron. A narrow but distinct costula is present on each elytron parallel to the suture and midway between suture and pale line. Sides of elytra, as well as sides of pronotum, obscurely paler pubescent. Ground color of elytra uniformly dark, not lighter under the stripes. Underside of body with sparser and longer pubescence than above, the surface clearly visible; pubescence uniformly rufous except for some black toward the apex of the tarsi. Legs moderately stout, entirely black in ground color. Anterior tibial spurs two, spiniform, the inner longer; inner posterior tibial spur slender, tapered-sticklike, the outer about twice as broad, slightly expanded apically.

The size of the three paratypes is almost exactly the same as in the holotype. In one male and the female paratype the pronotum has a pair of small pits in the postero-lateral impressions. A feeble indication of these pits is present in the other paratype and in the holotype. The color of the two male paratypes is almost the same as in the holotype, except that one of them has the elytral vittae slightly narrower. The female paratype is not so brilliantly colored and the last ventral abdominal segment appears to have entirely black pubescence.

Holotype.—Male: 10 m. N. of Rockport (Aransas Co.), Texas, IV-18-1952, Michener, Beamers, Wille, and LaBerge collectors. Deposited in the Snow Entomological Museum, University of Kansas. *Paratypes*, two males: Riviera (Kleberg Co.), Texas, IV-17-1952, Michener, Beamers, Wille, and LaBerge collectors; one in the Snow Entomological Museum, and one in the collection of the author; one female: Kingsville (Kleberg Co.), Texas, C. T. Reed Coll., in the collections of Cornell University. All three localities are near Corpus Christi.

This species is named in honor of Dr. Wilbur R. Enns, who recognized that the holotype could not be assigned to any described species. In my 1945 key to the species of *Epicauta*, *ennsi* runs to couplet 24 but is distinct in having the pubescence mainly rufous over the whole body. It is unlike any described species from Mexico or Central America. It belongs to group BB, subgenus *Epicauta*, and appears to be most closely related to *E. strigosa*.

A NEW REARED OPIUS FROM AFRICA

(HYMENOPTERA: BRACONIDAE)

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The following new species was included in a collection of *Opius* reared from various fruit flies in Africa by J. M. McGough.

Opius ottotomoanus, new species

Female.—Length 4 mm.; ovipositor 4 mm. Head and thorax shining black; abdomen bright fulvous; antennae, sheaths of the ovipositor, hind tibiae, and tarsi black or blackish; palpi and tegulae pale yellow; mandibles except at tips, front, middle, and hind legs except tibiae and tarsi, bright fulvous, wings hyaline, stigma and veins black or blackish. Body, including abdomen, with sparse pale hairs and sparsely punctate, especially on face.

Head broader than thorax and twice as wide as thick, broad behind the eyes; ocelli disposed in the form of an isosceles triangle in the middle of the fronto-vertex, a tight group set in a shallow basin, the individual members almost touching; ocellocular line twice length of base of triangle; vertex in front of ocelli transversely striate on either side of a smooth, depressed area; eyes short oval; face convex, wider than high, antennae inserted at upper margin and rather widely separated, the scrobes as far apart as distance to eyes, a short median carina below; clypeus somewhat tectiform, the anterior margin angulate; malar space twice the width of base of mandible; gena even wider and strongly margined; antennae 39-segmented, scape and pedicel rather short and thick, flagellar segments all longer than wide, the proximal ones four to five times longer than wide, segmental length decreasing distally; palpi, particularly the maxillary, slender, elongate.

Pronotum not visible from above, pleurum with a crenulated groove on posterior margin; mesonotum convex and with foveolated parapsidal grooves extending diagonally from anterior lateral angles caudally, converging before apical margin, forming median and lateral lobes, the former rather prominent, the latter with foveolated lateral margins; mesopleurum crossed by vertical and horizontal crenulated sulci; scutellum convex; prescutellar sulcus divided by costae into four pits; metanotum with a narrow costate groove between anterior and posterior carinated margins on either side of a median longitudinal carina; propodeum convex, coarsely rugose (reticulate areolate), especially at sides, and with a short median longitudinal carina anteriorly, spiracle minute, circular.

Abdomen elongate oval; first tergite ligulate, considerably wider apically than basally, the median plate aciculate; succeeding segments weakly separated.

Legs fairly stout. Wings long and rather narrow, three to four times as long as wide, faintly cloudy; stigma lanceolate, three to four times as long as wide, radius emitted from its middle; first abscissa of radius more than half stigma width; second abscissa twice length of first but shorter than first cubital cross-vein, which is interstitial with recurrent vein; second cubital cell wider than high but hardly twice as wide; nervulus postfurcal; nervus parallelus joining medial below the middle; postnervellus present.

Male.—Similar to female except for sexual differences and the apical segments of the abdomen black or blackish.

Described from eight female and two male specimens (type, allotype, and paratypes) reared from a species of *Dacus* infesting cultivated gourds in the Ottotomo Forest Reserve in the French Cameroons (West Africa), November 1, 1951, by J. M. McGough. One specimen labeled as from cucurbits, Cameroons, May 21, 1951, J. M. McGough, appears to be the same. This species is closest to Bridwell's *desideratus* or Szepligeti's *caudatus*, but is readily distinguishable by the black hind tibiae and tarsi.

A REVIEW OF THE GENERIC NAMES PROPOSED FOR OLD WORLD ICHNEUMONIDS, THE TYPES OF WHOSE GENOTYPES ARE IN JAPAN, FORMOSA, OR NORTH AMERICA

(HYMENOPTERA, ICHNEUMONIDAE)

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It has recently been possible to study the types of the ichneumonid genotypes that are in various collections in Japan, Formosa, and North America. In certain papers, particularly in the *Hymenoptera of America North of Mexico, Synoptic Catalog* (1951. U. S. Dept. Agr., Agr. Monog. 2: 184-409), there has been an opportunity to review the status of the generic names applicable to the Nearctic Fauna, so far as was possible at those times. The present paper reviews the generic names proposed for Old World species, the types of whose genotypes have been studied to date.

Other authors, particularly Uchida, Heinrich, and Cushman, have already reviewed the status of many of the generic names treated herein, and many of those proposed by Uchida and Cushman were adequately described and figured to begin with. There has remained, however, a large number which are enigmas as far as the literature is concerned, and it has seemed desirable to try to clarify these and to bring together all the names in one list for easy reference, with confirmations of previous dispositions, further information or corrections where needed, and bibliographic references to the pertinent literature.

The types of the genotypes concerned are housed in the following collections: Institutum Entomologicum, Hokkaido University, Sapporo, Japan; Taiwan National Agricultural Research Insitute, Taipeh, Formosa; U. S. National Museum, Washington, D. C.; and the postwar collection of Mr. Gerd Heinrich, at present partly at Dryden, Maine, and partly at Ann Arbor, Michigan. The types of Uchida's genotypes are mostly at Sapporo and a few others are in Shanghai, Washington, and Berlin-Dahlem. Those in Washington concern genera erected on Ashmead species. The Uchida types in Shanghai and Berlin-Dahlem have not been seen, but the generic names involved are included also in the discussion for the sake of completing the list of his genera, even though the remarks concerning them can not be based on the holotypes. The Sonan types are in Taipeh. The Ashmead, Cushman, and Viereck types are all in Washington. Ashmead, Uchida, and Viereck have referred Old World species to a few of Foerster's ichneumonid genera that had not previously contained species and thus made genotypes available for them. The status of these Foersterian genera is reviewed also, alphabetically with the rest.

I am deeply indebted to the curators of the various collections for the privilege of studying the material in their care, and especially to Dr. Toichi Uchida for the assistance given while I was visiting Sapporo. Mr. J. F. Perkins has assisted with information on the names *Atelente*, *Talorga*, *Cremastus*, and with some of the Acaenitini.

Some of the tribal and subtribal names employed in the discussion of genera belonging to the subfamilies Gelinae and Ophioninae will be unfamiliar. For their elucidation, the reader is referred to another paper by the author, entitled "A synopsis of the tribes and subtribes of Gelinae and Ophioninae (Hymenoptera, Ichneumonidae)" (1957. Proc. Ent. Soc. Wash. 59: _____.)

Alphabetical List of the Genera

ACERATASPIS Uchida, 1934. Insecta Matsumurana 9: 23. New name for *Cerataspis* Uchida, preoccupied.

Resembles *Metopius* in most characters but lacks the shield-shaped area on the face. The face is evenly convex.

AKAJOPPA Uchida, 1932. Jour. Faculty Agr. Hokkaido Univ. 33: 217 **New name** for *Erythrojoppa* Uchida, preoccupied.

Synonym of *Allonotus* (**new synonymy**).

ALLOTHERONIA Ashmead, 1900. Proc. Linnaean Soc. New South Wales 25: 351. One species.

Type: (*Allotheronia 12-guttata* Ashmead, 1900) = *Cryptus intricatorius* Fabricius, 1804.

A synonym of *Echthromorpha*, as previously noted (Townes, 1940. Ann. Ent. Soc. Amer. 33: 288).

AMAUROMORPHA Ashmead, 1905. Proc. U. S. Natl. Mus. 29: 410. One species.

Type: *Amauromorpha metathoracica* Ashmead, 1905. Monobasic.

A monotypic Oriental genus of Mesostenini, subtribe Echthrina. Its cardinal characters are: First abdominal tergite without a lateral subbasal triangular projection, propodeum with a basal transverse carina, first intercubitus a little beyond the second recurrent vein, body hair very dense, clypeus without a median tooth.

AMEBACHIA Uchida, 1938. Jour. Faculty Agr. Hokkaido Univ. 21: 198. One species.

Type: *Amebachia baibarana* Uchida, 1928. Original designation.

Same genus as *Netelia*, and belongs in or near the subgenus *Netelia*. *Baibarana* differs from known members of the subgenus *Netelia* in lacking the occipital carina, but a careful examination of Uchida's specimens shows this carina to be sometimes present as a faint trace. A decision as to whether *Amebachia* should be synonymized with the subgenus *Netelia* or maintained as a distinct subgenus should be deferred until the male genitalia of its genotype can be studied.

ANOMALOCTENUS Cushman, 1934. Indian Forest Rec. 20: 4. One species.

Type: *Anomaloctenus melleus* Cushman, 1934. Original designation.

I consider this a synonym of *Apatagium*, which is a subgenus of *Netelia*, as previously noted (Townes, 1938. Lloydia 1: 185).

APOCRYPTUS Uchida, 1932. Jour. Faculty Agr. Hokkaido Univ. 33: 170. One species.

Type: *Apocryptus issikii* Uchida, 1932. Original designation.

This genus belongs in the Mesostenini and appears to belong to the subtribe Echthrina, but the only specimen seen was a male. The female type is in Berlin-Dahlem.

APOPHYSIUS Cushman, 1922. Philippine Jour. Sci. 20: 587. One species.

Type: *Apophysius bakeri* Cushman, 1922. Original designation.

An aberrant genus of Hemigastrini, well characterized in the original description. I have seen about six species, all from the Oriental Region.

ARACHNOLETER Cushman, 1924. Proc. U. S. Natl. Mus. 64: 2. One species.

Type: *Arachnoleter swezeyi* Cushman, 1924. Original designation.

A genus of Gelini, well illustrated in the original description. A singular generic character that is not brought out in the original description is the fact that the spiracles of the second to fourth abdominal segments are on the epipleura rather than on the tergites. I have a Swedish specimen determined as "*Theroscopus stagnalis* Thomson" by Roman which belongs to *Arachnoleter*, to which genus *Hemiteles stagnalis* Thomson, 1884 is hereby transferred. A third species of the genus (undescribed) occurs in northeastern United States.

ASTOMASPIS Foerster, 1868. Vehr. naturh. Ver. Rheinlande 25: 175. No species.

Ashmead, 1904. Proc. U. S. Natl. Mus. 28: 140. One species.

Type: *Astomaspis metathoracica* Ashmead, 1904. Monobasic.

An Oriental genus of the *Phobetes* group, tribe *Gelini*, that commonly goes under the name of *Syrites*. The male has a broad short abdomen with three visible tergites, the third ending in a pair of spines. *Syrites* is a junior synonym. *Astomaspis* of authors is a different genus, which has been renamed *Haplaspis*.

BADYORYGMA Uchida, 1936. Insecta Matsumurana 10: 112. One species.

Type: *Badyorygma flavoguttatum* Uchida, 1936. Original designation.

A synonym of *Ichneumon* (new synonymy). The genotype is closely related to (*Aglaojoppa*) *Ichneumon flavomaculata* Cameron, 1901 (**new combination**).

BANCHOGASTRA Ashmead, 1900. Proc. U. S. Natl. Mus. 23: 87. One species.

Type: *Banchogastra nigra* Ashmead, 1900. Original designation.

I consider this a synonym of *Enicospilus*, as first noted in 1945 (Mem. Amer. Ent. Soc. 11: 737). Cushman, however, considers it a distinct genus and has discussed its characters (1947. Proc. U. S. Natl. Mus. 96: 460-461).

BRACHYNERVUS Uchida, 1955. Jour. Faculty Agr. Hokkaido Univ. 50: 123. One species.

Type: *Brachynervus tsunekii* Uchida, 1955. Original designation.

A genus of Anomalini with one spur on the middle tibia and the intercubitus obliterated by the approximation of the radial and cubital veins. I have not seen it.

BRACHYSCLEROMA Cushman, 1936. Proc. U. S. Natl. Mus. 88: 369. One species.

Type: *Brachyscleroma apoderi* Cushman, 1936. Original designation.

This anomalous ophionine genus belongs in a separate tribe, the Brachyscleromatini.

CAENOCRYPTOIDES Uchida, 1936. Insecta Matsumurana 11: 4. One species.

Type: *Ischnojoppa tarsalis* Matsumura, 1912. Original designation.

This genus is close to *Agrothereutes*.

CERATOMANSA Cushman, 1922. Philippine Jour. Sci. 20: 574. One species.

Type: *Ceratomansa prima* Cushman, 1922. Original designation.

A genus of Mesostenina with considerable superficial resemblance to the genus *Mansa*. *Mansa* belongs in the Hemigastrini.

CERCODINOTOMUS Uchida, 1940. Insecta Matsumurana 15: 9. One species.

Type (*Psilomastax pictus* Kriechbaumer, 1882) = *Psilomastax pyramidalis* Tischbein, 1868. Original designation.

A synonym of *Psilomastax*, having the same genotype. *Psilomastax* is very close to *Trogus*, but differs in having the prepectal carina present only on the mesosternum, and in some additional characters as tabulated by Uchida in his description of *Cercodinotomus*.

CERATASPIS Uchida, 1934. Trans. Sapporo Nat. Hist. Soc. 13: 275. One species. Name preoccupied by Gray, 1828.

Type: *Cerataspis clavata* Uchida, 1934. Original designation.

Renamed *Aceratastpis*, which see.

CHASMOCRYPTUS Uchida, 1936. Insecta Matsumurana 11: 16. One species.

Type: (*Plectocryptus hokkaidensis* Uchida, 1930) = *Cryptus penetrator* Smith, 1874.

A synonym of *Polytribax* (**new synonymy**).

CHRIODES Foerster, 1868. Vehr. naturh. Ver. Rheinlande 25: 178. No species. Ashmead, 1905. Proc .U. S. Natl. Mus. 28: 966. One species.

Type: (*Chriodes* (!) *oculatus* Ashmead, 1905) = *Atrometus minutus* Ashmead, 1904. Monobasic.

A genus of Ophioninae common in the Old World tropics and many times named. Synonyms are *Nesomesochorus*, *Mavandia*, and *Metanomalon* (**new synonymies**). *Klutiana* is a subgenus differing in the lack of the subdiscoidella vein (**new status**). *Mavandiella* is a synonym of *Klutiana* (**new synonymy**). *Chriodes* and the Neotropic genus *Nonnus* constitute a distinct section of the tribe Porizonini.

COBUNUS Uchida, 1926. Jour. Faculty Agr. Hokkaido Univ. 23: 65. One species.

Type: *Ichneumon pallidiolus* Matsumura, 1912. Original designation.

Heinrich (1934. Mitteil. Zool. Mus. Berlin 20: 100) discusses the characters of this genus. He places it near *Naenaria*.

COCHLIDIONOSTENUS Uchida, 1936. Insecta Matsumurana 10: 115. One species.

Type: *Cryptaulax coreanus* Szépligeti, 1916. Original designation.

This genus is related to *Coccygodes*, *Christolia*, and *Lamprocryptidea*. This group of genera, so far as known, parasitizes Limacodidae.

COELOJOPPA Uchida, 1925. Zool. Mag. Tokyo 37: 453. One species. Name preoccupied by Cameron, 1904.

Type: *Coelojoppa segmentalia* Uchida, 1925. Original designation.

This genus was renamed *Uchidia* by Heinrich in 1934, but it is a synonym of *Naenaria* Cameron, 1903. Uchida has discussed the synonymy (1942. Insecta Matsumurana 16: 34).

COLPOTROCHIOIDES Uchida, 1930. Jour. Faculty Agr. Hokkaido Univ. 25: 263. Two species.

Type: *Colpotrochioides orientalis* Uchida, 1930. Original designation.

Listed as a synonym of *Colpotrochia* (Townes and Townes, 1951. U. S. Dept. Agr., Agr. Monog. 2: 355), but a better treatment seems to be as a synonym of *Scallama*, with *Scallama* as a subgenus of *Colpotrochia* (**new status**). *Scallama* (with *Colpotrochioides* as a synonym) has the nervellus broken below the middle and the areolet always present. The subgenus *Colpotrochia* has the nervellus broken near the middle and the areolet often lacking.

COREOJOPPA Uchida, 1926. Jour. Faculty Agr. Hokkaido Univ. 18: 23. One species.

Type: *Coreojoppa flavomaculata* Uchida, 1926. Original designation.

A synonym of *Pterocormus* (**new synonymy**). The genotype is a large robust form which is close to and may be a subspecies of (*Ichneumon*) *Pterocormus sexmaculatus* Matsumura, 1912.

CREMASTIDEA Viereck, 1912. Proc. U. S. Natl. Mus. 43: 587. One species.

Type: *Cremastus* (*Cremastidea*) *chinensis* Viereck, 1912. Original designation.

A synonym of *Temelucha*, and the genotype is a synonym of (*Ophionellus*) *Temelucha biguttulus* Munakata (**new combination**). Uchida (1934. Insecta Matsumurana 9: 4) has published the specific synonymy.

CRYPTAULAXOIDES Uchida, 1940. Insecta Matsumurana 14: 121. Two species.

Type: *Cryptus purpuratus* Smith, 1852. Original designation.

I consider this a synonym of *Cochlidionostenus* (**new synonymy**).

CTENOCHARIDEA Cushman, 1922. Philippine Jour. Sci. 20: 549. One species.

Type: (*Ctenocharidea luzonensis* Cushman, 1922) = subspecies of *Maraces flavobalteata* Cameron, 1902. Original designation.

A synonym of *Maraces*. *Luzonensis* is a Philippine subspecies of *Maraces flavobalteata* Cameron, 1902, the genotype of *Maraces*. Heinrich published these facts in 1934 (Mitteil. Zool. Mus. Berlin 20: 134, 136).

CUBOSCOPESIS Heinrich, 1952. Ann. Mag. Nat. Hist. (ser. 12) 5: 1080. One species.

Type: *Cuboscopesis epachthoides* Heinrich, 1952. Original designation.

Similar to *Scopesis* and I see no reason for making the fine generic distinctions that would be necessary if *Cuboscopesis* is to be retained as a genus. I have formerly (1951. U. S. Dept. Agr., Agr. Monog. 2: 331-334) included *Scopesis* and many other minor groups in a broadly defined genus *Mesoleius*. This may be the best arrangement, but the matter needs a thorough study.

DAICTES Foerster, 1868. Verh. naturh. Ver. Rheinlande 25: 176. No species.
Viereck, 1911. Proc. U. S. Natl. Mus. 40: 193. One Species.

Type: *Phygadeuon* (*Daïctes*) *fukaii* Viereck 1911. Monobasic.

A synonym of *Mastrus* (**new synonymy**).

DAISETSUZANIA Uchida, 1930. Jour. Faculty Agr. Hokkaido Univ. 25: 289. One species.

Type: *Daisetsuzania albifrons* Uchida, 1930. Original designation.

A synonym of *Himerta* (**new synonymy**).

DENTIMACHUS Heinrich, 1949. Mitteil. Münchner Ent. Gesell. 35-39: 86. One species.

Type: *Dentimachus morio* Heinrich, 1949. Original designation.

This genus resembles *Perispuda* and *Scopesis*, but differs from both in having the lower tooth of the mandible longer than the upper. I have compared the type of *Dentimachus morio* with the series of *Tryphon flavipes* Gravenhorst on which Heinrich based the new genus *Nemesoleius*. I believe the two species congeneric and hereby synonymize *Nemesoleius* with *Dentimachus*. Heinrich mentioned propodeal differences as the generic distinction between *Nemesoleius* and *Dentimachus*. The propodeal carinae of the genotype of *Nemesoleius* are of the common *Scopesis* type. In the genotype of *Dentimachus* they are almost obsolete and the apical propodeal carina is more regularly transverse. This difference does not impress me as being of generic value.

DIAGLYPTIDEA Viereck, 1913. Proc. U. S. Natl. Mus. 46: 371. One species.

Type: *Diaglyptidea roepkei* Viereck, 1913. Original designation.

A genus of Gelini related to such genera as *Isdromas* and *Haplaspis*.

DIATORA Foerster, 1868. Ver. naturh. Ver. Rheinlande 25: 180. No species.

Ashmead, 1904. Proc. U. S. Natl. Mus. 28: 141. One species.

Type: *Diatora prodeniae* Ashmead, 1904. Monobasic.

An Oriental genus of Gelini. Cardinal generic characters are: Lateral edge of second tergite without a carina or crease setting off its epipleurum; notaulus extending beyond the middle of the mesoscutum, of almost uniform strength throughout its length and posteriorly ending abruptly; disc of mesoscutum without hairs.

DICHELOBOSMINA Uchida, 1932. Jour. Faculty Agr. Hokkaido Univ. 33: 201. One species.

Type: *Dichelobosmina tuberculata* Uchida, 1932. Original designation.

A rather robust member of the *Hymenobosmina* group of genera. Unusual features are the absence of the glymma except for a trace, the short face and clypeus, and particularly the propodeal carination.

ECTOPOIDES Heinrich, 1951. Bonner Zool. Beitrage 3-4: 280. One species.

Type: *Ectopoides tennisseni* Heinrich, 1951. Original designation.

Heinrich related this genus to *Ectopius* and *Apaeleticus*. I examined the type in 1951 but have not seen it recently.

EGURICHNEUMON Uchida, 1929. Trans. Sapporo Nat. Hist. Soc. 10: 116. One species.

Type: *Chasmias agitatus* Matsumura and Uchida, 1926. Original designation.

A synonym of *Ulesta*, as was noted by Heinrich (1934. Mitteil. Zool. Mus. Berlin 20: 174).

ELASMOGNATHIAS Ashmead, 1906. Proc. Ent. Soc. Wash. 8: 31. New name for *Elasmognathus*, preoccupied.

A synonym of *Caenojoppa*, as noted by Heinrich (1934. Mitteil. Zool. Mus. Berlin 20: 122).

ELASMOGNATHUS Ashmead, 1905. Proc. U. S. Natl. Mus. 29: 405. One species. Name preoccupied by Gill, 1865, and by Newton, 1878.

Type: *Elasmognathus cephalotes* Ashmead, 1905. Monobasic.

Renamed *Elasmognathias*, which see.

ERIPTERNIMORPHA Viereck, 1913. Proc. U. S. Natl. Mus. 44: 645. One species.

Type: (*Eripternimorpha schoenobii Viereck*, 1913) = subspecies of *Amauromorpha metathoracica* Ashmead, 1905. Original designation.

A synonym of *Amauromorpha* (**new synonymy**), its genotype being only a subspecies of the genotype of *Amauromorpha*. The proper scientific name of the present genotype would therefore be *Amauromorpha metathoracica schoenobii* (**new status**).

ERYTHROJOPPA Uchida, 1932. Jour. Faculty Agr. Hokkaido Univ. 33: 153. One species. Name preoccupied by Cameron, 1902.

Type: *Acanthojoppa* (*Erythrojoppa*) *sauteri* Uchida, 1932. Original designation.

Renamed *Akajoppa*, which see.

ERYTHROPIMPLA Ashmead, 1900. Proc. U. S. Natl. Mus. 23: 57. One species.

Type: *Erythropimpla abbottii* Ashmead, 1900. Monobasic.

A synonym of *Camptotypus*, as noted by Cushman (1942. Proc. U. S. Natl. Mus. 92: 284). Whether *Camptotypus* should be maintained as generically distinct from *Hemipimpla*, as Cushman contends (*ibidem*), is a question requiring study.

ESUCHONEMATOPODIUS Cushman, 1922. Philippine Jour. Sci. 20: 567. One species.

Type: *Esuchonematopodius luzonensis* Cushman, 1922. Original designation.

A synonym of *Diapetus*. *Diapetus* and *Michrochorus* are subgenera of *Nematopodius* (**new status**). The subgenera of *Nematopodius* may be distinguished as follows:

1. Epomia ending dorsally in a prominent tooth on upper margin of pronotum; clasper of male genitalia ending in a slender rod ..... *Microchorus*
   Epomia not toothed above and not reaching upper margin of pronotum; clasper of male genitalia rounded apically 2
2. Occipital carina distinct dorsally; apical carina of propodeum represented only by lateral vestiges ..... *Nematopodius*
   Occipital carina absent dorsally; apical carina of propodeum usually distinct, complete or interrupted medially, or sometimes absent ..... *Diapetus*

Cushman has referred a number of species to *Diapetus*, which considering the subordination of *Diapetus* to *Nematopodius* as a subgenus, should now be included under *Nematopodius*. The necessary nomenclatorial shifts are as follows:

Earrana nigromaculata Cameron, 1907 = *Nematopodius* (subgenus?) *nigromaculata*.

Ischnoceros? dimidiatus Brullé, 1846 = *Nematopodius* (*Diapetus*) *dimidiatus*.

Diapetus (*D.*) *pallidicornis* Cushman, 1932 = *Nematopodius* (*Diapetus*) *pallidicornis*.

Diapetus (*D.*) *unicolor* Cushman, 1932 = *Nematopodius* (*Diapetus*) *unicolor*.

Diapetus (*D.*) *parvus* Cushman, 1932 = *Nematopodius* (*Diapetus*) *parvus*.

Earrana lutea Cameron, 1905 = *Nematopodius* (subgenus?) *luteus*.

Diapetus (*D.*) *taiwanensis* Cushman, 1932 = *Nematopodius* (*Diapetus*) *taiwanensis*.

Diapetus (*D.*) *dissipus* Cushman, 1932 = *Nematopodius* (*Diapetus*) *dissipus*.

Diapetus (*D.*) *piceatus* Cushman, 1932 = *Nematopodius* (*Diapetus*) *piceatus*.

Diapetus (*D.*) *fossulatus* Cushman, 1932 = *Nematopodius* (*Diapetus*) *fossulatus.*

Esuchonematopodius luzonensis Cushman, 1922 = *Nematopodius* (*Diapetus*) *luzonensis.*

Earrana philippinensis Cushman, 1922 = *Nematopodius* (*Microchorus*) *philippinensis.*

Microchorus mirabilis Szépligeti, 1916 = *Nematopodius* (*Microchorus*) *mirabilis.*

Diapetus (*Microchorus*) *uniformis* Cushman, 1932 = *Nematopodius* (*Microchorus*) *uniformis.*

EUCTENOPUS Ashmead, 1900. Proc. Linnaean Soc. New South Wales 25: 351. One species.

Type: *Euctenopus novazealandicus* Ashmead, 1900. Monobasic.

A synonym of *Phytodictus* **(new synonymy)**. The genus *Phytodictus* may some day be divided into subgenera, when *Euctenopus* may be used for one of them. Cushman (1942. Proc. U. S. Natl. Mus. 92: 286) has discussed the characters of *Euctenopus.*

EXERISTESOIDES Uchida, 1928. Jour. Faculty Agr. Hokkaido Univ. 25: 51. One species.

Type: (*Pimpla spectabilis* Matsumura, 1926) = subspecies of *Pimpla alternans* Gravenhorst, 1829. Original designation.

A synonym of *Itoplectis. Spectabilis* is a subspecies of *Itoplectis alternans* Gravenhorst, 1829, as published by Uchida (1942. Insecta Matsumurana 16: 122). It differs from typical *alternans* most conspicuously in the coloration of the hind tibia, which is fuscous with a white submedian band, the submedian band being wider than in typical *alternans* and the fuscous areas without the ferruginous infusion characteristic of typical *alternans. Itoplectis triannulatus* Uchida 1928, *Itoplectis epinotiae* Uchida 1928, and *Itoplectis nigribasalis* Uchida 1937 are synonyms of *spectabilis* **(new synonymies)**.

FORMOCRYPTUS Uchida, 1931. Jour. Faculty Agr. Hokkaido Univ. 30: 192. One species.

Type: *Formocryptus tenuicornis* Uchida, 1931. Original designation.

This genus belong in the Gelini. Distinctive features are its relatively large size, two strong teeth on the clypeus, and strong propodeal apophyses.

FORMOSANOMALON Uchida, 1928. Jour. Faculty Agr. Hokkaido Univ. 21: 241. One species.

Type: (*Formosanomalon baibarense* Uchida, 1928) = subspecies of *Macrostemma elegans* Shestakov, 1923, new status. Original designation.

A synonym of *Aphanistes* **(new synonymy)**. Its genotype is only a subspecies of the genotype of *Macrostemma*, and this name also should be listed as a synonym of *Aphanistes* **(new synonymy)**. The species *elegans*, genotype of *Formosanomalon* and of *Macrostemma*, although believed to belong in the genus *Aphanistes*, is atypical in having the ocelli large, the lateral ocellus separated from the eye by only about 0.3 its diameter, the median frontal carina reaching the median ocellus and nowhere strongly elevated, and the tarsal claws

somewhat longer than is typical for *Aphanistes*. Uchida (1953. Trans. Shikoku Ent. Soc. 3: 129) has published the synonymy of *Formosanomalon* with *Macrostemma*.

FORMOSTENUS Uchida, 1931. Jour. Faculty Agr. Hokkaido Univ. 30: 180. Two species.

Type: *Mesostenus* (*Formostenus*) *angularis* Uchida, 1931. Original designation.

A synonym of *Isotima* **(new synonymy)**. The genotype of *Formostenus* and certain related species differs from *albicincta* (the genotype of *Isotima*) and its closer relatives in having the brachiella vein present, and in the somewhat narrower postpetiole. Both groups of species agree, however, in having a characteristic arcuate carina above each antennal socket.

FORMOXORIDES Uchida, 1928. Jour. Faculty Agr. Hokkaido Univ. 25: 14. One species.

Type: *Achorocephalus pilosus* Szépligeti, 1914. Original designation.

A synonym of *Eugalta*. The type of the genotype is in Budapest, but its generic identity is determinable from the original description. Its synonymy was recognized by Uchida (1932. Jour. Faculty Agr. Hokkaido Univ. 33: 221) and by Cushman (1933. Insecta Matsumurana 8: 1).

GLYPTOGASTRA Ashmead, 1900. Proc. U. S. Natl. Mus. 23: 57. One species.

Type: *Glyptogastra hawaiiensis* Ashmead. Monobasic.

A synonym of *Echthromorpha*, as previously noted (Townes, 1940. Ann. Ent. Soc. Amer. 33: 288).

HABROCRYPTOIDES Uchida, 1952. Insecta Matsumurana 18: 19. Two species.

Type: *Habrocryptus shikokuensis* Uchida, 1936. Original designation.

A synonym of *Trachysphyrus* **(new synonymy)**.

HEMIEPHIALTES Ashmead, 1906. Proc. U. S. Natl. Mus. 30: 177. One species.

Type: *Hemiephialtes glyptus* Ashmead, 1906. Monobasic.

A synonym of *Glypta*, as was first noted by Uchida (1928. Jour. Faculty Agr. Hokkaido Univ. 25: 71).

HYMENOMACROPYGA Uchida, 1941. Insecta Matsumurana 15: 116. One species.

Type: *Hymenomacropyga latifrontalis* Uchida, 1941. Original designation.

A synonym of *Clistopyga* **(new synonymy)**. The species *latifrontalis* has the temples narrower and the abdominal tergites more heavily punctate than is usual for species of *Clistopyga*, but does not deserve generic distinction.

HYPOPHELTES Cushman, 1924. Proc. U. S. Natl. Mus. 64 (20): 11. One species.

Type: *Hypopheltes pergae* Cushman, 1924. Original designation.

A genus of Mesoleiini as indicated in the original description. I have seen only the genotype, from Australia.

IDIOGNATHUS Cushman, 1922. Philippine Jour. Sci. 20: 558. One species.

Type: *Idiognathus balteatus* Cushman, 1922. Original designation.

A synonym of *Aulojoppa*, as first noted by Heinrich (1934. Mitteil. Zool. Mus. Berlin 20: 127). *Balteatus* is a Philippine subspecies of *Aulojoppa spilocephala* Cameron, 1907, the genotype of *Aulojoppa* **(new status)**.

ISHIGAKIA Uchida, 1928. Jour. Faculty Agr. Hokkaido Univ. 25: 32. One species.
Type: *Ishigakia exetasea* Uchida, 1928. Original designation.

An Oriental genus of Acaenitini with long erect hairs on the first sternite, hind tarsal claws simple, apical half of clypeus rather flat and without a subapical transverse ridge, and intercubitus well beyond the second recurrent.

ISOTIMA Foerster, 1868. Ver. naturh. Ver. Rheinlande 25: 182. No species.
Ashmead, 1905. Proc. U. S. Natl. Mus. 29: 407. Four species.
Type: *Isotima albicineta* Ashmead, 1905. By present designation.

A mesostenine genus of the *Goryphus-Gambrus* group of genera. It is distinctive in having, in the female, a semicircular area above each antennal socket bordered dorsally by a carina. The male has either a similar structure or in some species a grotesque specialization of it. Many of the species, including the genotype, lack the brachiella vein. *Isotima cincticornis* Ashmead, 1905 is a synonym of *I. albicineta* (**new synonymy**). *Formostenus*, *Fotsiforia*, and *Mavia* are synonyms of *Isotima* (**new synonymies**).

ITAMUS Foerster, 1868. Verh. naturh. Ver. Rheinlande 25: 179. No species.
Name preoccupied by Goebel, 1846 and by Loew, 1849.
Uchida, 1936. Insecta Matsumurana 11: 13. One species.
Type: (*Hemiteles* (*Itamus*) *okamotoi* Uchida, 1936) = *Leptocryptus marginatus* Uchida, 1930. Monobasic.

This genus has a general resemblance to *Bathythrix*, but the notaulus is shorter and not quite so sharp, and the clypeus is larger and with an evenly convex margin. The genotype was described first as *Leptocryptus marginatus* by Uchida in 1930, with which it is hereby synonymized. Besides the genotype from Japan, I have a second species of the genus from the Philippines.

Since the generic name is preoccupied and the genus is a distinct one, I hereby rename it *Uchidella*, as a token of respect for Dr. Toichi Uchida and his work on the Oriental Ichneumonidae.

JEZAROTES Uchida, 1928. Jour. Faculty Agr. Hokkaido Univ. 25: 30. Two species.
Type: *Jezarotes tamanukii* Uchida, 1928. Original designation.

A genus easily distinguished by the strongly forward projecting median lobe of the mesoscutum. The blunt ventral tooth on the hind femur and subobsolete upper tooth of the mandible are additional features of note.

KARAECHTHRUS Uchida, 1929. Insecta Matsumurana 3: 176. One species.
Type: *Karaechthrus tuberculatus* Uchida, 1929. Original designation.

Closely related to *Echthrus*, from which it differs in having the apex of the clypeus truncate, without a median tooth, and in a few additional minor characters.

KOSHUNIA Uchida, 1932. Jour. Faculty Agr. Hokkaido Univ. 33: 185. One species.
Type: *Hemiteles* (*Koshunia*) *taiwanellus* Uchida, 1932. Original designation.

The type of the genotype is in Berlin-Dahlem and has not been seen.

The original description indicates that *Koshunia* belongs probably in the *Phobetes* group of genera, tribe Gelini.

KRIEGERIA Ashmead, 1905. Proc. U. S. Natl. Mus. 29: 116. One species.

Type: *Kriegeria heptazonata* Ashmead, 1905. Monobasic.

An Oriental genus of the Mesostenini, subtribe *Echthrina*. Its cardinal characters are: First abdominal tergite with a lateral subbasal triangular projection, acute or subacute in females, blunt and often indistinct in males; pleural carina of propodeum present behind the basal carina; apical carina of propodeum absent; epomia reaching the upper edge of the pronotum and curved strongly forward at its upper end; nervulus varying from interstitial with basal vein to beyond it by 0.3 of its length.

KUNIOCRYPTUS Sonan, 1937. Trans. Nat. Hist. Soc. Formosa 27: 172. One species.

Type: *Orientocryptus flavofasciatus* Uchida, 1931. Original designation.

A synonym of *Latibulus* (**new synonymy**).

LEPTOBATOPSIS Ashmead, 1900. Proc. Linnaean Soc. New South Wales 25: 349. One species.

Type: (*Leptobatopsis australiensis* Ashmead, 1900) = *Cryptus indicus* Cameron, 1897. Monobasic.

A well-known lissonotine genus of the Oriental Region. *Tanera* and *Sauterellus* are synonyms, as discussed by Cushman in 1922, 1924, 1933, and 1940, *Tanera* having the same type species (through synonymy) as *Leptobatopsis*.

LONGICHAROPS Uchida, 1940. Insecta Matsumurana 14: 131. New name for *Nothanomaloides* Uchida, preoccupied.

A synonym of *Casinaria* (**new synonymy**).

MEGALOMYA Uchida, 1940. Trans. Nat. Hist. Soc. Formosa 30: 223. One species.

Type: *Megalomya longiabdominalis* Uchida, 1940. Original designation.

This genus is close to *Alomya*.

MATSUMURAIUS Ashmead, 1906. Proc. U. S. Natl. Mus. 30: 169. One species.

Type: *Matsumuraius grandis* Ashmead, 1906. Monobasic.

A synonym of *Pterocormus*, as was first recognized by Matsumura (1912. Thousand Insects of Japan, Supplement 4: 102).

MELALOPHACHAROPS Uchida, 1928. Jour. Faculty Agr. Hokkaido Univ. 21: 280. One species.

Type: *Melalophacharops tamanukii* Uchida, 1928. Original designation.

Very close to *Charopsimorpha*.

METACHORISCHIZUS Uchida, 1928. Jour. Faculty Agr. Hokkaido Univ. 25: 35. One species.

Type: *Metachorischizus unicolor* Uchida, 1928. Original designation.

Related to *Siphimedia*.

METARHYSSA Ashmead, 1900. Proc. U. S. Natl. Mus. 23: 40. One species.

Type: *Metarhyssa bifasciata* Ashmead, 1900. Monobasic.

A synonym of *Gabunia* (**new synonymy**). Cushman (1942. Proc. U. S. Natl. Mus. 92: 279-280) has redescribed the genotype. The genus belongs in the Mesostenini, subtribe Echthrina.

METOPHELTES Uchida, 1932. Insecta Matsumurana 6: 162. One species.

Type: *Metopheltes petiolaris* Uchida, 1932. Original designation.

This genus is close to *Perilissus*.

METOPICHNEUMON Uchida, 1935. Insecta Matsumurana 10: 13. One species.

Type: *Protichneumon* (*Metopichneumon*) *superomediae* Uchida, 1935. Original designation.

Proposed first as a subgenus of *Protichneumon* and later (1937. Insecta Matsumurana 11: 85) elevated to generic rank. It is very close to *Protichneumon*, but the genotype is unusual in having a compressed tubercle in the middle of the frons, a relatively narrow clypeus, and relatively elongate areola with distinct bounding carinae.

MICROTORIDEA Viereck, 1912. Proc. U. S. Natl. Mus. 42: 150. One species.

Type: *Microtoridea lissonota* Viereck, 1912. Original designation.

A synonym of *Diatora* (**new synonymy**).

MICROTORUS Foerster, 1868. Verh. naturh. Ver. Rheinlande 25: 175. No species. Uchida, 1940. Insecta Matsumurana 14: 64-66. Two species.

Type: *Microtorus kichijoi* Uchida, 1940. By present designation.

A synonym of *Otacustes* (**new synonymy**). Uchida placed a second species, *Microtus tenuibasalis* Uchida, 1940, in *Microtus*. It should be referred to *Mastrus* (**new combination**).

MONOMACRODON Cushman, 1934. Indian Forest Rec. 20: 2. One species.

Type: *Monomacrodon bicolor* Cushman, 1934. Original designation.

A subgenus of *Netelia*, as noted in 1938 (Townes. Lloydia 1: 186).

MONONTOS Uchida, 1926. Jour. Faculty Agr. Hokkaido Univ. 18: 165. One species.

Type: *Monontos niphonicus* Uchida, 1926. Original designation.

Near *Heresiarches*, but a distinct genus, not a synonym as stated by Uchida (1932. Insecta Matsumurana 7: 32). In *Monontos* the second lateral area of the propodeum extends to the apical 0.6 of the propodeum and is separated from the third lateral area by a sharp carina. In *Heresiarches* the second lateral area extends to the apical 0.8 of the propodeum and the carina between it and the third lateral area is obsolescent.

MONOPLECTROCHUS Heinrich, 1949. Mitteil. Münchner Ent. Gesell. 35-39: 109. One species.

Type: *Monoplectrochus hoerhammeri* Heinrich, 1949. Original designation.

A synonym of *Periope* (**new synonymy**). Its genotype is related more closely to the Nearctic *Periope aethiops* Cresson than to the European *Periope auscultator* Curtis.

MYRMELEONOSTENUS Uchida, 1936. Insecta Matsumurana 10: 116. One species.

Type: *Myrmeleonostenus babai* Uchida, 1936. Original designation.

Close to *Trychosis*, differing from *Trychosis* in the interstitial nervulus, smaller areolet, narrower first abdominal segment, and longer ovipositor.

NAWAIA Ashmead, 1906. Proc. U. S. Natl. Mus. 30: 184. One species.

Type: *Nawaia japonica* Ashmead, 1906. Monobasic.

A synonym of *Banchus*, as was first noted by Uchida (1931. Insecta

Matsumurana 6: 51). Its genotype (*Banchus japonicus*) is similar to the Nearctic *Banchus canadensis* in the elongate female abdomen and in the relatively small fourth segment of the maxillary palpus of the male. These two species seem to constitute a distinct group.

NEISCHNUS Heinrich, 1952. Ann. Mag. Nat. Hist. (ser. 12) 5: 1066. One species.

Type: *Neischnus oxypygus* Heinrich, 1952. Original designation.

Heinrich placed this genus in the "Ichneumonini," at the same time stating its relation to the Phaeogenini. The type is in Dryden, Maine.

NEODONTOCRYPTUS Uchida, 1940. Insecta Matsumurana 14: 122. New name for *Odontocryptus* Uchida, preoccupied.

The type of the genotype was returned to Berlin-Dahlem, but I have a specimen which appears to belong to the genotype species. It represents an aberrant genus of Mesostenina related possibly to *Trachysphyrus*. Its dark metallic blue coloration and the structural characters described by Uchida should make it easy to recognize.

NEOHERESIARCHES Uchida, 1937. Insecta Matsumurana 11: 87. One species.

Type: *Neoheresiarches albipilosus* Uchida, 1937. Original designation.

This is an unusual genus of which I have seen only the type of the genotype. It is somewhat reminiscent of *Tricholabus* but probably not closely related to it.

NEOPIMPLA Ashmead, 1900. Proc. U. S. Natl. Mus. 23: 56. One species.

Type: *Neopimpla abbottii* Ashmead, 1900. Original designation.

The type of the genotype, stated to be from Africa, has never been found since Ashmead published the name, and the original description is insufficient for even a subfamily placement. *Neopimpla* remains a *nomen dubium* until further evidence is available.

NEOPIMPLOIDES Viereck, 1912. Proc. U. S. Natl. Mus. 42: 151. One species.

Type: (*Neopimploides syleptae* Viereck, 1912) = *Ichneumon punctatus* Fabricius, 1787. Original designation.

This is a synonym of *Xanthopimpla*, and its genotype is a synonym of *Xanthopimpla punctata* Fabricius, 1787. The generic synonymy was first published by Krieger (1914. Arch. Naturg. 80 (A), 6: 3) and the specific synonymy first by Cushman (1922. Proc. U. S. Natl. Mus. 60: 10).

NEOTORBDA Uchida, 1932. Insecta Matsumurana 6: 153. One species.

Type: *Torbda* (*Neotorbda*) *sakaguchii* Uchida, 1932. Original designation.

A mesostenine genus of the subtribe Echthrina, related to *Microstenus*. The first tergite has a lateral subbasal triangular projection, the pleural carina of the propodeum is absent beyond the basal carina, both transverse carinae of the propodeum are strong, and the hypostomal carina is obsolete apically and does not meet the occipital carina. I have seen several Oriental and one Madagascan species of the genus. *Didiaspis* is a synonym of *Neotorbda* (**new synonymy**).

NEPHOPHELTES Cushman, 1924. Proc. U. S. Natl. Mus. 64 (20): 16. One species.

Type: *Nephopheltes japonicus* Cushman, 1924. Original designation.

A synonym of *Opheltes*, as previously noted (Townes, 1945. Mem. Amer. Ent. Soc. 11: 495).

NESOMESOCHORUS Ashmead, 1905. Proc. U. S. Natl. Mus. 28: 967. One species.

Type: (*Nesomesochorus oculatus* Ashmead, 1905) = *Atrometus minutus* Ashmead, 1904. Monobasic.

A synonym of *Chriodes*. Its genotype is a synonym of *Atrometus minutus* Ashmead, 1904, and of *Chriodes oculatus* Ashmead, 1905, the genotype of *Chriodes*.

NESOPIMPLA Ashmead, 1906. Proc. U. S. Natl. Mus. 30: 180. One species.

Type: *Nesopimpla naranyae* Ashmead, 1906. Monobasic.

A synonym of *Itoplectis*, as previously noted. (Townes, 1940. Ann. Ent. Soc. Amer. 33: 314).

NESOSTENODONTUS Cushman, 1922. Philippine Jour. Sci. 20: 555. One species.

Type: *Nesostenodontus bakeri* Cushman, 1922. Original designation.

This genus belongs in the Alomyini as defined by the subcircular spiracles and the usually lenticular clypeus. Cushman relates it to *Stenodontus*, emphasizing the sickle-shaped mandible. If the lack of gastrocoeli were emphasized it would be placed near *Centeterus*. Its true relations are problematic. The genus is adequately described and figured in the original publication.

NEUCHORUS Uchida, 1931. Insecta Matsumurana 5: 143. One species.

Type: *Neuchorus longicauda* Uchida, 1931. Original designation.

A synonym of *Phytodietus* (**new synonymy**). The species *longicauda* is closely related to the Nearctic *Phytodietus pulcherrimus* Cresson.

NIPPOCRYPTUS Uchida, 1936. Insecta Matsumurana 11: 3. One species.

Type: *Hemiteles suzukii* Matsumura, 1912.

A synonym of *Trachysphyrus* (**new synonymy**).

NIPPONAETES Uchida, 1933. Insecta Matsumurana 7: 160. One species.

Type: *Hemiteles* (*Nipponaëtes*) *haeussleri* Uchida, 1933. Original designation.

This genus is similar to *Acrolyta* in most characters. Further study of generic limits in this area is needed before a more definite statement can be made as to its relationships and distinctness.

NIPPONOPHION Uchida, 1928. Jour. Faculty Agr. Hokkaido Univ. 21: 201. One species.

Type: (*Nipponophion variegatus* Uchida, 1928) = variety of *Ophion bombycivorus* Gravenhorst, 1829.

This genus is a synonym of *Stauropoctomus*, a synonymy already published by Cushman (1947. Proc. U. S. Natl. Mus. 96: 456). Uchida (1951. Insecta Matsumurana 17: 127) has reduced the name *variegatus* to varietal status under *bombycivorus*.

NIPPORICNUS Uchida, 1931. Insecta Matsumurana 5: 147. One species.

Type: *Acroricnus tarsalis* Matsumura, 1912. Original designation.

A synonym of *Picardellia* (**new synonymy**). The genus belongs in the Mesostenini, subtribe Ospryncho tina, and is close to *Messatoporus*, differing from that genus most conspicuously in the somewhat larger areolet.

NOTHANOMALOIDES Uchida, 1928. Jour. Faculty Agr. Hokkaido Univ. 21: 273. One species. Name preoccupied by Viereck, 1925.

Type: *Nothanomaloides matsuyamensis* Uchida, 1928. Original designation.

Renamed *Longicharops*, which see.

ODONTOCRYPTUS Uchida, 1932. Jour. Faculty Agr. Hokkaido Univ. 33: 187. One species. Name preoccupied by Saussure, 1890, by Cameron, 1903, and by Szépligeti, 1916.

Type: *Odontocryptus brillantus* Uchida, 1932. Original designation.

Renamed *Neodontocryptus*, which see.

ODONTOTYLOCOMNUS Uchida, 1940. Trans. Sapporo Nat. Hist. Soc. 16: 179. One species.

Type: *Odontotylocomnus pilosus* Uchida, 1940. Original designation.

A synonym of *Pseudometopius* (**new synonymy**). *Pilosus* is an extraordinary species with the face sharply produced beneath the antennal sockets, the apex of the front tibia with a rounded prolongation, and with other specializations as mentioned in the original description. It does not seem, however, to be more than an aberrant member of the genus *Pseudometopius*.

OPISTHOSTENUS Foerster, 1868. Verh. naturh. Ver. Rheinlande 25: 175. No species.

Uchida, 1936. Insecta Matsumurana 11: 43. One species.

Type: *Hemiteles* (*Opisthostenus*) *etorofuensis* Uchida. Monobasic.

A synonym of *Gnypetomorpha* (**new synonymy**).

ORIENTOCRYPTUS Uchida, 1931. Jour. Faculty Agr. Hokkaido Univ. 30: 174. Two species.

Aype: *Orientocryptus formosanus* Uchida, 1931. Original designation.

A synonym of *Arthula*, as noted by Uchida in 1940 (Insecta Matsumurana 14: 125).

ORIENTOHEMITELES Uchida, 1932. Jour. Faculty Agr. Hokkaido Univ. 33: 186. One species.

Type: *Orientohemiteles ovatus* Uchida, 1932. Original designation.

This genus belongs to *Phobetes* group. It differs from all others of that group in having the petiolar area of the propodeum very long (0.7 as long as the propodeum) and the areola very short (about 3.8 as wide as long).

ORIENTOSTENARAEUS Uchida, 1930. Jour. Faculty Agr. Hokkaido Univ. 25: 321. One species.

Type: *Orientostenaraeus chinensis* Uchida, 1930. Original designation.

This is a singular mesostenine genus with coarse apical teeth on both upper and lower ovipositor valves, the ovipositor about 1.3 to 1.5 as long as the head and body, the clypeus broad, and the areolet as in *Mesostenus*. The genotype occurs in China, Taiwan, and the Philippines and I have a second species from Queensland. The European *Mesostenus gladiator* Scopoli, 1763 is closely related to these two species but differs in having the apical propodeal carina present. *Parasilsila* is a synonym (**new synonymy**).

OTOHIMEA Uchida, 1926. Jour. Faculty Agr. Hokkaido Univ. 18: 146. Two species.

Type: (*Otohimea nigra* Uchida, 1926) = *Ichneumon incanescens* Smith, 1874. Original designation.

A synonym of *Tricholabus*, as has been noted by Uchida (1932.

Insecta Matsumurana 7: 31).

PARACRYPTUS Uchida, 1932. Insecta Matsumurana 6: 149. One species.

Type: *Paracryptus orientalis* Uchida, 1932. Original designation.

Close to *Trachysphyrus* and further study may prove it to be a synonym.

PARAGAMBRUS Uchida, 1936. Insecta Matsumurana 11: 7. One species.

Type: *Gambrus sapporonis* Uchida, 1930. Original designation.

The genus is superficially similar to *Agrothereutes* and *Gambrus*. The apical margin of the clypeus is without a median angulation, the apical carina of the propodeum indicated only laterally, and the dorsal valve of the ovipositor has distinct apical teeth.

PARAGRYPON Uchida, 1941. Insecta Matsumurana 15: 159.

Type: *Gongropelma kikuchii* Uchida, 1928. Original designation.

A synonym of *Phaenolabrorychus* (**new synonymy**).

PARAPHYLAX Foerster, 1868. Verh. naturh. Ver. Rheinlande 25: 176. No species.

Ashmead, 1904. Proc. U. S. Natl. Mus. 28: 141. One species.

Type: *Paraphylax fasciatipennis* Ashmead, 1904. Monobasic.

This is an Oriental and Australian genus of the *Phobetes* group, tribe Gelini, containing many species. Its generic characters are: Disc of scutellum and upper part of temple smooth or with weak punctures, the scutellum with a weak median longitudinal elevation and the upper part of temple flat or almost so; notaulus extending more than 0.6 the length of the mesoscutum; nervulus approximately opposite the basal vein, or beyond it by less than 0.35 its length; sternaulus extending distinctly to near the middle coxa; propodeum with its first and second pleural areas separated by a carina just beyond the spiracle and its median apical area occupying 0.4 to 0.6 of the propodeal length; spiracle of first tergite at 0.65 to 0.7 the distance from the base of the tergite; first sternite without a preapical transverse carina; ovipositor sheath about as long as the width of the second tergite; ovipositor point not unusually slender.

PERILISSOIDES Uchida, 1932. Jour. Faculty Agr. Hokkaido Univ. 33: 213. One species.

Type: *Perilissoides cubitalis* Uchida, 1932. Original designation.

This genus is not in Uchida's collection. The type of the genotype is in Berlin-Dahlem. The genus is said to be near *Perilissus* and is distinguished by a peculiar venation.

PHOTOPTERA Viereck, 1913. Proc. U. S. Natl. Mus. 46: 380. One species.

Type: *Photoptera erythronota* Viereck, 1913. Original designation.

A synonym of *Paraphylax* (**new synonymy**).

PIELIA Uchida, 1937. Insecta Matsumurana 11: 91. One species.

Type: *Pielia concava* Uchida, 1937. Original designation.

The type of the genotype is in Musée Heude, Shanghai. Uchida compares the genus with *Bureschias*, *Eupalamus*, and *Gyrodonta*. The face and clypeus are concave, the face has a strong transverse carina just below the antennal sockets, and the gastrocoeli are indistinct.

PLANOCRYPTUS Heinrich, 1949. Mitteil. Münchner Ent. Gessell. 35-39: 56. One species.

Type: *Planocryptus mirabilis* Heinrich, 1949. Original designation.

A synonym of *Cubocephalus* (**new synonymy**).

PLATYJOPPA Uchida, 1932. Insecta Matsumurana 6: 146. One species.

Type: *Platyjoppa naxae* Uchida, 1932. Original designation.

This genus is somewhat intermediate in its characters between *Aoplus* and *Stenichneumon*, but different from both in the sharply elevated, laterally margined scutellum. The costula is strong.

PLECTOCHORUS Uchida, 1933. Insecta Matsumurana 7: 163. One species.

Type: *Mesochorus iwatensis* Uchida, 1928. Original designation.

Near *Stictopisthus*. The transverse carina beneath the antennal sockets is continuous, without a median dip, and the prepectal carina reaches the front edge of the mesopleurum. These are characters shared with *Stictopisthus*. Females differ from those of *Stictopisthus* in having the propodeum extending to or beyond the middle of the hind coxa, abdomen greatly elongate, and the ovipositor sheath only about four times as long as wide. Males seem indistinguishable from those of *Stictopisthus*.

PLEURONEUROPHION Ashmead, 1900. Proc. U. S. Natl. Mus. 23: 86. One species.

Type: *Pleuroneurophion hawaiensis* Ashmead, 1900. Original designation.

A synonym of *Enicospilus*, as previously noted (Townes, 1945. Mem. Amer. Ent. Soc. 11: 737).

POTOPHION Cushman, 1947. Proc. U. S. Natl. Mus. 96: 442. One species.

Type: *Potophion caudatus* Cushman, 1947. Original designation.

Near *Ophion*, from which it differs in the longer ovipositor and somewhat elongate trophi, as described and figured in the original publication.

PROSOPOSTENUS Uchida, 1932. Jour. Faculty Agr. Hokkaido Univ. 33: 184. One species.

Type: *Hemiteles* (*Prosopostenus*) *koshunensis* Uchida, 1932. Original designation.

The type of the genotype is in Berlin-Dahlem and has not been seen.

PROTEROCRYPTUS Ashmead, 1906. Proc. U. S. Natl. Mus. 30: 174. One species.

Type: *Proterocryptus nawaii* Ashmead, 1906. Monobasic.

A synonym of *Brachycyrtus*, as was first noted by Roman (1915. Ark. för. Zool. 9 (9): 5).

PSEUDAROTES Uchida, 1929. Insecta Matsumurana 3: 179. One species.

Type: *Pseudarotes chishimensis* Uchida, 1929. Original designation.

This genus is a synonym of *Yamatarotes* (**new synonymy**). Its genotype has the propodeum, first sternite, first tergite, and scutellum with specialized swellings, but these may be regarded as specific rather than generic characters.

PSEUDASTHENARA Uchida, 1930. Jour. Faculty Agr. Hokkaido Univ. 25: 276. One species.

Type: *Asthenara rufocincta* Ashmead, 1906. Original designation.

A synonym of *Euceros*, as previously noted (Townes and Townes, 1951. U. S. Dept. Agr., Agr. Monog. 2: 321). The type of the genotype

is in Washington.

PSEUDEUGALTA Ashmead, 1900. Proc. U. S. Natl. Mus. 23: 55. One species.

Type: *Eugalta spinosa* Cameron, 1899. Original designation.

A synonym of *Eugalta*. Cushman (1933. Insecta Matsumurana 8: 1) has discussed the synonymy.

PSEUDOCHASMIAS Uchida, 1926. Jour. Faculty Agr. Hokkaido Univ. 18: 115. One species.

Type: *Pseudochasmias major* Uchida, 1926. Original designation.

Resembles *Chasmias* in most of its characters. The propodeum is a little more elongate than in *Chasmias* and the areola bounded posteriorly in both sexes by a strong carina. The apex of the female antenna is a little more tapered than in *Chasmias*. The apical edge of the clypeus is truncate with a weak median angular projection. The upper edge of the face is unique in having a median, short, broad, angular, upward-projecting flange in place of the usual subantennal tubercle.

PSEUDODINOTOMUS Uchida, 1925. Trans. Nat. Hist. Soc. Formosa 15: 239. One species.

Type: *Pseudodinotomus tricolor* Uchida, 1925. Original designation.

A synonym of *Charitojoppa*, as noted by Uchida (1932. Insecta Matsumurana 7: 25).

PSEUDOTORBDA Uchida, 1932. Jour. Faculty Agr. Hokkaido Univ. 33: 195. One species.

Type: *Pseudotorbda geniculata* Uchida, 1932. Original designation.

A mesostenine genus of the subtribe *Echthrina*. The first tergite has a basal lateral triangular projection, the pleural carina of the propodeum is absent beyond the basal carina, the apical transverse carina of the propodeum absent, and the clypeus without a median apical tooth but with a subapical transverse ridge. Besides the genotype from Taiwan, I have seen one species from Japan and two from the Philippines.

PSYCHOSTENUS Uchida, 1955. Insecta Matsumurana 19: 32. Three species.

Type: *Psychostenus minusculae* Uchida, 1955. Original designation.

A synonym of *Ateleute*. *Talorga* and *Tsirirella* are also synonyms (all **new synonymies**).

PYCNOPHION Ashmead, 1900. Proc. U. S. Natl. Mus. 23: 87. One species.

Type: *Pycnophion molokaiensis* Ashmead, 1900. Original designation.

Related to *Enicospilus*. Cushman (1947. Proc. U. S. Natl. Mus. 96: 461-462) has discussed its characters.

PYCNOPYGE Cushman, 1922. Philippine Jour. Sci. 20: 552. One species.

Type: *Pycnopyge bella* Cushman, 1922. Original designation.

A distinctive Oriental genus placed in the Oedicephalini by Heinrich. It is adequately described and figured by Cushman in the original description.

RHEXIDERMUS Foerster, 1868. Verh. naturh. Ver. Rheinlande 25: 192. No species.

Ashmead, 1906. Proc. U. S. Natl. Mus. 30: 171. One species.

Type: *Rhexidermus japonicus* Ashmead, 1906. Monobasic.

This is the proper name for *Ischnus* of authors. The genotype of *Ischnus* (*porrectorius*) is a species of *Habrocryptus*, so *Ischnus* must be used in the Mesostenini, with *Habrocryptus* as a synonym, and *Ischnus* of authors, in the Alomyini, must be called by the name *Rhexidermus*. *Rhexidermus* as interpreted by Uchida (1926. Jour. Fac. Agr. Hokkaido Univ. 18: 166), however, is *Pseudoplatylabus*, and his species *Rhexidermus apicalis* must be called *Pseudoplatylabus apicalis* (**new combination**).

SCENOCHAROPS Uchida, 1932. Jour. Faculty Agr. Hokkaido Univ. 33: 202. One species.

Type: *Scenocharops longipetiolaris* Uchida, 1932. Original designation.

This genus is close to *Charops* but differs in having the areolet present but small (or occasionally absent) and the outer lower angle of the second discoidal cell slightly less than a right angle. It contains a number of Oriental species.

In 1946 I (Bol. Ent. Venezol. 5: 61) included *Schenocharops* in the genus *Charops* as an aberrant Oriental species group. I now agree with Uchida as to its generic distinctness.

STENARAEOIDES Uchida, 1932. Jour. Faculty Agr. Hokkaido Univ. 33: 181. Three species.

Type: *Mesostenus octocinctus* Ashmead, 1906. Original designation.

A synonym of *Gotra*. Uchida has published the synonymy (1940. Insecta Matsumurana 14: 121).

STENICHNEUMONOIDES Uchida, 1930. Insecta Matsumurana 5: 95. Three species.

Type: *Stenichneumon posticalis* Matsumura, 1912. Original designation.

This genus is intermediate between *Stenichneumon* and *Chiaglas*, having the clypeal and propodeal characters of the former and the post petiole without a distinctly raised median area as in the latter. Uchida (1937. Insecta Matsumurana 11: 93-94) has discussed the generic characters.

STREPSIMALLUS Foerster, 1868. Verh. naturh. Ver. Rheinlande 25: 176. No species.

Ashmead, 1905. Proc. U. S. Natl. Mus. 29: 115. One species.

Type: *Strepsimallus bicinctus* Ashmead, 1905. Monobasic.

This is an Oriental genus of the *Phobetes* group, tribe Gelini. I know only three species. Its generic characters are mostly the same as those of *Paraphylax* but the upper part of the temple is strongly convex, mat or rugosopunctate; and the scutellum is rather flat, mat or rugoso-punctate.

STRIATOSTENUS Uchida, 1931. Jour. Faculty Agr. Hokkaido Univ. 30: 177. One species.

Type: *Striatostenus areolatus* Uchida, 1931. Original designation.

A synonym of *Coesula* (**new synonymy**).

TAIWATHERONIA Sonan, 1936. Trans. Nat. Hist. Soc. Formosa 26: 256. One species.

Type: (*Taiwatheronia mahasenae* Sonan, 1936) = *Apechthis taiwana* Uchida, 1928. Original designation.

A synonym of *Ephialtes* Schrank, 1802 (**new synonymy**). A paratype of *T. mahasenae* in Uchida's collection was compared with the type of *Apechthis taiwana* Uchida, 1928, and found to be conspecific (**new synonymy**).

TAKANOMA Uchida, 1926. Jour. Faculty Agr. Hokkaido Univ. 18: 163. One species.

Type: *Takanoma ishiyamana* Uchida, 1926. Original designation.

Close to *Phaeogenes* but probably merits generic distinction. The Nearctic *Ichneumon vincibilis* Cresson, 1867 should be referred to *Takanoma* (**new combination**).

TAKASTENUS Uchida, 1931. Jour. Faculty Agr. Hokkaido Univ. 30: 188. One species.

Type: *Takastenus longidentatus* Uchida, 1931. Original designation.

This is a genus of the Mesostenina, close to *Buodias,* with a large number of Oriental species. *Chromocryptus albomaculatus* Ashmead, 1905, should be referred to it (**new combination**).

TEMELUCHA Foerster, 1868. Verh. naturh. Ver. Rheinlande 25: 148. No species.
Ashmead, 1904. Canad. Ent. 36: 101. One species.

Type: *Temelucha philippinensis* Ashmead, 1904. Monobasic.

This genus is *Cremastus* as understood by American authors, but according to recent information from J. F. Perkins in England the species commonly determined as *Cremastus spectator* Gravenhorst, the genotype of *Cremastus*, belongs in the group called *Zaleptopygus* in America. Mr. Perkins also reports that the genotype of *Tarytia* is congeneric with that of *Temelucha*. In view of this information *Tarytia* is hereby synonymized with *Temelucha,* which is the same as *Cremastus* of American authors, and true *Cremastus* is considered either the same as *Zaleptopygus*, or of uncertain identity until Gravenhorst's type of *C. spectator* can be examined.

TOGEA Uchida, 1926. Jour. Faculty Agr. Hokkaido Univ. 18: 109. Four species.

Type: *Togea albofasciata* Uchida, 1926. Original designation.

Close to *Neocratichneumon*, from which it differs most conspicuously, at least in the genotype, in lacking the lateral carina on the scutellum. Uchida (1937. Insecta Matsumurana 11: 93) states that *Barichneumonites* is a synonym, but this is a distinct genus.

TOSQUINETIA Ashmead, 1900. Canad. Ent. 32: 368. New name for *Obba* Tosquinet, preoccupied by Beck, 1837, and by Walker, 1869.

I have not studied material of this genus, but Heinrich (1938. Mém. Acad. Malagache 25: 36-37) has discussed its taxonomy, placing it near *Compsophorus* and *Pyramidellus* in the Listrodromini.

TYLOCOMNOIDES Uchida, 1940. Trans. Sapporo Nat. Hist. Soc. 16: 178. One species.

Type: *Tylocomnoides egawai* Uchida, 1940. Original designation.

A synonym for *Pseudometopius* (**new synonymy**).

UCHIDELIA, **new name** for *Itamus* Foerster, which see.

YAMATAROTES Uchida, 1929. Insecta Matsumurana 3: 180. Two species.

Type: *Yamatarotes bicolor* Uchida, 1929. Original designation.

This genus resembles *Arotes*, particularly in having an accessory tooth on the hind tarsal claws, but is distinct from *Arotes* in having the clypeus thin apically, not inflexed or impressed, and the intercubitus a little basad of the second recurrent.

YEZOCERYX Uchida, 1928. Jour. Faculty Agr. Hokkaido Univ. 25: 36. One species.

Type: *Yezoceryx scutellaris* Uchida, 1928. Original designation.

This is a genus of Acaenitini which includes many species from the eastern Palaearctic Region and the Indo-Australian area, and *Acaenitus rupinsulensis* from the United States (**new combination**).

ZAMESOCHORUS Viereck, 1912. Proc. U. S. Natl. Mus. 42: 152. One species.

Type: *Zamesochorus orientalis* Viereck, 1912. Original designation.

This is a synonym of *Edrisa* (**new synonymy**).

ZAPARAPHYLAX Viereck, 1913. Proc. U. S. Natl. Mus. 44: 647. One species.

Type: (*Zaparaphylax perinae* Viereck, 1913) = *Microtoridea lissonota* Viereck, 1912. Original designation.

A synonym of *Diatora* (**new synonymy**).

ZONOCRYPTUS Ashmead, 1900. Proc. U. S. Natl. Mus. 23: 40. One species.

Type: *Cryptus sphingis* Ashmead, 1900. Monobasic.

Cushman (1942. Proc. U. S. Natl. Mus. 92: 277-279) has redescribed the genotype and discussed the status of the genus. *Zonocryptus* comes within Waterston's definition of *Oneilella* (1927. Bull. Ent. Res. 18: 191-204), but Waterson's *Oneilella* is polyphyletic, as he was deceived by the common color pattern into thinking that at least two unrelated groups of species were congeneric. The color pattern involved occurs in a number of unrelated African Hymenoptera. It is evidently a mimicry pattern and as such should not be used as evidence for phyletic relationship. The genotype of *Oneilella* (*formosa* Brullé) is a species with which I am not familiar so it would not be profitable to speculate on the disposition of this generic name. *Zonocryptus sphingis* Ashmead is very close to *nigiriensis* Waterston.

I have the species *Oneilella latifascia* Waterston, 1927, *and O. nigeriensis* Waterston, 1927, which should be referred to *Zonocryptus* and also the species *O. subquadrata* Waterston, 1927, and *O. brevispicula* Waterston, 1927, which should be referred to Uchida's genus *Cochlidionostenus* (**new combinations**). Since Waterston states that *Cryptus corpulentus* Tosquinet, 1896, is closely related to *subquadrata* and *brevispicula*, this species also is referred to *Cochlidionostenus* (**new combination**).

ZONOPIMPLA Ashmead, 1900. Proc. U. S. Natl. Mus. 23: 55. One species.

Type: *Zonopimpla albicincta* Ashmead, 1900. Original designation.

Though Ashmead stated that the genotype was from "Africa" it is actually from Peru. The genus is related to *Scambus* (= *Epiurus*) and restricted to the Neotropic region. Cushman (1942. Proc. U. S. Natl. Mus. 92: 283) has discussed the genus. He synonymized it with "*Epiurus*," but it is distinct from "*Epiurus*" in lacking the occipital carina and in lacking sculpture on the the abdominal tergites.

ON THE VALIDITY OF HAEMAGOGUS SPEGAZZINII FALCO KUMM ET AL, 1946

(Diptera, Culicidae)

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Kumm *et al.* (1946) described a new *Haemagogus* from Colombia with hairy larva and male with short palps and bushy antennae, which could be clearly differentiated from *H. capricornii* Lutz, but appeared very close to *H. spegazzinii* Brethes, being separable from the latter species only by details of the mesosome of the male when viewed from the side. The new form was named *falco*, but the describers considered it doubtful whether the characters defining it were of sufficient importance to justify the creation of a new species and placed it as a subspecies of *spegazzinii*. In the same publication the name *H. janthinomys* Dyar, 1921, based on a species from the island of Trinidad, was relegated to the synonymy of *H. spegazzinii spegazzinii*.

Levi Castillo (1956), after examining the male terminalia of the hololectotype of *H. janthinomys*, concluded that this specimen shows the mesosome tip as in *falco*, and consequently sank *H. spegazzinii falco* Kumm *et al.*, 1946, in the synonymy of *H. janthinomys* Dyar, 1921.

The author is not in agreement with Levi Castillo's conclusions for the following reasons:

1) Cerqueira (1943) published a photomicrograph of the male terminalia of the hololectotype (then cotype) of *H. janthinomys*. As can be observed in this excellent reproduction, the terminalia is only partly dissected and the mesosome is in ventral view, thus not well oriented to judge the shape of its tip, which, as pointed out by Kumm *et al.* (loc. cit.),can best be studied in lateral view.

2) The author, on a visit to the U. S. National Museum, personally examined the hololectotype slide of the terminalia of *janthinomys*. Although the mesosome in this preparation is not in a good position to permit a conclusive judgment, it appears to belong to an intergrading form between *spegazzinii* and *falco*, close to the so-called "intermediate" type illustrated by Kumm and Cerqueira (1951) from areas of intergradation in Brazil.

3) Kumm *et al.* (loc. cit.) in the same paper in which they described *H. spegazzinii falco* from Colombia stated: "the name *janthinomys* becomes a synonym of *H. spegazzinii*, as material obtained from the type area of *spegazzinii*, near Ledesma, Argentina, is the same as that from the island of Trinidad, B.W.I., the type locality of *janthinomys*." This statement shows rather convincingly that these authors had material from Trinidad, as well as from Argentina, in front of them at the time they described *falco*, and found that specimens from Trinidad (*janthinomys*) were closer to type material of *spegazzinii* than to their new form.

4) The terminalia of 10 specimens of "*janthinomys*" from Trini-

dad in the collection of the Gorgas Memorial Laboratory have been dissected by the author and the mesosome mounted in lateral view. These specimens all show some degree of intergradation between *spegazzinii* and *falco*, but appear to be much closer to the former than to the latter (see photomicrographs).

5) More than a hundred mesosomes of males from Honduras, Nicaragua, Costa Rica and Panama examined by the author appear identical with material from Colombia (*falco*) and differ from the mesosomes of males from Trinidad (*janthinomys.*)

6) In mapping out the distribution of *spegazzinii* and *falco*, Kumm and Cerqueira (loc. cit.) show that while *spegazzinii* is quite abundant along the northeastern coast of Brazil, being found all the way up into the State of Amapá along the border with French Guiana, *falco* is not coastal at all but ranges throughout the northwestern corner of Brazil. Specimens from the island of Trinidad would be logically expected to fall closer to *spegazzinii*, the common form along the Atlantic littoral of northern Brazil, rather than to *falco* which is more Andean in distribution.

From these observations the author concludes that typical *falco* extends from northwestern Brazil and adjoining territories in Ecuador and Perú, through Western Venezuela and Colombia as far north as the north coast of Honduras. True *spegazzinii* occurs from northern Argentina and Bolivia, across eastern Brazil to French Guiana. The area of north-central Brazil, most of the Guianas, part of Venezuela, and the island of Trinidad (type locality of *janthinomys*) form a large intergrading zone where mesosomes of intermediate type are found, which neither correspond to typical *spegazzinii* nor to typical *falco*. Since the form *janthinomys* falls in this category, but appears closer to the former than to the latter, the author feels that there is no justification for sinking *H. spegazzinii falco* Kumm *et al.*, 1946, in the synonymy of *H. janthinomys* Dyar, 1921, and suggests that the latter be maintained in the synonymy of *H. spegazzinii spegazzinii* Brethes, 1912, as proposed by Kumm *et al.* (loc. cit.), and that *falco* be considered a valid name to designate a northern and western geographical race of *spegazzinii*.

EXPLANATION OF PLATE

Fig. A, *H. spegazzinii spegazzinii*. Mesosome of a male from "Rio de Janeiro, Brazil (without date) J. Lane"; fig. B, *H. janthinomys*. Mesosome of a male from "St. Pat's, Arima, Trinidad, (8-15)-12-54. T. H. G. Aitken." (Note similarity with mesosome shown in figure A); fig. C, *H. janthinomys*. Mesosome of a male from Tabaquite, Trinidad, (8-13)-1-55. T. H. G. Aitken"; fig. D, *H. spegazzinii falco*. Mesosome of a male from "Chorcha, Chiriqui, Panama, 5-6-50. P. Galindo." (Note differences with figures B and C); fig. E, *H. spegazzinii falco*. Mesosome of a male from "Rio Mesapa, El Negrito, Department of Yoro, Honduras, 4-9-54. P. Orjuela. (Northernmost specimen of the species thus far collected).

B

C

A

D

E

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INSECTS OF MICRONESIA, HOMOPTERA: FULGOROIDEA

by R. G. Fennah. Paper. Bernice P. Bishop Museum, Insects of Micronesia 6(3):[39]-211, 64 figs. Price $3.00.

This work will be an indispensable tool for specialists working in Fulgoroidea of the included Pacific area for many years to come. The introduction includes a resume of the distribution of the 54 genera and 135 species known from Micronesia, a reasonable discussion of the probable sources of the Micronesian fauna in the groups studied by the author, and a charmingly frank account of the interpretation placed on degrees of morphological differences in the case of groups below the genus category. The last appeared quite reasonable to the reviewer and undoubtedly it will appear so to others engaged in taxonomy in the seclusion of a laboratory where, like Fennah's, their evaluation of categories must rest on an appraisal of degrees of morphological differences, although "it is fully realized how poor an alternative such assessment must be for actual experimental investigation."

Although the work lacks keys in some groups (e.g., *Myndus* with 18 forms), the included keys offer bonuses in several instances, in that they include more than the area under treatment: the key to families is for the world, the generic key of Cixiidae includes the Philippine Islands and Australasia, and the latter area is included also in the generic keys of Delphacidae and Derbidae.

A minor weakness, but one worthy of comment because it occurs so commonly in works in Homoptera, is associated with Fennah's treatment of the subgenus *Sogatella* which in this and one previous work he has discussed clearly enough to make it obvious that several Western Hemisphere taxa should be included in the concept. One cannot doubt that the author was well aware of this, yet he failed to mention the forms by name. If other specialists, in making identifications (for field workers, for example) of the Western Hemisphere taxa place them in *Sogatella*, the publication of the new combination may, as a result, occur in some obscure organ not readily available to those who catalogue taxonomic literature. If the identifier purposely avoids this pitfall, and uses the older combination, he is placed in the position of delaying taxonomic progress. The reviewer subscribes to the opinion that it would have been preferable for Fennah to list by name all of the taxa he felt should be placed in his category *Sogatella*.

The descriptions are well written and the illustrations excellent and well arranged.—DAVID A. YOUNG, JR., *Entomology Research Branch, U. S. Department of Agriculture.*

THREE NEW SPECIES OF LIPOSCELIS (=TROCTES) (PSOCOPTERA) FROM TEXAS

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These descriptions have been withdrawn from a comprehensive paper in preparation, which treats of the Liposcelidae, so that published records of the psocids taken in Texas by Dr. A. B. Gurney in the fall of 1951 may be complete. The terminology used here, for the most part, follows that proposed by Mr. J. V. Pearman in his 1946 and 1951 papers. I am also greatly indebted to Mr. Pearman for numerous sketches and personal correspondence that were of tremendous help to me in getting acquainted with the book-lice. Dr. E. Broadhead contributed specimens of many of the species he has reared, and Dr. Gurney kindly lent his Texas collections for study. It is a pleasure to express my gratitude for the kind and generous assistance received from these three fellow-workers.

When standard "permanent" mounting media, such as balsam, Euparal, and Hoyer's, are used for book-lice there is a considerable decrease in visibility of the sculpturing on the integument, which often results in a complete loss of detail, especially after a lapse of time. Therefore these specimens were cleared in warm NaOH or KOH solution, then rinsed in water, and studied in temporary water-mounts containing a tiny bit of detergent to facilitate handling. Slight underclearing is recommended. Normal clearing, as for permanent mounts or overclearing, makes the specimens more difficult to find and to handle. After study the specimens were returned to alcohol. Upon contact with alcohol the partially dissolved contents of these undercleared specimens coagulate, so it may be necessary to transfer the specimen momentarily to KOH upon future examination to make it translucent again.

The measurements apply to cleared specimens in water-mounts, which are neither swollen nor shrunken because the gut ruptures when the specimen is rinsed and in so doing the psocid relaxes to normal size. The color descriptions refer to uncleared alcoholic specimens. In general there is a slight but progressive change in the sculpturing on the abdominal terga from III-IX. In an attempt to standardize comparisons the sculpturing on terga II and III is described for each species. It might be well to stress that "tergum I," as used here, is composed of what appear to be two terga (I and II of Broadhead), each of which is further subdivided into an anterior and a posterior strip. This composite tergum I contains only two rows of setae, the same as each following tergum, when the setae are arranged in rows. M: d(orsal) on tergum VII refers to the seta behind the spiracle.

Liposcelis lacinia n. sp.

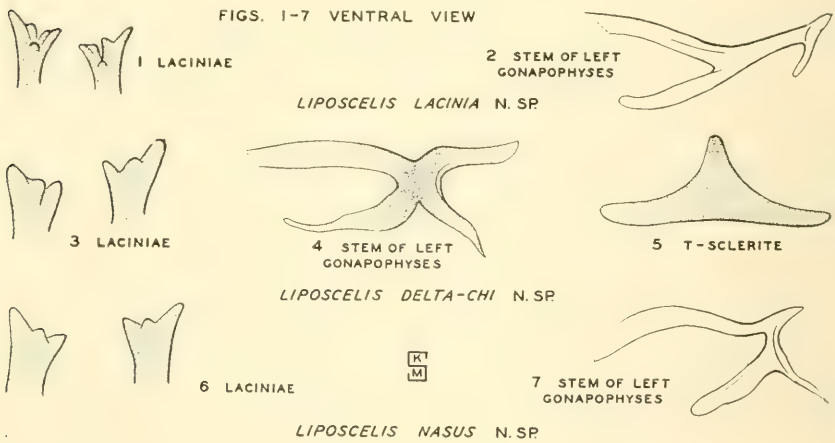
(Figs. 1 and 2)

On the basis of color this species superficially resembles the species in the

bostrychophilus complex, but differs from them and all other known species in the shape of the lacinia and in the combination of setation and sculpturing of the head, thorax, and abdomen, as well as abdominal infuscation.

Female.—Length 1.0 mm. Color dorsally against black background, almost uniformly light brown, exclusive of eyes.

Head: Proportions, length and width equal. Dorsally—Setae not dense, distance between them 1 to 2 times their length or 2 to 4 times width of areoles. Sculpturing areolate, imbricate; areoles ridge-marginate, 2 to 4 times longer than wide (the narrow ones toward mesal part of head) with 1 to 3 distinct nodules across width. Epicranial suture and arms indistinct. Eyes with 7 facets. Third antennal segment with approximately 16 rings. Ventrally—Prongs of lacinae incised and widely divergent (Fig. 1).



Thorax: Each lateral lobe of prothorax with long humeral seta plus 2 to 3 short setae usually posteriorly. Mesothorax with interrupted median internal thickening, lacking arched lateral thickenings, only 2 setae along each indistinct arch where lateral thickenings would be if present. Sculpturing on metathorax areolate, imbricate; areoles ridge-marginate, a few containing distinct modules. On anterior half of prothoracic sternum 3 long setae (median one slightly shorter), none posteriorly. On mesosternum 8 long setae in row anteriorly.

Abdomen: Infuscation of terga II and III diffuse, sculpturing behind each posterior row of setae similar to that anteriorly, and with very narrow but distinct linear intersegmental membrane between terga. Terga IV-VI with slightly paler band of sculpturing behind posterior row of setae. Pale median lineation on anterior margin of terga III-VII. Sculpturing of terga II and III areolate, not interrupted medianly; areoles long and narrow, about 5 to 7 times longer than wide, with margins ridged; areoles containing distinct modules, usually only 1 nodule across width of areole. Setae tending toward arrangement in 2 rows

across each of terga II-V, thereafter scattered; on tergum VIII density of unnamed setae similar to head. On terga VII, M: d,v both short; VIII, M: d short, v long, L short (not identifiable), stem of gonapophyses long, slender, bifid (Fig. 2), T-sclerite normal; IX, M: d,v subequal, D present, 8 setae in apical row between marginals; epiproct, 2 longest setae in second row.

Male.—Unknown.

Holotype, cleared female in alcohol, Kerrville, Tex., Sept. 20, 1951, under sycamore bark on tree trunks beside river, A. B. Gurney. Deposited in U. S. National Museum.

Liposcelis delta-chi n. sp.
(Figs. 3 to 5)

This species is most closely related to *entomophilus* (Endl. 1907) but can be distinguished readily from it by the darker color and different color pattern, and by the shape and conspicuous brown color of the T-sclerite and stem of the gonapophyses.

Female: Length 1.4 mm. Color dorsally against black background—head, femora and anterior three-fourths of abdomen light yellow-brown, thorax light brown, tip of abdomen brown; indefinite lateral fuscous patches on abdominal terga becoming progressively larger posteriorly. Ventrally—part of paraprocts, stem of gonapophyses, and T-sclerite conspicuous brown.

Head: Proportions, length to width at 25 to 24. Dorsally—Setae dense, distance between them ½ to 1 times their length or 1 to 4 times width of areoles. Sculpturing areolate, imbricate; areoles delicately ridge-marginate and narrow, especially toward middle of head, those near eyes more boldly ridge-marginate and wider; areoles for most part with extremely fine pin-point nodules, too fine to count, but a few toward middle of head and near eyes with large, distinct nodules; areoles 2 to 5 times longer than wide. Epicranial suture and arms distinct, suture with internal thickening posteriorly. Eyes with 8 facets. Third antennal segment with approximately 20 rings. Ventrally—Prongs of laciniae stubby (Fig. 3).

Thorax: Each lateral lobe of prothorax with long humeral seta plus 2 to 3 slightly shorter setae on anterior margin, and 3 to 5 shorter setae posteriorly. Mesothorax with distinct median internal thickening with adjoining arched lateral thickenings having 5 setae, including 1 mesally, along each lateral arch. Sculpturing on metathorax areolate, areoles nodule-marginate and containing distinct nodules. On anterior half of prothoracic sternum, 6 to 7 long setae in arched row, the posterior ones longest, none isolated on posterior half. On mesosternum, 8 to 9 setae in row anteriorly.

Abdomen: Infuscation of terga II and III diffuse, with very narrow but distinct linear intersegmental membrane between terga; terga V-VI with paler band of sculpturing posteriorly. Bold median lineations on anterior margin of terga II-VII. Sculpturing on terga II and III non-areolate but distinctly nodulate, suggestive of patterned stippling. Unnamed setae on tergum VIII truncate, numerous and scattered, as dense as setation on head. On terga VII, M: d, v long, subequal, but not so long as VIII M: VIII, M: d, v long, subequal, L present, stem of gonapophyses extremely short and stout, wider than long, bifid,

(Fig. 4), T-sclerite (Fig. 5); IX, M: d, v subequal, D present; epiproct, 2 longest setae in second row.

Male.—Unknown.

Holotype, uncleared female in alcohol, Garner State Park, Texas, Sept. 22, 1951, beating mesquite with air plants on twigs, A. B. Gurney. *Paratype*, cleared female in alcohol, same data. Both specimens deposited in USNM.

The name refers to the conspicuous brown T-sclerite and stem of the gonapophyses, the first being somewhat deltoid in shape and the latter suggestive of the Greek letter "X".

Liposcelis nasus n. sp.
(Figs. 6 and 7)

This species is perhaps most closely (but rather remotely) related to *hirsutus* Badonnel 1948 from which it differs in many ways, the most conspicuous being color and color pattern, and sculpturing of the head.

Female.—Length 1.4 mm. Color dorsally against black background yellow-buff; indefinite fuscous patch (pigment granules) antero-mesad of each eye and at tip of second antennal segment; labrum and anterior part of clypeus brown gradually fading to yellow-buff at vertex of head; terminal part of abdomen pale.

Head: Proportions, length to width as 22 to 20. Dorsally—Setae not dense, distance between them equal to their length. Sculpturing areolate, imbricate; areoles ridge-marginate (some fused nodule-marginate), areoles containing 1 to 2 small nodules across width; areoles 3 to 8 times longer than wide, narrow ones toward middle of head. Epicranial suture indistinct. Eyes with 8 facets. Third antennal segment with approximately 14 rings. Ventrally—Prongs of laciniae normal (Fig. 6).

Thorax: Each lateral lobe of prothorax with long humeral seta plus 2 shorter setae on anterior margin and 3 to 4 posteriorly. Mesothorax with short median internal thickening, lacking arched lateral thickenings. Sculpturing on metathorax nonareolate but distinctly nodulate, suggestive of patterned stippling. On anterior half of prothoracic sternum 4 to 5 long setae, none on posterior half. On mesosternum 8 to 9 long setae in row anteriorly, lateral ones longest.

Abdomen: Infuscation on terga II and III diffuse, with very narrow but distinct linear intersegmental membrane between terga. Terga IV-VI lacking obvious pale band of sculpturing posteriorly. Sculpturing on terga II and III nonareolate but distinctly nodulate, suggestive of patterned stippling, not interrupted medianly. No median lineations or heavy infuscation on anterior margin of terga II-VII. Two longer setae near mid-line on terga VII, VIII and IX. Unnamed setae on tergum VIII not so dense as on head. On terga VII, M: d short, v long, but not so long as VIII M; VIII, M: d, v long, subequal, L short (not identifiable), stem of gonapophyses very wide, delicate, bifid (Fig. 7), T-sclerite normal; IX, M: d, v subequal, D present; epiproct, 2 longest setae in second row.

Male.—Length 0.8 mm. Differs from female as follows: Fuscous markings much less conspicuous.

Head: Proportions, length to width as 16 to 15. Eyes with 5 facets. Lacinia similar to female but more delicate.

Thorax: Each lateral lobe of prothorax with long humeral seta plus 1 slightly shorter seta on anterior margin and 2 shorter ones posteriorly. On anterior half of prothoracic sternum 4 long setae, none posteriorly. On mesosternum 6 long setae in row anteriorly.

Holotype, uncleared female in alcohol, Mission, Tex., Sept. 30, 1951, beating Fan palm leaves, A. B. Gurney. *Allotype,* same data. *Paratypes,* 21 females (3 cleared) same data. All deposited in U. S. National Museum excepting 1 uncleared and 2 cleared paratypes, which are in my collection. Additional Texas records taken by A. B. Gurney in 1951 include: 2 mutilated females, same data as holotype; Mission, Bentson State Park, Sept. 28, beating mesquite, ♀; Mission, Sept. 30, beating ebony bushes on pasture land, ♀; Weslaco, Oct. 1, beating dead leaves on palm trees, ♂, 8 ♀; S. of Brownsville, Rabb Palm Grove, Oct. 3, beating dead palm leaves, ♂, 2 ♀; 9 mi. N. of Brownsville, Olmita Resaca, Oct. 4, beating palms and palmettos ♂, 2 ♀.

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ASHMEAD'S METEORIDEA

(HYMENOPTERA: BRACONIDAE)

R. D. SHENEFELT, *University of Wisconsin, Madison,* and C. F. W. MUESEBECK, *United States National Museum, Washington, D. C.*

In 1900 Ashmead (Proc. U. S. Nat. Mus. 23: 128, 129) briefly characterized the genus *Meteoridea* in his key to the Microdini. The description as extracted from the key is as follows:

"First cubital and first discoidal cells separated; areolet wider than long, trapezoidal; first abscissa of the radius thrice as long as the second; marginal cell very wide; maxillary palpi 5-jointed; abdomen narrow, subcompressed and acute at apex, the first segment long, petioliform, coarsely rugulose, the sides parallel.

Meteoridea Ashmead, new genus
(Type, *Meteoridea longiventris* Ashmead, manuscript.)"

Szepligeti (1904, Genera Insectorum, fasc. 22:100) repeated Ashmead's description and placed the genus in the Agathidinae. Muese-

beck and Walkley (1951, *in* Muesebeck *et al*, U. S. Dept. Agr., Agr. Monog. No. 2, p. 109) transferred *Meteoridea* to the Diospilini. Meanwhile, Nixon (1941, Bull. Ent. Res. 32:98-101) described from Ceylon a monobasic diospiline genus which he named *Benama* (type, *B. hutsoni* Nixon). In this paper Nixon described in some detail the unusual modification of the female abdomen. In 1949 Granger (Mém. Inst. Sci. Madagascar, A 2:361-363) described two additional species in *Benama* from Madagascar.

Since, in our opinion, *Benama* is clearly the same as *Meteoridea,* and since two new species have been discovered, one from the United States and one from Japan, it seems desirable that *Meteoridea* be redescribed and that the type species be described in more detail. The two new species will also be described.

METEORIDEA Ashmead

Meteoridea Ashmead, 1900. Proc. U. S. Nat. Mus. 23: 129.

Type: *M. longiventris* Ashmead, by monotypy and original designation.

Benama Nixon, 1941. Bull. Ent. Res. 32: 98. **New synonymy.**

Type: *B. hutsoni* Nixon, by monotypy and original designation.

Nixon's excellent description of the type of *Benama* leaves no doubt that this species belongs in *Meteoridea,* a genus he did not know since it had been inadequately described and had been incorrectly placed by its author in the Agathidinae. Following is a summary of what seem to be the significant distinguishing characters of *Meteoridea:*

Head carinately margined behind; eyes bare; clypeus separated from face by a distinct groove; maxillary palpi 6-segmented; labial palpi 4-segmented; antennae slender, filiform. Notaulices complete, well impressed, not meeting behind; prepectus strongly carinately margined; legs slender, calcaria of hind tibia very short and inconspicuous, tarsal claws simple; anterior wing with three cubital cells, the second subquadrate or subtrapezoidal, the first cubital and first discoidal cells separated. Abdomen narrowly sessile, strongly compressed apically in the female; spiracles of second and third segments situated on the sides, far below the acute lateral margins of the tergites; ovipositor sheath subexserted.

Meteorus longiventris Ashmead

Meteoridea longiventris Ashmead, 1900. Proc. U. S. Nat. Mus. 23: 129; Szepligeti, 1904. Genera Insectorum, fasc. 22: 100; Muesebeck and Walkley, 1951. *In* Muesebeck *et al.*, U. S. Dept. Agr., Agr. Monog. No. 2, p. 109.

The following redescription is based on Ashmead's type and one additional female specimen that was collected at light by R. A. Morse, April 19, 1955, in Alachua County, Florida.

Female.—Length about 4.2 mm. Head and thorax honey-yellow; antennae yellow basally, darkened apically; wings clear hyaline, stigma hyaline, veins in middle of anterior wing yellowish brown; legs entirely pale yellow; abdomen reddish yellow, with first and second tergites more or less piceous.

Head a little wider than thorax, smooth and polished; temple narrow, receding, not more than one third as wide as eye; eyes very large; malar space exceedingly

short, almost absent; clypeus with anterior margin sinuate and somewhat elevated; antennae broken in type, nearly as long as the body and 26-segmented in the other specimen.

Notaulices sharply, deeply impressed, foveolate; mesonotal lobes and disc of scutellum perfectly smooth and polished; mesopleuron with a broad, rugulose longitudinal impression below; propodeum rugose reticulate; radius arising from slightly behind middle of stigma; first discoidal cell sessile or subsessile; first abscissa of radius twice as long as second and subequal with first intercubitus; recurrent vein entering first cubital cell; nervellus nearly perpendicular to anterior margin of hind wing and weakly angled or curved near middle.

Abdomen much narrower than thorax; first tergite finely, longitudinally rugulose, more than three times as long as broad at base and one and one-half times as broad at apex as at base, and with a large, deep fossa at base on each side; suturiform articulation very fine but distinct; second and following tergites smooth and polished.

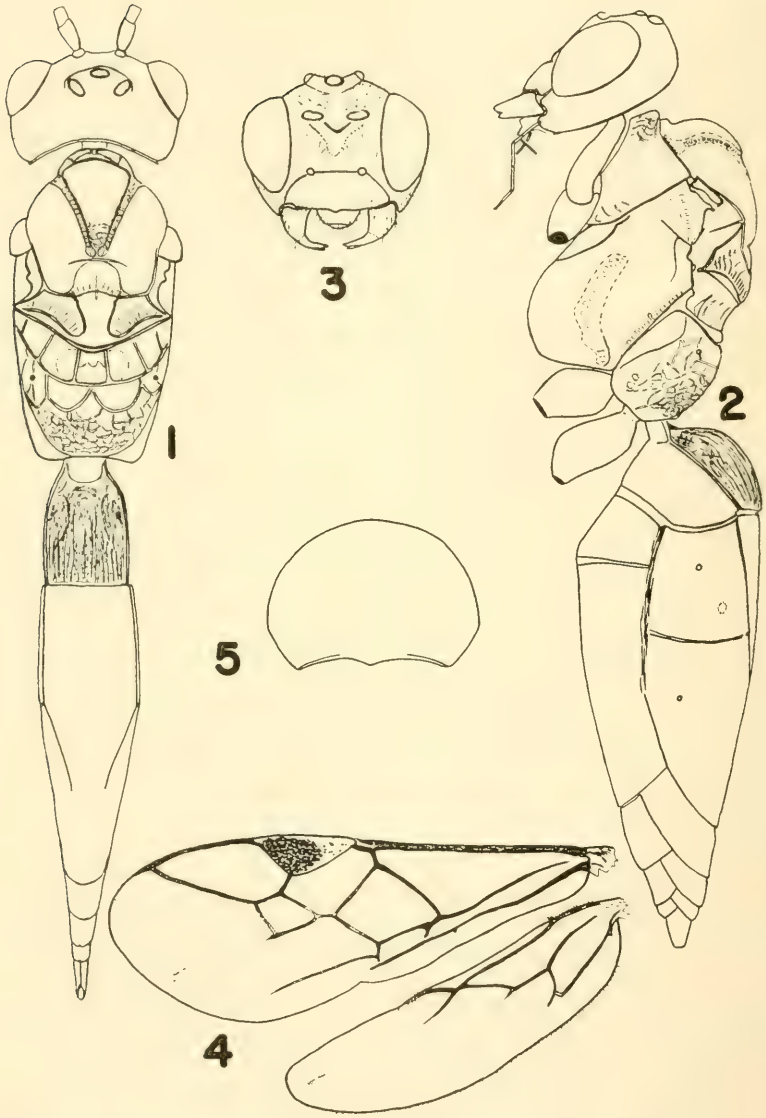
Meteoridea compressiventris, new species
(Figs. 1, 2, 3, 4)

Differs from the genotype and only other North American species in numerous details but especially in its piceous head, largely dark stigma, strongly petiolate first discoidal cell, and outwardly directed nervellus.

Female.—Length 4.7 to 5.4 mm. Head piceous; basal half of mandible tan; palpi yellowish tan; antenna fuscous, with scape and pedicel testaceous; thorax largely light fuscous, propodeum a little darker than remainder; tegulae yellow; legs testaceous; abdomen with first tergite and lateral margins of conjoined second and third tergites brownish, otherwise testaceous, becoming paler ventrally and apically; wings hyaline, veins brownish, stigma brown with basal third pale.

Head about twice as wide as long, broader than thorax, smooth and shining; eyes large; malar space less than half as long as clypeus; face 1.5 times as wide at lower edges of antennal sockets as deep from this line to clypeal suture, a little swollen below antennae; clypeus three times as wide as deep, its apical margin nearly straight but with a weak projection centrally; ocelli large, greatest diameter of a lateral ocellus equal to length of pedicel and nearly as long as ocell-ocular line; antennae nearly as long as body, with 30 segments in type and 28 in one paratype; pedicel two-thirds as long as scape; first flagellar segment slightly longer than scape and pedicel combined; genae, temples, basal two-thirds of mandibles; apex of labrum, clypeus, vertex, and face with scattered yellowish hairs, which are absent on a shining depressed area above antennae.

Pronotum coarsely crenulate in depressed area on side; mesonotum shining, with minute punctures which are numerous on middle lobe and scattered on lateral lobes; notaulices deep, complete but not meeting posteriorly, foveolate, a rugulose area between their posterior ends; prescutullar fovea two-thirds as long as disc of scutellum, divided into two parts by a median carina; disc of scutellum convex, virtually smooth; propodeum largely covered with irregular reticulations but with two large, nearly semicircular, basal areas smooth and polished; propodeal spiracles small, circular in outline; mesopleuron largely smooth, a little roughened next to prepectal carina and metapleuron; mesopleural furrow foveolate



Meteoridea compressiventris, female: Fig. 1, Dorsal aspect; fig. 2, lateral aspect; fig. 3, anterior view of head; fig. 4, wings. *Meteoridea japonensis*, female: fig. 5, outline of clypeus.

posteriorly, rugulose anteriorly; legs moderately slender; radius arising from a little beyond middle of stigma; first abscissa of radius 0.8 the length of second; second cubital cell much narrower above than below; first discoidal cell strongly petiolate, the petiole one-third the length of the free portion of first abscissa of cubitus; recurrent vein entering first cubital cell; hairs on submedian and second discoidal cells a little longer and denser than elsewhere; nervellus strongly directed outward, angled far below the middle; lower abscissa of basella about half as long as mediella.

Abdomen long and narrow, five or more times as long as its greatest width, greatly compressed apically and with six exposed tergites; first tergite strongly arched, longitudinally rugulose punctate although with some small transverse rugae near basal impression, its spiracles small and situated very slightly before the middle; remainder of abdomen smooth and polished, the suturiform articulation nearly effaced; first tergite about half as wide at apex as long; second one and one-half times as long as wide at base, an oval "lunula" on the side above and behind the spiracle; terminal segments retractile.

Male.—Unknown.

Type.—U. S. National Museum No. 63094.

Described from three females, all taken by R. D. Shenefelt from a light trap at Gordon Nursery, Douglas Co., Wis., in 1951. The holotype was collected June 30; one of the paratypes, collected June 21, is deposited in the collection of the University of Wisconsin, the other, taken July 4, is in the collection of R. D. Shenefelt.

Meteoridea japonensis, new species
(Fig. 5)

Meteoridea sp. Haeussler, 1940. U. S. Dept. Agr. Tech. Bull. 728:30.

Superficially very similar to *longiventris*, but differs in having the temples broader and more convex, in the first and second abscissae of radius being subequal, and in the first tergite being parallel-sided behind the spiracles.

Female.—Length 4 mm. Head yellow; apical third of mandible piceous; antennae basally unicolorous with face, becoming fuscous beyond basal third; thorax concolorous with head, the propodeum sometimes slightly darker; legs yellow; first tergite brownish yellow and parts of the second and third tergites also a little darkened, remainder of abdomen concolorous with head and thorax; wings hyaline, stigma yellowish hyaline edged with brownish.

Head smooth and polished, transverse, broader than thorax; eyes large; malar space almost absent; face not or only very slightly wider than deep, moderately swollen below antennae; clypeus about half as deep as broad, the anterior portion reflexed laterally, the anterior margin somewhat sinuate but with a blunt projection centrally (fig. 5); greatest diameter of a lateral ocellus equal to length of pedicel but distinctly shorter than ocellocular line; antennae 29-segmented in the type; first flagellar segment as long as scape and pedicel combined and a little longer than the second; occipital carina incomplete, narrowly interrupted at the middle; genae and face with scattered pale hairs that are longest on the lower portions; basal two-thirds of mandibles, clypeus, and lower part of labrum with long yellowish hairs.

Mesonotum shining, smooth except for small, scattered hair pits; notaulices deep, foveolate, well separated at posterior ends; prescutellar furrow nearly half as long as scutellum and divided into two parts by a median longitudinal carina; scutellum weakly convex; propodeum with strong carinae separating irregular, small, more or less roughened areas, a pair of strong carinae diverging slightly from the center of base of propodeum to posterior face and then diverging sharply to form a border between the dorsal and posterior faces; propodeal spiracles small, broadly ovate; mesopleuron shining, with scattered punctures; mesopleural furrow foveolate, about half as long as mesopleuron; legs slender; spurs of hind tibia so small as to be barely distinguishable from the hairs; anterior wing with radius emerging slightly beyond middle of stigma; first abscissa of radius as long as the second and shorter than first intercubitus; second cubital cell subtrapezoidal, its anterior side about two-thirds as long as posterior side which is subequal to first intercubitus; first discoidal cell sessile; recurrent vein entering first cubital cell; nervulus postfurcal by about its length; nervellus slightly curved, not distinctly angled; lower abscissa of basella less than one-third as long as mediella.

Abdomen very narrow, about eight times as long as broad across second tergite, strongly compressed apically; first tergite in lateral view strongly arched on basal third, nearly three times as long as broad at apex, the sides nearly parallel except at base, the surface irregularly longitudinally rugulose, the spiracles at end of basal third; second tergite twice as long as broad at apex, irregularly and very weakly longitudinally aciculate, separated from third by a very fine grooved line; remainder of abdomen smooth and polished.

Male.—Like the female except in the secondary sexual characters and in the following additional respects: propodeum and first tergite not darkened; antennae 35-segmented in the allotype; temples somewhat broader; abdomen not compressed; second tergite about as long as broad at apex; third and following tergites combined about as long as first tergite.

Type.—U. S. National Museum No. 63252.

Described from three specimens: the holotype, reared from *Grapholitha molesta* (Busck), August 1, 1933, Mitsuoka, Nagano, Japan; the allotype, reared from *Anacampsis metagramma* Meyr., July 22, 1937, Tsunashima, Kanagawa-kon, Japan, and a female paratype reared from *G. molesta* August 16, 1933, Heitaku, Keikido, Chosen. The paratype has the second tergite smooth and shining.

Other Species of Meteoridea

The other known species of *Meteoridea* are the following:

Meteoridea hutsoni (Nixon), **new combination.**

Benama hutsoni Nixon, 1941. Bull. Ent. Research 32: 98.

Meteoridea infuscata (Granger), **new combination.**

Benama infuscata Granger, 1949. Mém. Inst. Sci. Madagascar A2: 363.

Meteoridea testacea (Granger), **new combination.**

Benama testacea Granger, 1949. Mém. Inst. Sci. Madagascar A2: 362.

DESCRIPTIONS AND RECORDS OF NORTH AMERICAN MELOIDAE. I. (COLEOPTERA)

RICHARD B. SELANDER, *Illinois Natural History Survey*

The Meloidae described in this paper are additions to the fauna of the southwestern United States and northern Mexico. I am indebted to H. B. Leech, A. T. McClay, J. W. MacSwain, F. H. Parker, P. Vaurie, and F. G. Werner for supplying most of the material upon which the paper is based.

Pyrota bicurvata, new species

Pyrota virgata [error for *divirgata*], Schaeffer, 1905, Mus. Brooklyn Inst. Arts and Sci., Sci. Bull. 1:177. Misidentification.

Pyrota tenuicostatis, Dillon, 1952, Amer. Midland Nat. 48:360. Misidentification, in part.

Yellow-orange, the elytra paler. First two segments of antennae and first three segments of maxillary palpi orange, the other segments black. Labrum largely or completely black. Head with one or three black spots on neck, occasionally with some black on gula, always with a pair of black spots on frontal area between eyes. Pronotum with a pair of large, black discal spots just behind middle and a pair of smaller spots on each side, one just anterior to discal spots and the other on the anterior angle of the pronotum, not quite attaining the margin; occasionally there are one or more black spots on each of the posterior angles of the pronotum. Elytra each with a large, oval black scutellar spot and a moderately broad black discal vitta which, except where it is narrowed to avoid the scutellar spot, is about one-third the width of the elytron. Fore and middle coxae orange; hind coxae varying from black tipped with orange to largely orange. Femora and tibiae cleanly tipped with black. Under surface black with orange markings of variable extent; in the darkest specimens the margins of the thoracic sclerites, a broad marginal area of the fifth visible abdominal sternite, and the sixth visible sternite are orange; in the lightest the thorax is largely orange, the first four visible sternites are broadly bordered with orange, and both the fifth and sixth visible sternites are orange. Upper surface subglabrous; under surface sparsely clothed with short, pale pubescence. Length: 7-17 mm.

Head and pronotum smooth, shiny, with scattered larger punctures and fine, sparse micropunctures. Pronotum depressed anteriorly, one-fifth to one-fourth longer than broad. Elytra finely, densely punctate; surface finely granulose, not at all rugulose, less shiny than head and pronotum, not swollen between costulae.

First segment of middle and hind tarsi with pad (pale pubescence) limited to apex or absent. Hind tibial spurs thickened and obliquely truncate, the outer spur heavier; truncature of outer spur usually broadly oval but varying occasionally to a more elongate and pointed form.

Male.—Antennae with segment II curved in the same direction as I; III strongly compressed and curved in the opposite direction (fig. 9). Last segment of maxillary palpi (fig. 1) modified but not greatly enlarged; length equal to about two-thirds distance between eyes on frontal area; beneath with sensory surface limited to basal half or less of segment, hardly or not at all concave. Fore tarsi somewhat expanded but not asymmetrically produced. Sixth visible abdominal

sternite with a relatively shallow, broadly triangular emargination;[1] membranous zone large, with much shorter setae along emargination and at center than along anterior and lateral margins. Genitalia as in figure 5; gonostyli nearly straight; dorsal hook of aedeagus sharply bent at apex.

Female.—Antennae with segments II and III at least slightly curved but III not compressed. Maxillary palpi and fore tarsi not modified. Sixth visible abdominal sternite obtusely emarginate, as in figure 7.

Distribution.—Gulf Coast from Texas to eastern San Luis Potosí.

Type Material.—Holotype male and allotype female from [Ciudad] Victoria, Tamaulipas, May 22, 1952, M. Cazier, W. Gertsch, and R. Schrammel, in the collection of the American Museum of Natural History. Paratypes: NUEVO LEÓN: 1 female, Linares, Sept. 11, 1947, F. Johnson donor, collectors C. and P. Vaurie; 1 female, Monterrey, June 15, 1941, H. S. Dybas; 2 females, Vallecillo, June 2-5, 1951, P. D. Hurd. SAN LUIS POTOSÍ: 1 female, 11 km. E Ciudad de Valles, May 29, 1948, tropical jungle pass, F. Werner and W. Nutting. TAMAULIPAS: 6 males, 7 females, eutopotypical; 1 male, Ciudad Victoria, Sept. 11, 1947, F. Johnson donor, collectors C. and P. Vaurie; 1 male, Ciudad Victoria, Aug. 19, 1941, H. S. Dybas; 1 male, 1 female, Abasolo, May 17, 1952, M. Cazier, W. Gertsch, and R. Schrammel. TEXAS: 1 male, 3 females, state label only, Aug., 1904; 2 males, 11 females, Brownsville, May 30 and June 5, 1932, J. O. Martin; 1 male, Edinburg, S. Mulaik; 1 female, Edinburg, Hidalgo County, April, 1939, S. and D. Mulaik; 1 female, Harlingen; 1 female, Hearne, June 7, 1937, K. Maehler; 1 male, Naval Air Station, Corpus Christi, July 21, 1942, W. M. Gordon; 1 male, 1 female, Weslaco, Sept. 15, 1931, S. W. Clark. Paratypes in the collections of W. R. Enns, R. B. Selander, F. G. Werner, the American Museum of Natural History, the California Academy of Sciences, the Illinois Natural History Survey, and the University of California at Berkeley.

This species appears to be most closely related to *divirgata*, with which it has been confused. Although I have not seen the specimens from Brownsville, Tex., identified as *divirgata* by Schaeffer, his description leaves little doubt that they represent *bicurvata*. Schaeffer's record seems to have been the basis for the inclusion of *divirgata* in the Leng catalogue. True *divirgata* is not known to occur north of Veracruz.

In Dillon's report on the Meloidae of Texas at least one specimen of *bicurvata* (*i.e.*, a male from Edinburg) was recorded under the name *tenuicostatis*. A number of additional specimens studied have been similarly misidentified by others. The species *tenuicostatis* apparently occupies the entire range of *bicurvata* but is known to extend farther south. I have seen specimens of *tenuicostatis* from Texas, Tamaulipas, and Veracruz. The species has been recorded also from Tabasco.

[1]In dealing with either sex of species of *Pyrota* it is usually necessary to relax specimens to determine the true form of this sternite.

Pyrota bicurvata might be confused also with *trochanterica*, a far-western species treated below. Pending a much-needed revision of the genus *Pyrota* the following key will serve to distinguish *bicurvata*, *divirgata*, *tenuicostatis*, and *trochanterica* from one another.

1. Basal two or three antennal segments pale 2
   Antennae entirely black 3
2. Antennal segment III curved in both sexes, strongly compressed in male (fig. 9); pronotum with two spots on each side before middle; male with last segment of maxillary palpi not greatly enlarged, beneath with sensory surface covering basal half or less (fig. 1); female with sixth visible abdominal sternite obtusely emarginate (fig. 7) (Texas to San Luis Potosí) ..... *bicurvata* Selander
   Antennal segment III not modified; pronotum with at most one spot on each side before middle; male with last segment of maxillary palpi greatly enlarged, beneath with sensory surface covering all but apex (fig. 2); female with sixth visible abdominal sternite triangularly emarginate (Guerrero and Oaxaca to Veracruz) ..... *divirgata* (Villada and Peñafiel)
3. Dark orange; elytra weakly costate; male with last segment of maxillary palpi extremely elongate, scaphiform (fig. 4), first three segments of fore tarsi strongly produced anteriorly at apex; female with sixth visible abdominal sternite weakly notched at apex (Texas to Tabasco) ..... *tenuicostatis* (Dugès)
   Yellow-orange; elytra not costate; male with last segment of maxillary palpi pyriform (fig. 3), fore tarsi expanded but not asymmetrically produced; female with sixth visible abdominal sternite triangularly emarginate (fig. 8) (Baja California, Sonora, and Arizona) ..... *trochanterica* Horn

Pyrota trochanterica Horn

This species has been recorded previously only from the type locality in Baja California. It is now known from a second locality in Baja California and has been found also in southern Arizona and Sonora, where it is represented by a distinct race.

Yellow-orange. Head and pronotum marked with black. Antennae and maxillary palpi black. Labrum largely or entirely black or brownish. Elytra each with a large, oval black scutellar spot and a very broad back vitta, which, except where it is narrowed to avoid the scutellar spot, is at least three-fifths the width of the elytron. Tarsi black. Under surface black, with at most the margins of the thoracic sclerites and the hind margin of the abdominal sternites orange; sixth visible abdominal sternite of female almost always orange at tip. Upper surface subglabrous; under surface sparsely clothed with short, pale pubescence.

Head and pronotum smooth, shiny, with scattered larger punctures and fine micropunctures. Pronotum depressed anteriorly, one-fifth to nearly one-third longer than broad. Elytra rather coarsely, very densely punctate; surface finely granulose, distinctly rugulose, uneven, less shiny than head and pronotum, not swollen between costulae.

First segment of hind tarsi with pad (pale pubescence) limited to apex. Hind tibial spurs thickened, obliquely truncate, the outer spur heavier; truncature of both spurs elongate, pointed.

Male.—Antennae unmodified; segment III as long as or longer than IV, simi-

lar to it in shape, not at all expanded or curved. Last segment of maxillary palpi (fig. 3) modified, greatly enlarged; length nearly or fully equal to distance between eyes on frontal area; beneath with sensory surface deeply concave, covering all but apex of segment. Fore tarsi somewhat expanded but not asymmetrically produced. Fifth visible abdominal sternite noticeably emarginate. Sixth deeply and acutely emarginate; membranous zone large, with setae of nearly uniform length. Genitalia as in figure 6, with a fairly wide range of individual variation; gonostyli divergent apically, strongly curved dorsad; dorsal hook of aedeagus slightly hooked at apex.

Female.—Maxillary palpi and fore tarsi not modified. Sixth visible abdominal sternite triangularly emarginate, as in figure 8.

This species, like *bicurvata*, seems to be most closely related to *divirgata*. Two subspecies of *trochanterica* may be recognized, as follows.

Pyrota trochanterica trochanterica Horn

Pyrota trochanterica Horn, 1894, Proc. Calif. Acad. Sci. (2)4:439.

More heavily marked with black than *t. werneri*. Neck, occiput, and gula black; vertex usually with black markings at sides, these often fusing with occipital marking; frontal area with a heavy spot, usually touching eyes and extending to lower margin of frontal area. Pronotum with a basic pattern of a pair of discal spots and a spot on each side anterior to the discal spots, but the pattern is masked to a greater or lesser extent by fusion of the spots; black markings reaching basal margin of pronotum. Scutellar spot and vitta of each elytron narrowly separated or fused. Femora black. Tibiae black for apical third (occasionally entirely black). Abdomen, except, usually, tip of sixth visible sternite of female, black. Length: 8-19 mm.

Male.—Fore tarsi more strongly expanded than in *t. werneri*.

Distribution.—Cape region of Baja California.

Records.—Baja California Sur: 10 mi. NW La Paz, Oct. 6, 1941, Ross and Bohart, 17; Sierra El Chinche, 2 (Horn type material).

Type Locality.—Sierra El Chinche, Baja California Sur. The type locality is a small mountain range about 10 miles north of San Lucas, Baja California Sur, at approximately 23°N-110°W (see Michelbacher and Ross, 1942, Proc. Calif. Acad. Sci., (4)24(1), pl. 3).

The frontal black mark is reduced in 6 of the 19 specimens studied to the small spot or pair of spots found in some *t. werneri*. The pronotal spots are fused on each side in all but 3 specimens and in these the lateral spots extend to the basal margin of the pronotum. In the

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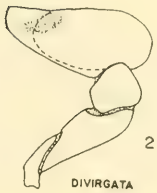
EXPLANATION OF FIGURES

Species of *Pyrota* as labeled.—Figs. 1 to 4, Right maxillary palpus of males, dorsal view (broken line indicates extent of ventral sensory surface); figs. 5 and 6, male genitalia, ventral and lateral views of gonoforceps, and lateral view of aedeagus; figs. 7 and 8, sixth visible abdominal sternite of females; fig. 9, basal antennal segments of male, lateral and dorsal views. Localities for specimens figured: *P. bicurvata*, Ciudad Victoria, Tamaulipas; *divirgata*, Mexcala, Guerrero; *tenuicostatis*, Laredo, Tex.; *trochanterica*, Tucson, Ariz., (figs. 3 and 8) and 10 mi. NW La Paz, Baja California Sur (fig. 6).

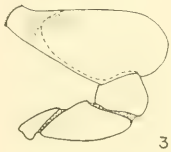
1

BICURVATA



2

DIVIRGATA

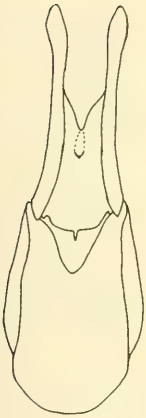


3

TROCHANTERICA

4

TENUICOSTATIS



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BICURVATA

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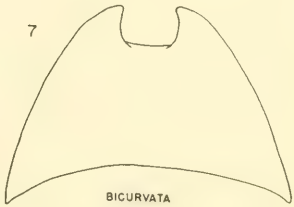

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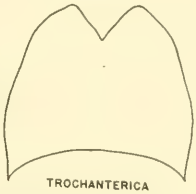
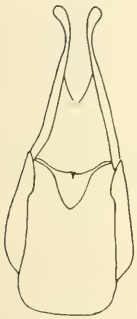


TROCHANTERICA



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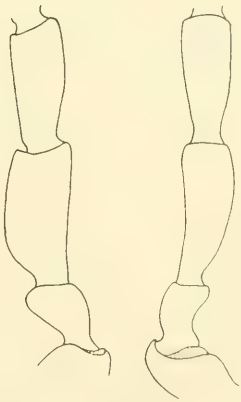
TROCHANTERICA



9

BICURVATA

most heavily marked specimens all but the midline of the pronotum is black. The scutellar spots are fused to the elytral vittae in 6 specimens.

The original description of *trochanterica* was based on specimens from the collection of the California Academy of Sciences. Material returned to the Academy by Horn consists of 2 female syntypes. From this material I hereby designate as the lectotype of *trochanterica* the specimen labeled as follows: Sierra El Chinche, Horn type, No. 164B, 10.744, Lectotype *trochanterica* [Van Duzee's unpublished designation (Leech, *in litt.*)], Type No. 158.

Pyrota trochanterica werneri, new subspecies

Less heavily marked with black than *t. trochanterica.* Dorsal black marking of head reduced, confined largely or entirely to neck, usually divided to form three spots; sides of vertex unmarked; frontal area immaculate or with a small spot or pair of spots between eyes. Pronotum with a pair of discal spots behind middle and usually a smaller spot on each side just anterior to discal spots; spots well separated, not approaching basal margin of pronotum. Scutellar spot and vitta of each elytron well separated. Femora and tibiae orange tipped with black. Hind margin of abdominal sternites occasionally orange. Length: 7-17 mm.

Male.—Fore tarsi less strongly expanded than in *t. trochanterica.*

Distribution.—Southern Arizona to Guaymas, Sonora. In all probability the range of *t. werneri* is continuous through northern Sonora. The existence of a contact with the range of *t. trochanterica* seems improbable.

Type Material.—Holotype male and allotype female from Guaymas, Sonora, Aug. 5, 1940, R. P. Allen, in the collection of the California Academy of Sciences, Paratypes: SONORA: 1 female, Empalme, Aug. 6, 1940, R. P. Allen; 4 males, eutopotypical; 1 male, 1 female, Guaymas, Aug. 28, 1955, Z. B. Noon, Jr. [taken at light (Werner, *in litt.*)].

Additional Material.—ARIZONA: Organ Pipe Cactus National Monument, Pima County, Aug. 6, 1955, F. G. Werner and G. D. Butler, 1; Thatcher, Aug. 13 and 16, 1950, E. J. Taylor, 2; Thatcher, Aug. 18, 1951, W. Taylor, 1; Tucson, Aug. 1, 1937, F. H. Parker, 1; Tucson, Oct. 1, 1932, F. H. Parker, 1; Tucson, Sept., 1948, V. G. Cochran, 1; Tucson Mountains (Desert Museum), Aug. 12, 1955, light trap, G. Butler and F. Werner, 7. Paratypes and other material in the collections of F. H. Parker, R. B. Selander, F. G. Werner, the California Academy of Sciences, the University of Arizona, and the University of California at Davis.

All specimens from Sonora are typical, as described above. Specimens from Arizona differ consistently in that the black femoral marking is more extensive, especially on the posterior surface and dorsal edge, covering as much as half the surface area of the segment. This condition presumably reflects the influence of *t. trochanterica* on the population in Arizona, but if such is the case, it is unusual that samples of the population are, on the average, no more heavily marked with black on the head and body than material from Sonora. Al-

though perhaps entitled to subspecific status separately, the population in Arizona is for the present assigned to *t. werneri*.

Lytta arizonica, new species

Closely related to *mirifica* Werner, from which it differs as follows: Head black, suffused with dark orange or piceous on frontal area. Pronotum yellow-orange, transversely oval in shape, proportionately broader (except in 1 specimen), averaging (13 specimens) 0.15 (0.11-0.22) broader than long; sides more evenly rounded, especially from middle to apex. Apex of scutellum broader, pale in color. Elytra strongly, rather finely reticulate, all or nearly all cells less than 0.5 mm. in diameter. In *arizonica* the elytral reticulations are nearly as fine as in *deserticola* Horn; in *mirifica* they are as coarse as in *reticulata* Say. Immediate base of elytra sometimes washed with orange. Wings uniformly dark brown. Length: 13-20 mm.

Male.—Genitalia with fused gonocoxites (basal piece) generally slightly shorter and more truncate.

Type Material.—Holotype male and allotype female from Littlefield, Arizona, April 20, 1930, W. J. Gertsch, in the collection of the American Museum of Natural History. Paratypes: 11 (male and female), eutopotypical. Paratypes in the collections of R. B. Selander, F. G. Werner, and the American Museum of Natural History.

The type locality of *arizonica* is in the Valley of the Virgin River in the northwestern corner of Arizona; *mirifica* is known only from its type locality at Anthony, New Mexico. Both species appear to be extremely rare.

(Date of publication, Vol. 59, No. 2, was May 8, 1957.)

VOL. 59 AUGUST 1957 NO. 4

PROCEEDINGS
of the
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of
WASHINGTON

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WASHINGTON 25, D. C.

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VOL. 59 AUGUST 1957 NO. 4

FIVE NEW SPECIES OF GELASTOCORIDAE WITH COMMENTS ON OTHER SPECIES

(HEMIPTERA)

E. L. TODD, *Falls Church, Virginia*

This paper constitutes the results of an examination of more than 3,000 specimens of Gelastocoridae[1] that were not included in the revision of the family (Univ. Kansas Sci. Bul. V. 37 (Pt. 1, No. 11): 277-475, 1955). The number of specimens examined and the disposition of those specimens are presented for each species so that future workers might locate desired material more easily. Records of distribution are presented for all the poorly known species, but for those species that are abundantly represented in collections, the records are given only when they extend the known ranges of the species.

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[1]China and Miller (Ann. and Mag. Nat. Hist. ser. 12) 8: 267, 1955, suggest that the Family-Group names should be Galgulidae Billberg, 1820; Galgulinae Billberg, 1820, and Mononychinae, Fieber, 1851. The first two names are based on *Galgulus* Latreille, 1802 (Hist. Crust. Ins. V. 3, p. 253), which is a homonym of *Galgulus* Brisson, 1760 (Ornithologia 1:30, 2:63). The Brisson genera were accepted by Opinion 37 of the International Commission on Zoological Nomenclature and specifically excepted in the Paris action on the invalidation of binary works (*See:* Bull. Zool. Nomenclature 4: 65-66, 1950). Kirkaldy's action (Entomologist 30:258, 1897) in renaming the genus as *Gelastocoris* and changing the family name to Gelastocoridae was therefore correct. Thus Gelastocorinae Champion (Biol. Centr. Amer., Hemiptera Heteroptera V. 2, p. 437, 1901), is the proper name for the typical subfamily. Technically, Mononychinae Fieber, 1851, is the correct name for the other subfamily, but in fact, the stem based on *Mononychus* Schüppel (*in* Germar, Ins. Spec. nov., p. 241, 1824), has been used in the formation of Family-Group names in Coleoptera. When Family-Group names are homonyms of each other, the recommendation of the Copenhagen Colloqium is that the case be submitted to the International Commission, which body will cause one of the two names to be changed slightly. In this instance, however, it seems to me that a more satisfactory adjustment may be accomplished through the use of Nethrinae Kirkaldy, (Trans. Amer. Ent. Soc. 32: 149, 1906). I have used that name in my previous papers and accordingly continue its usage in this paper.

In connection with the preoccupation of *Galgulus* Latreille by *Galgulus Brisson*, a question has been raised concerning my use (Univ. Kansas Sci. Bul. 37 (Pt. 1, No. 11): 288, line 18, 1955,) of Pliny as author of *Galgulus* [Aves]. The sentence is poorly worded and should be modified to read as follows: Dumeril (Mem. Acad. Sci. l'Inst. Imp. France, 1860, 31 (2): 1040) considered *Galgulus* [Insecta] to be preoccupied by *Galgulus* [Aves], but he credited the names to Fabricius and Pliny rather than to Latreille and Brisson.

I am extremely grateful to the following individuals and institutions for the privilege of studying specimens from their personal collections or collections in their charge. For the sake of brevity, institutional names and private collections are referred to in the body of this paper by the letters, names of cities, or names of individuals placed in parentheses in the following list. R. I. Sailer, United States National Museum, (USNM); M. A. Cazier, American Museum of Natural History, (AMNH); W. E. China, British Museum (Natural History), (BMNH); E. S. Ross, California Academy of Sciences at San Francisco, (CAS); F. S. Truxal, Los Angeles County Museum, (LACM); E. Handschin, Naturhistorisches Museum, Basel, Switzerland, (Basel); M. Beier, Naturhistorisches Museum, Wien, Austria, (Wien); H. C. Blöte, Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands, (Leiden); Eva Halaszfy, Musee d'Historie Naturelle de la Hongrie, Budapest, Hungary, (Budapest); J. C. M. Carvalho, Museu Nacional, Rio de Janeiro, Brazil, (NMB); R. L. Usinger, Berkeley, Calif. (Usinger Coll.); C. J. Drake, U.S.N.M., Washington, D. C., (Drake Coll.); J. C. Lutz, Philadelphia, Pa. (Lutz Coll.); G. F. Knowlton, Utah State Agricultural College, Logan, Utah, (Utah St.); H. P. Chandler, Red Bluff, Calif. (Chandler Coll.), and G. Kruzeman, Zoologisch Museum, Amsterdam, Netherlands, (Amsterdam). My special thanks go to H. B. Hungerford who permitted me to examine all recent accessions of Gelastocoridae of the Francis Huntington Snow Entomological Collection, University of Kansas, (KU), and who obtained through other sources much of the other material on which this study is based.

GELASTOCORINAE Champion, 1901

Gelastocoris rotundatus Champion

Biol. Centr.-Amer., Rhynchota Heteroptera, V. 2, p. 347, 1901.

Number of specimens examined.—44 (USNM 15, AMNH 11, KU 6, Usinger Coll. 8, and Drake Coll. 4).

Distributional data.—The eight specimens in the Usinger collection are from San Bernardino Co., Calif. These are the only specimens that I have seen from that State, but there are reports in the literature of its occurrence there.

Gelastocoris bufo (Herrich-Schäffer)

Die Wanzenartigen Insecten V. 5, p. 88, 1839 (1840).

Number of specimens examined.—39 (USNM 30, AMNH 3, KU 1, Leiden 1, and Drake Coll. 4).

Gelastocoris fuscus Martin

Univ. of Kansas Sci. Bul. 18 (4): 364, 1929.

Number of specimens examined.—24 (USNM 7, AMNH 2, KU 1, Leiden 2, Usinger Coll. 1, and Drake Coll. 11).

Distributional data.—Specimens from Bueno Vista, Ichilo (KU); Rurrenabaque, Rio Beni (USNM); and Huachi, Beni (USNM), are

the first I have seen from Bolivia although the species was reported from that country by De Carlo through the description of the synonym *G. martinezi* (Mision de Estud. de Patol. Region. Argentina, 24 (83-84) :97).

Gelastocoris vicinus Champion

Biol. Central-Amer., Rhynchota Heteroptera, V. 2, p. 349, 1901.

Number of specimens examined.—20 (USNM 16, AMNH 1, and Leiden 3).

Gelastocoris viridis Todd

Univ. Kansas Sci. Bul. 37 (Pt. 1, No. 11): 338, 1955.

Number of specimens examined.—3 (USNM 1, AMNH 1, and Drake Coll. 1).

Distributional data.—The two specimens in the collections of the United States National Museum and the American Museum of Natural History are from La Victoria, Montozintla, Chiapas, Mexico. The other specimen is from Union Juarez, Chiapas, Mexico.

Gelastocoris angulatus (Melin).

Zool. Bidrag Fran Uppsala 12: 169, 1929.

Number of specimens examined.—13 (USNM 5, Basel 2, Wien 2, Drake Coll. 3, and BMNH 1).

Distributional data.—These specimens nearly double the number of specimens of this species that I have examined. They are from the following localities. PARAGUAY: Paso-Yobay (Basel), Molinascue (Basel), and S. Bernardino (Wien). BRAZIL: Near Para (USNM), Bahia (USNM), Manaos (USNM), and Santarem (Drake Coll.). BOLIVIA: Ixiamas (USNM), Rurrenabaque, Beni (USNM). BRITISH GUIANA: Kutari Sources (BMNH).

Gelastocoris major Montandon

Ann. de Mus. della R. Univ. di Napoli (n. s.) 3 (10): 2, 1910.

Number of specimens examined.—30 (USNM 23, Leiden 1, and Drake Coll. 6).

Distributional data.—Specimens previously examined were from Panama, Colombia, and Ecuador. The six specimens from the Drake Collection are from Barinitas, Venezuela. The specimen from the collection in Leiden is labeled "Chile."

Gelastocoris hungerfordi Melin.

Zool. Bidrag Fran Uppsala 12: 168, 1929.

Number of specimens examined.—109 (USNM 34, AMNH 10, KU 44, Leiden 2, Wien 1, LACM 1, and Drake Coll. 17).

Distributional data.—This common species, which is widely distributed from Mexico to Colombia, is now recorded from Barinitas, Venezuela (4 specimens in the Drake Collection).

Gelastocoris nebulosus (Guérin-Méneville)

Iconographie du Règne Animal de B. Cuvier, Pt. 7, p. 351, 1844.

Number of specimens examined.—476 (USNM 69, AMNH 8, KU 332, Leiden 28, NMB 11, Wien 1, and Drake Coll. 27).

Distributional data.—Specimens from Kabelstation, Dutch Guiana (Leiden), and Paso de Arriera River, Uruguay (USNM) are the first specimens I have seen from those two countries. Specimens from Argentina (six localities in the KU, Wien, and Drake collections) confirm the reports in the literature of the occurrence of this species in that country.

Gelastocoris peruensis Melin

Zool. Bidrag Fran Uppsala 12: 160, 1929.

Number of specimens examined.—5 (USNM 1 and Drake Coll. 4).

Distributional data.—All the specimens from Peru.

Gelastocoris amazonensis Melin

Zool. Bidrag Fran Uppsala 12: 158, 1929.

Number of specimens examined—1 (Wien).

Distributional data.—This specimen is labeled "Rio Branco, Haseman." It is presumed that the locality refers to the Rio Branco in Amazonas, Brazil, but it could refer to other rivers of that name in other states of Brazil or even of other countries.

Gelastocoris oculatus oculatus (Fabricius)

Supp. Ent. Syst., p. 525, 1798.

Number of specimens examined.—Approximately 1,000 (USNM, approx. 600, AMNH 127, KU 62, Leiden 13, Utah St. 5, Budapest 10, LACM 16, and Drake Coll. 149).

Distributional data.—Specimens from the following localities extend the known range of the typical subspecies to the north and to the south. CANADA: Vancouver, British Columbia (USNM). MEXICO: "L. Cal." (USNM), Truinbo, Baja California (Drake Coll.), Hermosillo, Sonora (AMNH), 6 mi. NE. Meoqui, Chihuahua (AMNH), "Chihuahua" (USNM and Drake Coll.), and Oaxaca (Drake Coll.).

Gelastocoris oculatus variegatus (Guerin-Meneville)

Iconographie due Regne Animal de B. Cuvier, Pt. 7, p. 352, 1844.

Number of specimens examined.—96 (USNM 43, AMNH 7, KU 16, Usinger Coll. 1, and Drake Coll. 29).

NERTHRINAE Kirkaldy, 1906

Nerthra stygica Say

Heteropterous Hemiptera of North America, New Harmony, Indiana, p. 37, 1832.

Number of specimens examined.—10 (USNM 9, and Drake Coll. 1).

Distributional data.—All specimens from Florida.

Nerthra mexicana (Melin)

Zool. Bidrag Fran Uppsala 12: 187, 1929.

Number of specimens examined.—2 (KU and Drake Coll.).

Distributional data.—Both specimens are from Mexico. The localities are El Salto, San Luis Potosi (KU), and "C. Valles" (Drake Coll.).

Nerthra martini Todd

Pan-Pacific Ent. 30: 113, 1954.

Number of specimens examined.—13 (LACM).

Nerthra parvula (Signoret)

Ann. de la Soc. des Ent. de France. 33: 588, 1864.

Number of specimens examined.—32 (USNM 4, KU 11, BMNH 2, and Drake Coll. 15).

Distributional data.—CHILE: Las Brisas, El Canelo, Toulemo, El Manzano, Guayacan (all KU), Valparaiso, and Valparaiso Prov. (USNM and Drake Coll.). The two specimens from the British Museum and two specimens from the Drake Collection are labeled "Chile."

Nerthra raptoria (Fabricius)

Systema Eleutheratorum V. 3 (Systema Rhyngotarum) p. 111, 1803.

Number of specimens examined—12 (Leiden 3, Wien 3, and Drake Coll. 6).

Distributional data.—GUATEMALA: Los Amates (Drake Coll). PANAMA: Gatun (Leiden) and Canal Zone (Leiden). COLOMBIA: "Colombia" (Leiden). DUTCH GUIANA: Kabelstation (Leiden). BRAZIL: Monte Alegre, Para (Drake Coll.) and Rio Grande do Sul (Wien). COUNTRY UNKNOWN: "Rio Branco" (Wien) and "Barinas" (Drake Coll.).

Nerthra ranina (Herrich-Schäffer)

Die Wanzenartigen Insecten V. 9, p. 896, 1853.

Number of specimens examined.—555 (KU 480, BMNH 2, Leiden 9, Basel 1, NMB 7, Wien 19, and Drake Coll. 37).

Nerthra nepaeformis (Fabricius)

Systema Entomologiae V. 2, p. 693, 1775.

Number of specimens examined.—7 (Leiden 4, BMNH 2, and Drake Coll. 1).

Distributional data.—One of the specimens from the collection in Leiden is labeled "Valpariso." If this label refers to Valpariso, Chile, the specimen confirms the reports in the literature of the occurrence of this species in that country.

Nerthra terrestris (Kevan)

Ann. and Mag. Nat. Hist. (ser. 11) 14 (119): 813, 1948.

Number of specimens examined.—14 (KU 1, Leiden 10, Basel 2, and Drake Coll. 1).

Distributional data.—One of the specimens from the collection in Leiden is from Jarugui, Ecuador, and it is the only specimen I have seen from that country. A few other specimens, from the British Museum, have also been examined, but as I failed to record the number at the time of examination, they have not been included above.

Nerthra borealis (Melin)

Zool. Bidrag Fran Uppsala. 12: 179, 1929.

Number of specimens examined.—Approximately 30 (BMNH).

Distributional data.—The specimens are labeled "Surinam, In coffee field" and "Surinam, Around roots of coffee."

Nerthra tenebrosa Todd

Univ. Kansas Sci. Bul. 37 (Pt. 1): 376, 1955.

Number of specimens examined.—6 (BMNH 5, and Amsterdam 1).

Nerthra unicornis (Melin)

Zool. Bidrag Fran Uppsala. 12: 179, 1929.

Number of specimens examined.—3 (Wien).

Nerthra peruviana (Montandon)

Ann. Mus. Nat. Hungarici. 3: 403, 1905.

Number of specimens examined.—7 (KU 6, and Drake Coll. 1).

Nerthra montandoni (Melin)

Zool. Bidrag Fran Uppsala. 12: 195, 1929.

Number of specimens examined.—5 (BMNH 1, and Drake Coll. 4).

Distributional data.—The four specimens in the Drake Collection are from "Los Canales, Naiguata." This locality is presumed to be in the Federal District of Venezuela. The other specimen is from the mountains north of Petare, Venezuela.

Nerthra amplicollis (Stål)

Ofvers. Kongl. Vetensk. Akad. Forhändl. 11: (3): 239, 1854.

Number of specimens examined.—5 (KU 1, BMNH 1, Wien 1, and Drake Coll. 2).

Nerthra ecuadorensis (Melin)

Zool. Bidrag Fran Uppsala. 12: 185, 1929.

Number of specimens examined.—4 (BMNH).

Nerthra rudis (Melin)

Zool. Bidrag Fran Uppsala. 12: 182, 1929.

Number of specimens examined.—2 (BMNH).

Distributional data.—One specimen is from Cachabé, Ecuador. The other is labeled "Mexico."

Nerthra fuscipes (Guérin-Méneville)

Rev. Zool. Trav. Ined. p. 114, 1843.

Number of specimens examined.—15 (Leiden 2, BMNH 7, Drake Coll. 4, and Usinger Coll. 2).

Nerthra hungerfordi Todd

Univ. Kansas Sci. Bul. 37 (Pt. 1): 398, 1955.

Number of specimens examined.—11 (Leiden 10, and BMNH 1).

Nerthra manni Todd

Univ. Kansas Sci. Bul. 37 (Pt. 1): 396, 1955.

Number of specimens examined.—7 (AMNH).

Nerthra praecipua n. sp.

(Fig. 9)

There is a unique female specimen in the Drake Collection, via the Reed Collection, which has been badly damaged by dermestids. The damage consists of loss of the legs, lobes of the ovipositor, parts of the venter of the thorax, part of the head, and most of the internal organs. Even so, the specimen is so distinct from the known species of the New World that it is described as follows.

Size.—Female: Length 8.2 mm., width of pronotum 5.3 mm., width of abdomen 6.0 mm.

Color.—General color reddish-brown. Because of the condition of the specimen cleaning was not attempted. There are some irregular spots of a lighter brown color on the hemelytra, but it is believed that they are the result of the dermestid damage.

Structural characteristics.—Apex of the head excavate; superapical and lateral tubercles present, but very weak and irregular; ocelli absent. Pronotum distinctive, nearly rectangular, short, about one-third width, widest at level of transverse furrow; anterior portion of lateral margin nearly transverse, median portion slightly concave; posterior margin nearly straight, slightly sinuous before bases of hemelytra. Scutellum with lateral and apical elevations. Hemelytra entirely coriaceous, fused together, not extending to end of abdomen, covered with network of indistinct longitudinal and transverse carinae. Connexivum very prominent, strongly serrate. Abdominal sternites symmetrical, last visible sternite projecting posteriorly in median area about as far as the lateral lobes of that sternite.

Distributional data.—Holotype, female, labeled "Chile, Reed Coll."

Location of type.—In the Drake Collection, U.S.N.M., Washington, D. C.

Remarks.—This species will not run in my key to the species of *Nerthra*, as it does not agree with either choice of couplet 4. In the New World two species, *N. williamsi* Todd and *N. americana* (Montandon), resemble it superficially, but differ in that the last visible abdominal sternites of the females are emarginate. The projecting median portion of the last abdominal sternite and general appearance would seem to indicate that this species is most closely related to the species of the *alaticollis* group found in Australia. The fused hemelytra and absence of ocelli will, however, separate it from those species.

Nerthra grandicollis (Germar).

Silbermann's Revue Entomologique V. 5, p. 122, 1837.

Number of specimens examined.—149 (KU 1, Leiden 46, BMNH 79, Basel 2, CAS 1, Wien 8, and Budapest 12).

Nerthra indica (Atkinson).

Jour. Asiatic Soc. Bengal. 57 (Pt. 2), 345, 1888.

Number of specimens examined.—33 (BMNH 29, Leiden 2, and KU 2).

Distributional data.—The specimens from the British Museum are from various localities in Sikkim and Assam, India. The other specimens are labeled "Tonkin, E. le Moult."

Remarks.—The specimens from Tonkin differ slightly in the shape of the lateral margin of the pronotum which appears more like the margin of the pronotum of *N. lobata* (Montandon), but the absence of lateral tumescences on the last visible abdominal sternite of the female and shape of the clasper of the male reveal their relation to *N. indica* (Atkinson).

Nerthra serrata (Montandon).

Ann. Mus. Civique di Storia Nat. Genova 1:365, 1897.

Remarks.—I have yet to see specimens that agree with Montandon's detailed description. The type localities, "Carin Ghecù" and "Carin Chebà," are now known to be in that section of Burma between the Salwin and Sittang rivers, east and northeast of Toungoo.

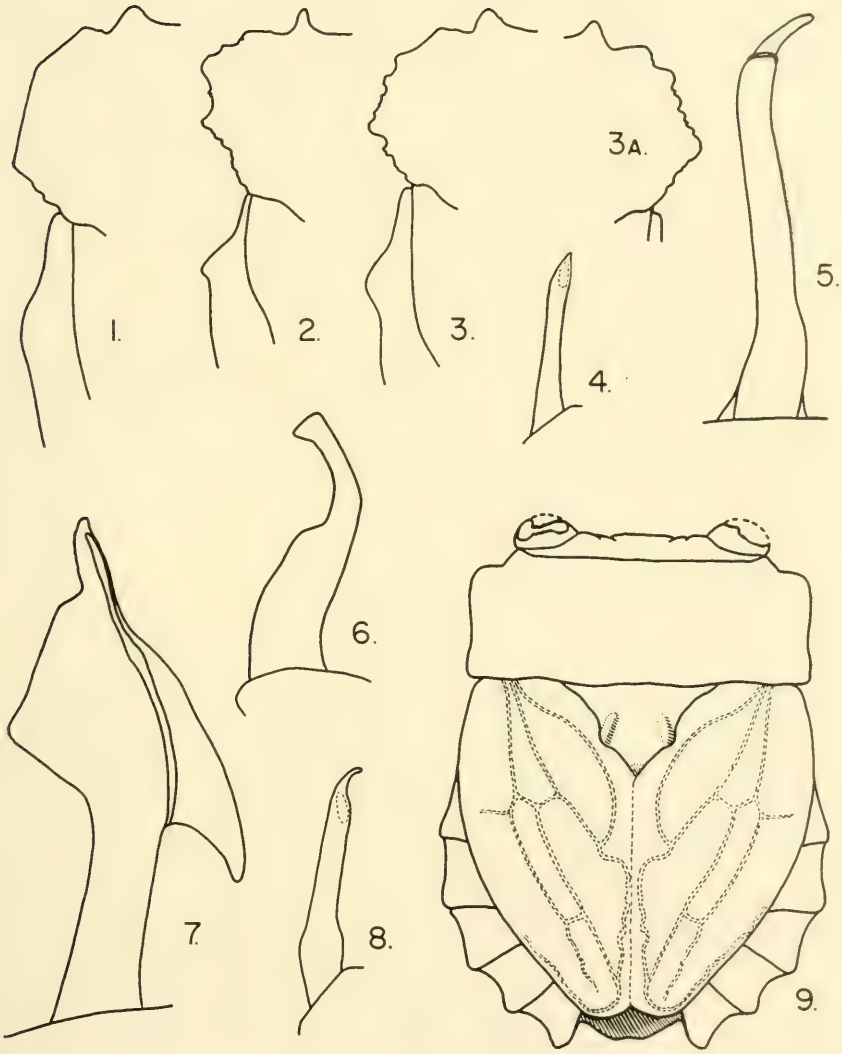
Nerthra unguistyla n. sp.

(Fig. 5)

Size.—Male: Length 9.5 mm., width of pronotum 6.8, width of abdomen 7.0 mm. Female: Length 10.5 mm, width of pronotum 7.5 mm., width of abdomen 8.2 mm.

Color.—Yellowish-brown above, basal halves of abdominal segments of connexivum darker. Abdominal sternites dark brown medially and at the basal one-half laterally. Mesosternal and metasternal processes of thorax dark, nearly black. Legs yellowish-brown, femora faintly ringed with darker brown.

Structural characteristics.—Apex of head with a weak tubercle, not visible from above; frons with a pair of superapical tubercles and a median elevation, none strongly developed; ocelli present. Pronotum widest at level of transverse furrow, not so wide as abdomen; disc very strongly elevated, provided with clumps of black clavate bristles. Lateral margins of pronotum with anterior portions converging toward the eyes; median portions straight, parallel; posterior portions only about one-half as long as median and anterior portions, converging obliquely toward bases of the hemelytra. Posterior margin of pronotum sinuous, concave before scutellum, crossed by five longitudinal carinae in the male and by seven in the female. Scutellum large with small rounded depressions medially and with a strong apical and slight latero-basal elevations, the latter densely covered with black clavate bristles. Hemelytra coriaceous, without membranes; reaching end of



FIGS. 1 to 3, Lateral margin of pronotum and embolium of left side; fig. 3A, lateral margin of pronotum of right side; figs. 4 to 8, ventral view of clasper of male; fig. 9, dorsal view of female. Fig. 1, *Nerthra nieuwenhuisi* n. sp. from Borneo; fig. 2, *N. lobata* (Montandon); figs. 3 and 3A, *N. eximia* n. sp. from Sumatra; fig. 4, *N. annulipes* (Horvath); fig. 5, *N. unguistyla* n. sp. from India; fig. 6, *N. stali* (Montandon); fig. 7, *N. hamata* n. sp. from New Guinea; fig. 8, *N. sinuosa* Todd; fig. 9, *N. praecipua* n. sp. from Chile.

abdomen in the male, but not in the female; basal expansion of embolium broadly triangular. Connexivum prominent in both sexes, but more so in the female. Terminal abdominal sternites of male asymmetrical, rather large; ninth sternite ovate, nearly twice as wide as long; eighth sternite longer than ninth sternite, nearly twice the length of the seventh sternite. Abdominal sternites of female nearly symmetrical; posterior margin of last visible sternite broadly and shallowly emarginate. Lobes of ovipositor produced posteriorly as in *lobata* but shorter and more rounded apically than in that species. Clasper of male nearly straight, tapering apically and terminating in a slightly curved, claw-like process at apex.

Distributional data.—Holotype, male, Mayavaram, South India, October 8, 1945, P. S. Nathan, and allotype, female, Coimbatore, South India, December 18, 1945, P. S. Nathan.

Location of type.—Holotype and allotype in the J. C. Lutz Collection at Philadelphia, Pa.

Remarks.—Because this species lacks membranes of the hemelytra, it will run to couplet 11 in my key to the species of *Nerthra*, but it does not agree with either choice of that couplet. The species clearly belongs to the *grandicollis* group of species, but the absence of membranes of the hemelytra, distinctive clasper of the male, and the shape of the pronotum will separate this species from any of those species that I have assigned to that group.

Nerthra lobata (Montandon).

(Fig. 2)

Bul. Soc. des Sci. de Bucarest-Roumanie 8 (4/5) : 397, 1899.

Number of specimens examined.—21 (Leiden 19, and BMNH 2)

Distributional data.—Previously known from Sumatra and Java, the specimens in the collection of the British Museum extend the known range of this species to the mainland of Asia. These specimens are from Sungai Taban and Kuala Tekis, both located in Pahang, Federated Malay States.

Nerthra asiatica (Horvath).

Termész. Fuzetek 15(3):136, 1892.

Number of specimens examined.—1 (Stockholm).

Remarks.—This specimen, a female, is from the same locality (Mou-Pin, Thibet, 1869-70, A. David) as the specimen previously examined by me. It is slightly larger, length 12.2 mm., width of pronotum 8.1 mm., and width of abdomen 8.5 mm.

Nerthra nieuwenhuisi n. sp.

(Fig. 1)

Size.—Female: Length 12.5 mm., width of pronotum 8.5, width of abdomen 8.3 mm.

Color.—Orange-brown above except bristles and scutellum which are black, membranes of hemelytra darker than rest of hemelytra. Abdominal sternites orangish-brown laterally, brown medially. Legs with tibiae and tarsi brown, trochanters and femora yellowish-brown, except apices of femora which are black.

Structural characteristics.—Apex of head rounded, without an apical tubercle; a pair of moderate superapical tubercles present; median tumescence of frons scarcely developed; ocelli present. Pronotum slightly wider than abdomen, widest at level of transverse furrow; disc strongly elevated, posterior portion with seven weak to moderate longitudinal carinae; lateral margin of pronotum distinctive, median and posterior portions nearly straight, converging medially from lateral angle, anterior portion with a dentation at middle; posterior margin of pronotum sinuous, concave before scutellum. Scutellum large, strongly elevated, tumescent laterally and at apex. Hemelytra reaching end of abdomen, but not covering lobes of ovipositor; membrane well-developed; lateral margin of embolium straight at basal one-fourth then expanded to middle, apical one-half of lateral margin nearly straight. Connexivum prominent, broadly expanded, six segments of abdomen visible. Intermediate and hind legs long and slender, the combined length of femur, tibia, and tarsus of hind leg exceeding body length. Abdominal sternites nearly symmetrical; posterior margin of last visible sternite broadly emarginate, caudo-lateral angle of left size of sternite slightly decumbent, lateral tumescences absent. Clumps of short, clavate bristles present on hemelytra and elevations of scutellum.

Distributional data.—Holotype, female, Boven (upper) Mahakkam River, Borneo, 1894, Borneo Exped. Dr. Nieuwenhuis.

Location of type.—In the Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands.

Remarks.—This species will not run in my key to the species of the genus *Nerthra* as it does not agree with either choice of couplet 17. The dilation of the lateral margin of embolium and the posteriorly projecting ovipositor lobes of this large species reveal that it belongs to the *grandicollis* group of species. It is slightly larger than *N. asiatica* (Horvath), from which it may be easily separated by the dilated margin of the embolium, distinctive lateral margin of the pronotum, and proportionally longer hind legs. The size, shape of the lateral dilation of the embolium, and the shape of the lateral margin of the pronotum will separate this species from the other species of the *grandicollis* group.

Nerthra eximia n. sp.

(Fig. 3 and 3A.)

Size.—Female: Length 11.2 mm., width of pronotum 8.0 mm., width of abdomen 7.9 mm.

Color.—Yellowish-brown above except scutellum, basal one-third of each segment of the connexivum, and clumps of bristles, which are dark brown. Abdominal sternites mostly dark brown, but with a contrasting marginal area of orangish-brown. Head, pronotum, and basal segments of legs (trochanters and femora)

yellowish-brown, Tibiae and tarsi of middle and hind legs and tibio-tarsi of front legs dark brown.

Structural characteristics.—Apex of head with a small tubercle, not visible from above; a pair of moderately large tooth-like superapical tubercles present; medial elevation of frons smaller than superapical tubercles; ocelli present. Pronotum widest at level of transverse furrow, only very slightly wider than abdomen; disc strongly elevated, posterior portion crossed by seven weak to moderate longitudinal carinae; lateral margin of pronotum irregularly dentate, the dentations rounded; posterior margin of pronotum sinuous, concave before scutellum. Scutellum large, strongly elevated, tumescent laterally and apically. Hemelytra reaching end of abdomen, but not covering lobes of ovipositor; membrane well-developed; lateral margin of embolium straight at basal one-fourth then roundly expanded about to middle, apical one-half very slightly convex. Connexivum prominent. Clumps of clavate bristles on hemelytra and elevations of the scutellum. Abdominal sternites nearly symmetrical; posterior margin of last visible sternite broadly, triangularly emarginate, slightly decumbent on the left side of sternite at the caudo-lateral angle.

Distributional data.—Holotype, female, "Tanangtaloo, Ophir-Sum., 1915, A. de Kock." This locality is presumably near Mt. Ophir, Sumatra.

Location of type.—In the Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands.

Remarks.—This species, like *N. nieuwenhusi* n. sp., runs to couplet 17 in my key to the species of *Nerthra*, but does not agree with either choice of that couplet. It is very closely related to the preceding species and may subsequently prove to be but a form of that species, but for the present I prefer to describe it as a separate species. This species agrees with *N. nieuwenhuisi* n. sp. and differs from *N. lobata* (Montandon), the only species previously reported from Sumatra, by the absence of lateral tumescences of the last visible abdominal sternite, by the strongly elevated scutellum, and by the greatest width of the pronotum being at the level of the transverse furrow. It differs from *N. nieuwenhuisi n. sp.* by its smaller size, differently shaped lateral margins of the pronotum, and differently shaped lateral margin of the embolium. It should be pointed-out, however, that the two sides of the pronotum of this specimen are not alike, and therefore differences of the shapes of the lateral margins of the pronota of the two species may not be significant in this instance. The facts that these are insular species and from different islands was another factor in my decision to treat this specimen as a separate species.

Nerthra rugosa (Desjardins)

Ann. Soc. Ent. de France 6:239, 1837.

Number of specimens examined.—1 (BMNH).

Distributional data.—The specimen is labeled "N. G., Hat. Ver., N. Holl." I have been unable to determine the meaning of the label, but

I presume that the "N. Holl." portion probably refers to Australia.

Nerthra macrothorax (Montrouzier)

Ann. des Sciences Phys. et Nat. d'Agr. et d'Indus. [Lyon], 2:110, 1855.

Number of specimens examined.—14 (CAS 2, Leiden 9, BMNH 2, and Wien 1).

Distributional data.—Specimens from the following localities have been examined. NEW GUINEA: Maffin Bay, Dutch New Guinea (CAS); Liki I., near Maffin Bay, Dutch New Guinea (CAS), and "N. O. Kuste" (Wien). CELEBES: Gorontalo (Leiden). PHILIPPINE ISLANDS: "Philippines" (BMNH). SOLOMON ISLANDS: Rendova (BMNH). MARATUA (or Maratoea) ISLAND: "Maratoea" (Leiden). TONGA ISLANDS: "Tonga Ins." (Leiden). POSTILION (or Postiljon) ISLANDS: Sapoeka besar Postiljon Eil. (Leiden). COMORO ISLANDS: "Mayotte" (Leiden). The record from the latter locality, while remote from the others, is not surprising when the distribution of the closely related *N. rugosa* (Desjardins) is considered.

Remarks.—A number of articles relating to the distribution of this species were missed in my previous treatment (Univ. Kansas Sci. Bul. 37(Pt. 1):414, 1955. The articles are as follows: Esaki, Insects of Samoa, pt. II, Hemiptera, fasc. 2, p. 75, 1928; Esaki, Mushi 9:43, 1936; Sonan, Trans. Nat. Hist. Soc. Formosa 24(No. 130.):21, 1934; Ohshima, Japanese Zool. and Bot. 1:410, 1933; Miyamoto, Nymph (Rep. Biol. Club 2nd Branch Kyushu University) 2:35, 1953; Miyamoto, Shin Konchu 7(1/2):28, 29, 1954. Localities recorded in the above papers are as follows: SAMOA ISLANDS: Leone Road, Tutuila. KÉ (Kei or Key) ISLANDS: Ke Dulan. CAROLINE ISLANDS: Truk. KASHO TO ISLAND. KOTO SHO ISLAND. RYUKYU ISLANDS: Yaeyama Group; Kikai Jima Island, Amami Group; Takajimi Island, Tokara Group. JAPAN: Satano Misaki, Osumi, Kyushu.

Nerthra mixta (Montandon)

Bul. Soc. des Sciences de Bucarest-Roumanie 8(4/5):406, 1899.

Number of specimens examined.—26 (Usinger Coll. 1, Leiden 7, BMNH 6, and Amsterdam 12).

Distributional data.—All the specimens are from localities in New Guinea. DUTCH NEW GUINEA: Hollandia (Usinger Coll. and BMNH); Sabron, Cyclops Mts. 930′ (BMNH); Humbolt Bay (BMNH), and "N. New Guinea" (Leiden). NORTH-EAST NEW GUINEA: Mt. Nomo, S. of Mt. Bougainville (BMNH). TERRITORY OF PAPUA: Ishurava 3000′ (BMNH). The specimens from the Zoologisch Museum in Amsterdam are labeled "Timmena" and "Tamarus." I have been unable to find these localities in the sources available to me.

Nerthra omani Todd

Univ. Kansas Sci. Bul 37(Pt. 1):422, 1955.

Number of specimens examined.—9 (Leiden 2, Wien 1, and BMNH 6).

Distributional data.—This species was previously known only from

Guadalcanal Island in the Solomons. Specimens examined are from the following localities. SOLOMON ISLANDS: Bougainville (Wien); Guadalcanal 5000′ (BMNH), and "British Solomons" (BMNH). NEW GUINEA: "N. Guinea" (Leiden) and "N. New Guinea" (Leiden).

Nerthra macrostyla Todd

Univ. Kansas Sci. Bul. 37(Pt. 1) 428, 1955.

Number of specimens examined.—1 (BMNH).

Distributional data.—The specimen is labeled as follows: "Jack Harbour, Lady Leever Est., Kolombangara, Solomon Islands, April 11, 1934, H. T. Pagden."

Remarks.—This male is larger than the holotype. The measurements are: Length 12.0 mm, width of pronotum 8.0 mm., and width of abdomen 8.0 mm.

Nerthra robusta Todd

Univ. Kansas Sci. Bul. 37(Pt. 1):429, 1955.

Number of specimens examined.—1 (Chandler Coll.).

Distributional data.—This specimen is from the type locality, Nadzab, Markham River Valley, New Guinea.

Nerthra hamata n. sp.

(Fig. 7)

Size.—Male: Length 12.7 mm., width of pronotum 8.7 mm., width of abdomen 8.9 mm.

Color.—Uniformly dark reddish-brown both above and below.

Structural characteristics.—Head with five large, pointed tubercles, four on anterior margin and one at apex, the latter ventrad and slightly caudad of the other tubercles; ocelli present, on rounded elevations. Pronotum moderately expanded, widest at the level of the transverse furrow, but only very slightly wider than at the antero-lateral angle, not so wide as abdomen; anterior and posterior portions of lateral margin converging toward the eye and base of embolium respectively; median portion of lateral margin nearly straight, slightly convergent anteriorly, the two sides subparallel; disc strongly elevated and rugose; posterior third of pronotum crossed by three strong and two weak longitudinal carinae; posterior margin of pronotum concave before scutellum. Scutellum strongly elevated laterally, slightly elevated apically. Hemelytra reaching end of abdomen; membrane well-developed; embolium narrow at base, lateral margin slightly concave basally, broadly convex for apical three-fourths. Connexivum not visible from above. Body covered with short, black, clavate setae, some of which are in clumps on elevations of the scutellum and pronotum, near the antero-lateral angle of pronotum, on the hemelytra at medial angle of embolial suture and another between that and the claval suture. Abdominal sternites asymmetrical, ninth sternite wider than long, moderately large, slightly shorter than eighth sternite, twice as long as seventh sternite, the latter only slightly wider than the ninth sternite, posterior margin of sixth sternite less than one-half width of pos-

terior margin of fourth sternite. Clasper distinctive, very similar to that of *N. robusta* Todd except for the large median thornlike projection of the swollen apical portion of the clasper.

Distributional data.—Holotype, male, Milne Bay, New Guinea, December, 1943, O. H. Graham.

Location of type.—In the collections of the United States National Museum, Washington, D. C.

Remarks.—This species will key to *N. robusta* Todd, but may easily be separated by the presence of the thorn-like projection of the median margin of the clasper.

Nerthra grandis (Montandon)

Bul. Soc. des Sci. de Bucharest-Roumanie 8(6):6, 1900.

Number of specimens examined.—2 (Wien).

Distributional data.—The specimens are labeled "Plason, Australien." I have not been able to find this locality in the sources available to me.

Remarks.—These specimens appear to have a vestige of a membrane and therefore agree with the statement in the original description that the membrane is reduced. The two specimens I had previously examined appeared to have the hemelytra entirely coriaceous.

Nerthra femoralis (Montandon)

Bul. Soc. des Sci. de Bucarest-Roumanie 8(4/5):407, 1899.

Number of specimens examined.—12 (BMNH).

Distributional data.—The specimens are all from Western Australia. The localities are: Yanchep, 32 mi. N. of Perth; Mundaring Weir; and Banbury.

Nerthra luteovaria (Distant)

Ann. Mag. Nat. Hist. (ser. 7) 14:63, 1904.

Number of specimens examined.—1 (BMNH).

Distributional data.—The specimen is from Redlynch, N. Queensland, Australia.

Nerthra sinuosa Todd

(Fig. 8)

Univ. Kansas Sci. Bul. 37(Pt. 1):440, 1955.

Number of specimens examined.—1 (Stockholm).

Distributional data.—This specimen, a male, is from Tolga, Queensland, Australia.

Remarks.—I am tentatively identifying this specimen as *N. sinuosa* Todd, to which it will run in my key to the species of *Nerthra*. It agrees with the females previously described in the nature of the tubercles of the head, the reduction of the membranes of the hemelytra, and the shape of the lateral margin of the embolium, which is straight

or slightly concave basally, the width of the embolium reduced basally. The median portion of the lateral margin of the pronotum is not so strongly concave as in the females. The measurements of the specimen are as follows: Length 7.6 mm.; width of pronotum 5.0 mm., width of abdomen 5.2 mm. The abdominal sternites are asymmetrical, the ninth sternite rather large, wider than long, but nearly as long as the seventh and eighth sternites combined, width distinctly greater than one-half the width of the posterior margin of the right side of the fourth sternite. The clasper is simple, sickle-shaped, the apex somewhat produced, curving mesad.

Nerthra annulipes (Horvath).

(Fig. 4)

Termész. Fuzetek 25:611, 1902.

Number of specimens examined.—2 (Budapest and Drake Coll.).

Distributional data.—The specimen from the Musee d'Historie Naturelle de la Hongrie, Budapest, Hungary, is the type. It is a female from Clarence River, New South Wales, Australia. The other specimen, a male, is from Stanthorpe, Queensland, a locality near the headwaters of the Clarence River.

Remarks.—Through the cooperation of Doctor Eva Halaszfy, I have been permitted to examine the type of this species. Unfortunately, the head and pronotum are missing, but the size and the characters of those parts remaining, especially the embolia, the greatly reduced membranes of the hemelytra, and the dark annulations of the intermediate and hind legs are sufficient to identify the species. The male from Stanthorpe, Queensland, which I now place as this species, agrees with the type in the characters mentioned above. It is smaller than the type, the measurements being as follows. Length 6.9 mm., width of pronotum 4.7 mm., width of abdomen 4.7 mm. The abdominal sternites are asymmetrical, the ninth sternite oval, wider than long, slightly longer than eighth sternite, not so long as length of seventh and eighth combined, width about equal to one-half the width of the posterior margin of the right side of the fourth sternite. The clasper is simple, apex not produced as in *N. sinuosa* Todd. This species will key to *N. sinuosa* Todd, but may be separated by the embolium which is broader basally, the lateral margin being convex. And if I have correctly identified the males of the two species also by the wider pronotum (as wide as abdomen), simple clasper of male (apex not produced mesad) and by the smaller ninth sternite of the male.

Nerthra nudata Todd

Univ. Kansas Sci. Bul. 37 (Pt. 1) 425, 1955.

Number of specimens examined.—6 (Drake Coll.)

Distributional data.—The specimens are from Brisbane, North Pine River, and Ashgrove, all of which are in Queensland, Australia.

Remarks.—The figure number under this name in the original

description has been reversed with that under *N. omani* Todd (loc. cit., p. 422); however, the correct names are assigned to the figure numbers on the "Explanation of Plate XI." The claspers of the specimens now before me (two of the specimens are males) do not agree with my statement in the original description to the effect that a portion of the aedeagal furrow is visible (ventral view) near the apex of the clasper. These specimens do not show any indication of the aedeagal furrow in that area; however, there is a difference in the pigmentation and sclerotization which under low magnification resembles a furrow. Since I do not now have any of the males of the type series available for restudy, I cannot state whether the apparent difference is real or whether I was originally in error. This species is obviously related to *N. annulipes* (Horvath) and *N. sinuosa* Todd, but it may be readily distinguished from those species by its larger size, the almost complete absence of tubercles of the front of the head, and by the well-developed membranes of the hemelytra.

Nerthra tuberculata (Montandon).

Bul. Soc. des Sci. de Bucarest-Roumanie 8(4/5):403, 1899.

Number of specimens examined.—9 (BMNH).

Distributional data.—From Flinders Bay, Western Australia.

Nerthra alaticollis (Stål).

Öfversi. Kongl. Vetensk.-Akad. Förhandl. Arg. 11: 239, 1954.

Number of specimens examined.—13 (BMNH, 4, Leiden 1, and Drake Coll. 8).

Distributional data.—The specimens in the Drake Collection are from Mt. Mee, Brisbane, Stanthorpe, and Caloundra, all in Queensland, Australia. The other specimens are just labeled "Australia."

Remarks.—Some of the specimens have the postero-lateral angle of the pronotum less rounded than others and in this respect resemble *N. stali* (Montandon), but the presence of posterior projections at the caudo-lateral angle of the last visible abdominal sternite of the female and the acuminate clasper of the male will permit its separation from the latter species.

Nerthra stali (Montandon).

(Fig. 6)

Bul. Soc. des Sci. de Bucarest-Roumanie 8(6):5, 1900.

Number of specimens examined.—2 (BMNH).

Distributional data.—The specimens are from Yanchep, 32 miles north of Perth, Western Australia, and "N. H. Swan River."

Remarks.—The specimens, both males, resemble the females but are more elongate. The measurements are as follows: Length 8.4 mm, width of pronotum 6.2 mm., width of abdomen 6.5 mm. The abdominal sternites are asymmetrical. The terminal sternites are small, the ninth sternite subequal to the eighth sternite in length, longer than the

seventh sternite. The clasper, stout basally, recurved, and bluntly knobbed apically.

Nerthra adspersa (Stål).

Berliner Ent. Ztschr. 7:407, 1863.

Number of specimens examined.—2 (BMNH).

Distributional data.—From Quindilup and Yanchep, 32 miles north of Perth, in Western Australia.

Remarks.—These specimens differ considerably in color from the specimen previously studied. One is mostly white with small black maculations, disc of pronotum yellowish-brown; below much darker. The other specimen is more yellowish and with larger maculations. This species will probably prove to be as variable in color as *N. alaticollis* (Stål). The specimens, both females, are also slightly larger than the one previously studied. The measurements are as follows: Length, 6.3 mm, width of pronotum, 5.4 mm, width of abdomen, 5.2 mm.

PERILLUS LUNATUS KNIGHT (HEMIPTERA: PENTATOMIDAE) IN MONTANA

RICHARD C. FROESCHNER, *Montana State College*

The discovery of three Montana specimens of *Perillus lunatus* while organizing the insect collection at Montana State College marks a significant northward extension of range for this species. Although *P. lunatus* was first named from Colorado by Knight in 1952 (Ann. Ent. Soc. Amer. 45:230-231), it was first described by Van Duzee in 1904 (Trans. Amer. Ent. Soc. 30:65-66) as "var. b" of *Perillus exaptus* (Say). Van Duzee there reported this "gaudily marked" form from Colorado and Wyoming. These localities, coupled with the western Montana records listed below and Knight's note "near 7,000 ft.," indicate that this is a mountain form of the northwestern states.

Montana records: Bridger Mts., Gallatin County, July 10, 1926, G. M. Kohls; Bridger Mts., Sacajawea Peak, 7,200 feet, Gallatin County, July 2, 1954, C. V. Davis; Lakeview, Beaverhead County, May 13, 1931.

BOOK NOTICE

Bohart, R. M., and R. C. Bechtel. The Social Wasps of California. Bull. Calif. Insect Survey 4(3):73-102, 1957. Univ. Calif. Press, Berkeley, 75c.

This latest contribution to our knowledge of the California insect fauna treats the 17 species and subspecies of social wasps (Vespinae and Polistinae) known from that state. As is customary in this useful series, there are keys to the genera and species, numerous figures and maps, and an abundance of distributional records.—KARL V. KROMBEIN, *Entomology Research Division, U. S. Department of Agriculture.*

A NEW SPECIES OF CULISETA (DIPTERA: CULICIDAE) FROM NORTH AMERICA[1]

A. RALPH BARR
Department of Entomology, University of Kansas

In identifying mosquitoes in Minnesota the author became aware that *Culiseta Corsitans* (Theobald) was being taken abundantly in light traps in the early spring. Since only overwintered mosquitoes were being taken at this time the appearance of *morsitans* seemed odd; this species is reported to overwinter in the larval and not in the adult stage. When these female mosquitoes were compared with specimens of *morsitans*, it was apparent that the females were of a different species. The author's wife Sylvia first separated the males of the two species. A description of the female follows:

Culiseta minnesotae new species

Adult female. *Head.*—Antenna with about 15 segments including torus and ringlike proximal segment; somewhat longer than proboscis; torus light reddish brown with small dorso-medial patch of elongate, dark scales; flagellum dark with light pubescence and a whorl of a half dozen or so dark bristles at base of each segment; basal segment of flagellum with the whorl at middle and with an extra group of bristles proximally. Palps about a quarter the length of the proboscis, clothed with darkish brown scales, appearing somewhat paler at the tip. Proboscis about as long as tibia of fore leg, with dark scaling (about the color of that of the palps) but with a sprinkling of pale ones medially and particularly ventrally so that the proboscis is definitely lighter in the middle but lacks a distinct pale band. Vertex with dark, erect scales and narrow, silvery, appressed ones, the latter becoming more abundant on the sides of the head; there is a group of dark bristles bordering the eyes from one side of the head to the other, the bristles being more numerous dorsally between the eyes.

Thorax.—Mesonotum. Integument dark brown with a pair of lighter, reddish-brown stripes in the middle, the two stripes rather narrowly separated by a darker brown stripe. Vestiture of tiny, narrow, recumbent, coppery brown scales, and with lines of dark bristles anteriorly, laterally, and medially, which become much larger posteriorly. Somewhat posterior of the middle of the mesonotum and lying lateral of the two mesonotal lines are a pair of patches of silvery scales; posterior of each of these is a line of silvery scales extending to the antescutellar space. There are additional silvery scales in a patch between these two lines and on the sides of the posterior third of the mesonotum. Scutellum with many large, dark bristles, and a few narrow, pale scales. Anterior pronotal lobe with dark bristles and a few long, narrow, pale scales. Posterior pronotum with small, narrow, recumbent, dark scales, a few pale ones on the ventral margin and a row of dark bristles posteriorly. Propleuron with many bristles and clothed with pale scales. The sclerite ventral of the post-pronotum is bare except for a patch of pale

[1]Contribution No. 931 from the Department of Entomology, University of Kansas.

scales posteriorly. Spiracular bristles present. Dorsal part of sternopleuron well bristled dorsally (pre-alars) and with a patch of bristles (upper sternopleurals) and pale scales ventrally. Ventral portion of sternopleuron with a patch of narrow, elongate, pale scales and a line of bristles (lower sternopleurals) posteriorly. Mesepimeron with a patch of pale scales medially and a patch of bristles in its upper part (upper mesepimerals), as well as a line of about three larger bristles (lower mesepimerals) anteriorly in the lower portion.

Wing.—Wing scales brownish for the most part; a few lighter ones on the basal half of the costa. The apical half or third of the costa has a fringe of distinctly pale or yellowish scales. There is a slight concentration of scales at the base of the third longitudinal vein (R_{4+5}). Halteres brownish; knobs somewhat darker than the stems and densely clothed with pale scales.

Legs.—Coxa of fore leg well bristled and scaled, the scales being dark but becoming pale dorso-posteriorly. Coxae of mid and hind legs also with bristles and pale scales. Femora dark scaled above (or anteriorly) and pale scaled below (or posteriorly), with definite white knee spots; dark portions with a light sprinkling of pale scales. Tibiae with dark and pale scales, more in lines than being intermingled; in general with pale scales posteriorly and dark ones anteriorly but with a line of pale scales down the middle of the dark anterior portion. Tarsi in general dark-scaled but with lines of pale ones particularly on the posterior surface of the basitarsi, and with rings of pale scales basally on the segments as well as at the tips of the immediately preceding segments. These rings occur principally between the first and second, and the second and third segments of the tarsi, but one or two smaller ones may also be evident on the hind tarsi.

Abdomen.—Medial portions of the tergites with brown scales, basal and apical margins largely pale scaled. The pale scales are not white but are of a dingy yellowish or light brownish color. First tergite with apical medial patch of pale scales. Tergite of second segment with apical band of pale scales interrupted medially, and with scattered pale scales on the rest of the sclerite. Tergites of segments 3 to 7 with broad bands of pale scales basally and apically, tending to be interrupted on the median line, particularly on the apical band. The pale bands do not have distinct edges but rather grade into the darker, median, transverse portions of the tergites. Tergites of eighth segment extensively pale scaled. Venter of abdomen largely but unevenly pale scaled.

Holotype. Female taken May 4, 1953, by the author in a light trap near the greenhouse at Olcott Park, City of Virginia, St. Louis County, Minnesota (U. S. Natl. Mus. Type No. 62409).

The author has designated a series of 62 females as paratypes, 11 of which have been deposited in the U. S. National Museum under the same number as the holotype. The remainder are in the collection of the University of Minnesota and in the personal collection of the author. The paratypes are from Virginia, St. Louis Co., Minn.: Itasca State Park, Clearwater Co., Minn., and Hennepin Co. (Crystal Bay area), Minn. The dates on these specimens are April 19 and 28; May 4 to 7, 9, 10, 23 to 26, and 28; June 29; Sept. 13, 15, 17, 18; and October 1. Most, if not all, appear to have been taken in light traps

and appear to be females which were either entering or leaving hibernation.

The female of *minnesotae* appears to be unique among North American *Culisetas* by virtue of the peculiar banding of the abdomen, the bands covering the apical portion of one segment and the basal portion of the next. Other interesting characters are the pale scales of the proboscis which are occasionally so conspicuous that the proboscis appears to be ringed; the pale markings of the mesonotum; the pale scaling on the anterior edge of the costa which is sometimes seen only on the outer part of the wing but often is found on the entire costa; the rather indefinite concentration of scales at the base of R_{4+5}; and the pale tarsal bands which cover the apex of one segment and the base of the next. The clump of scales at the base of R_{4+5} is sometimes distinct but often not so. There occasionally appear to be similar aggregations at the base of the radial sector, at the branching of R_{2+3}, and at the branching of the medial vein, but these spots are even less distinct than the one at the base of R_{4+5}. These concentrations of scales should be further studied in perfect specimens. The two reddish brown mesonotal stripes of the holotype are usually evident only when the specimen is slightly rubbed.

All of the females of "*Culiseta morsitans*" from Minnesota in the University of Minnesota collection pertain to *minnesotae*, including a series identified by Owen (1937); there are no females of *morsitans* from Minnesota in the collection. It would appear that most previous records of *morsitans* from Minnesota pertain to *minnesotae*.

Thompson (1953) mentions a form resembling *morsitans* that he took in Nebraska (and has been taken in Boston). This form has apical but not basal bands on the tergites. In a letter to the author (June 1953) Thompson stated that it is not the same as the presently described species.

The description of *morsitans* females by Stage *et al.* (1952) pertains at least in part to *minnesotae* (". . .Abdomen brown-scaled with scattered yellowish-white scales, most heavily concentrated along the apices and bases of segments, or these may occasionally form basal pale bands only . . ."). These authors illustrate the male genitalia of *minnesotae* under the name *morsitans*.

Male.—Males of both *minnesotae* and *morsitans* are commonly taken in light traps in Minnesota. The author can separate them only by the male terminalia. The terminalia of *morsitans* (illustrated on next page) are as figured from eastern specimens by many authors (e.g., Carpenter and LaCasse 1955). The terminalia of *minnesotae* (illustrated on next page) have been figured by Stage *et al.* (1952) from western specimens. It appears likely that *minnesotae* is a western replacement of *morsitans*.

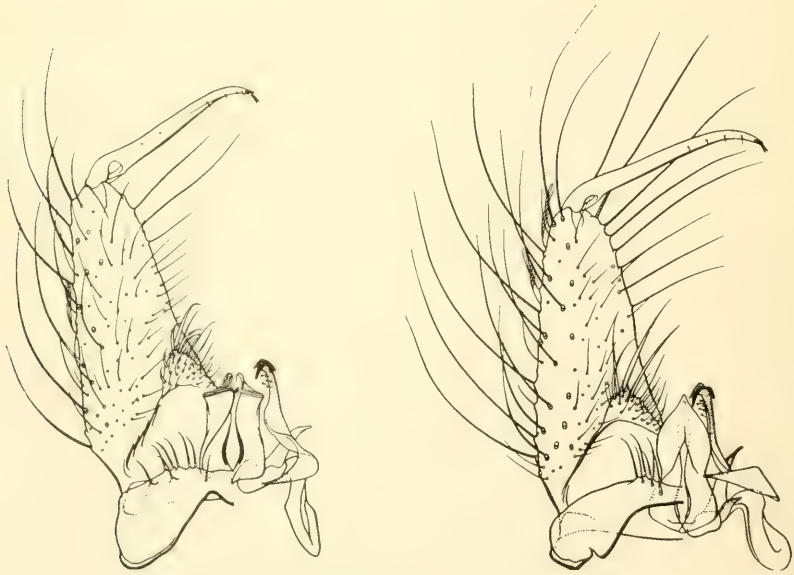
The appearance of the adult male is as follows: Antenna plumose on basal two thirds, apical third with short hairs. Palps dark brown with about 4 pale or definitely white rings, the penultimate and antepenultimate segments with many

long hairs; about one-third again as long as the proboscis. Proboscis dark but with a sprinkling of pale scales. Abdominal tergites with definite, basal, white bands covering the anterior third to half of the tergite. Eighth segment with dorsal sclerite (sternite) extensively covered with white scales. Sternites for the most part pale scaled basally and dark scaled apically but with posterior sternites (including tergite of eighth segment) largely pale-scaled. Wings with little or no pale scaling on costal margin; concentration of scales at base of R_{4+5}[9] usually not evident. Legs with fewer pale scales than in the female.

Terminalia.—The terminalia of *minnesota* are similar to those of *morsitans* but differ in the shape of the aedeagus, as can be seen in the illustrations below.

Systematic Position

It would appear that *minnesotae* is closely related to *morsitans* but the species cannot be assigned to a subgenus with certainty until larvae have been examined. The author has not yet collected immature stages[2] of this species.



Left: *Culiseta minnesotae.* Right: *C. morsitans.*

Biology

The larvae would be expected to occur in semi-permanent marshes. Females, but no males, were taken in a light trap at Virginia, Minn., from May 2 to 7, 1953, along with females of *Anopheles earlei, Culiseta inornata,* and *Culex territans* (=*apicalis* auct.). All appeared to be

[2]Currently being described by Dr. Roger Price at the University of Minnesota.

old, overwintered females. This would suggest that *minnesotae* hibernates as an adult female and not as a larva, as has been suggested for *morsitans*. In these light-trap collections, *Aedes* adults first appeared on May 9, which was consistent with the larval survey. No males of *Anopheles*, *Culex*, or *Culiseta* were taken until June 10, when an *inornata* male was captured. Adults have not been taken in hand catches.

Distribution.—In Minnesota females have been tentatively identified from Lake, St. Louis, Beltrami, Clearwater, Polk, and Hennepin Counties. Males have thus far been identified from Blue Earth (Mankato) as well as Beltrami (Bemidji), Clearwater, and Hennepin Counties. The species appears to be present also in the Pacific northwest.

ACKNOWLEDGEMENTS

The author would like to express his thanks to Dr. Alan Stone, of the U. S. National Museum, for comparing females of *minnesotae* with those of *morsitans* and *parodites* and for his many helpful suggestions, and to Sylvia Barr for preparing the illustrations and for her advice and criticism.

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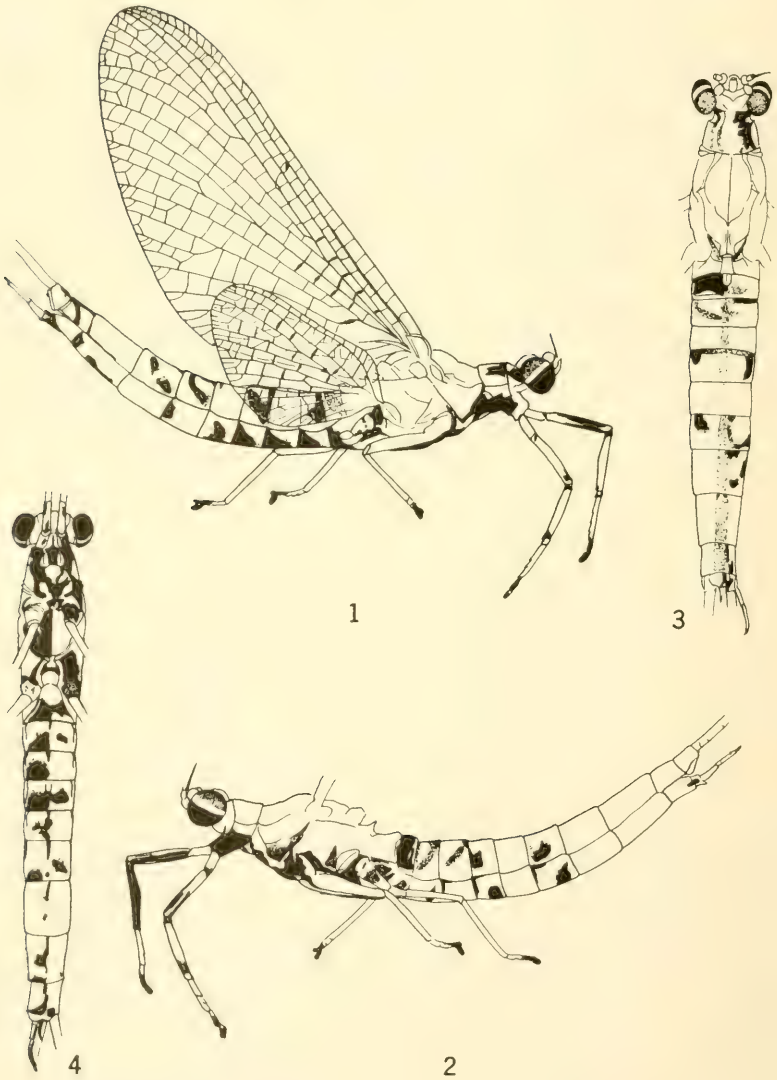
A MAYFLY GYNANDROMORPH

LEWIS BERNER, *Department of Biology, University of Florida, Gainesville.*

While working through a large series of *Hexagenia* adults collected at the Pearl River, Lawrence County, Miss., on August 16, 1954, I was attracted to one with a most unusual color pattern. Closer examination revealed that the specimen was a gynandromorph. As there are only two species, *Hexagenia bilineata* (Say) and *H. munda elegans* Traver, present in the collection, I am referring the gynandromorph to *elegans*. This reference is justified on the basis of the wing pattern and the structure of the genitalia.

This odd individual represents the first gynandromorph reported in the family Ephemeridae. As there are relatively few mayfly abberations known, I felt that this additional find should be brought to the attention of entomologists.

The specimen (Figs. 1-4) is predominantly female. The wings have the typical maculation of this sex, lacking the dark coloration of the



Hexagenia munda elegans gynandromorph.—Fig. 1, Right side; fig. 2, left side; fig. 3, dorsal aspect; fig. 4, ventral aspect.

coastal border found in the male. The eyes are small and widely separated, as is true of females of this genus, and the fore legs are relatively short as in a normal female. The color pattern of the legs and the abdomen is a mixture of the male and female patterns, with the right side being predominantly male and the left mostly female, although on neither side is the coloration typical. The distribution of pigment on the legs and on the abdomen is shown in the figures. In a normal male the color of the thoracic venter is uniform and on both dorsum and venter of the abdomen it is much darker and more heavily emphasized than in the female. Here there is a mixture.

The genitalia are incomplete. There is a perfectly formed penis and clasper on the right side, whereas on the left side the male organs are completely lacking. Tails are malelike. No study of the internal anatomy has been made, although the specimen is still virtually intact. It is hoped that a histological examination can be made in the future.

AN UNDESCRIBED APTEROUS ARADID FROM THE PHILIPPINES

(HEMIPTERA)

CARL J. DRAKE, *Smithsonian Institution, Washington, D. C.*

This paper characterizes a new species of apterous aradid from the Philippine Islands. Singularly enough, the specimens were found in the mouth and stomach of a preserved frog (*Rana m. leyensis*) collected on Julo Island in the Sulu Islands. As the specimens (1 male and 2 females) are in almost perfect state of preservation, it seems fairly certain that the aradids must have been snapped up by the frog shortly before the frog itself was caught, killed, and preserved. Apterous aradids, both adults and nymphs, have been collected on several occasions in the ground litter of natural forest growth by means of a Berlese funnel. Although these insects generally live beneath the loose bark of trunks and branches of dead and decaying trees, biotic conditions oftentimes are quite favorable for them to breed and multiply in the decaying surface litter on the forest floor.

As the new species of aradid falls into the Genus *Acaricoris* Harris & Drake, our present conception of the zoogeography of the range and distribution of genera is thus disrupted and will need to be modified as more forms are discovered. Up to the present writing, the genus *Acaricoris* has been represented solely by the genotype from the Gulf States, though I have another undescribed species from the West Indies.

In addition to the above material from the Philippines, Dr. H. S. Dybas, of the Chicago Natural History Museum, has also kindly permitted me to study several specimens of an undescribed species

which he had recently sorted out of ground litter from the palm and oak forest of Highlands Hammond State Park, Fla. April 15, 1955, with the aid of a Berlese funnel. The species was breeding in the ground litter, as nymphs (four different instars) outnumbered the imagoes. Specimens of *A. ignotus* have been taken in the states of Louisiana, Mississippi, and Georgia.

In all the measurements given in the following description, 80 units equals 1 millimeter.

Acaricoris dybasi, n. sp.

Body obovate, reddish fuscous, widest near middle of abdomen, narrowed anteriorly, often coated with an incrustation, without lateral lobes or other modifications. Head with median longitudinal length nearly equal to width across eyes (50:56), strongly narrowed posteriorly behind eyes, with a prominent granulose swelling just behind each eye, each granule of which bears a short, recumbent, setalike, white hair; juga extending a little in front of tylus, there divergent; eyes small, pale, granular; labium short, not reaching to base of channel; channel wide, not reaching to base of head; antenniferous tubercles sharply conical, divergent anteriorly. Antennae dark brown, with segment I swollen and terminal segment pubescent on apical third; segment I, 35; II, 18; III, 30; IV, 25. Legs short, dark brown.

Thorax slowly widened posteriorly, with broad median logitudinal part behind pronotum depressed, flattened, smooth, shining, and raised behind, with outer third of all thoracic divisions longitudinally roughened and ridged; lateral margins a little granulate; mesonotum and metanotum fused, without any sign of transverse suture on smooth median part; first two abdominal tergites also fused with metanotum, the transverse ridge behind metanotum interrupted at middle. Abdomen above with tergites III, IV, and V fused and ridged on median longitudinal line, with the usual impressions and ridges; tergite VI separated from V by a transverse suture; connexival segments distinct, separated from abdominal tergites and each other by sutures, except the first three segments fused. Body beneath with meso- and metasternum and first two ventrites fused, ventrites III, IV, and V distinguishable and sutured off from each other. Spiracles lateral, all plainly visible from dorsal aspect, II to VI (inclusive) situated on top of tiny lateral swellings, VII on a larger lateral swelling, VIII on the apical end of a short, posterior, fingerlike projection of genital segment.

Type (male) and *allotype* (female): Jola Island, Sulu Islands, Philippine Islands, both removed from the mouth and stomach of a preserved frog (*Rana m. leytensis*), in the collection of the Chicago Museum of Natural History. *Paratype:* one specimen, found in the stomach of the same frog as the type. The aradids were found during the process of studying the contents of the stomach after the frogs were shipped to Chicago. The allotype and paratype both have the last two antennal segments missing.

This apterous aradid is similar in form, size, and general aspect to the American *Acaricoris ignotus*, but can be easily separated from

it by the longer antennae, grandular swelling just back of each eye, feebly elevated lateral spiracles, and the smooth, depressed, median, longitudinal part of the fused mesometanotum, which is without any trace of a transverse suture. In *ignotus* the fused part of the mesometanotum bears several low, narrow, longitudinal ridges.

TWO OVERLOOKED SOURCES OF TYPE DESIGNATIONS FOR GENERA

CURTIS W. SABROSKY, *Entomology Research Division, U. S. Department of Agriculture, Washington, D. C.*

Two recently noted sources of type-species designations are called to the attention of taxonomists. The designations appear to have been generally overlooked, although possibly known to some workers but antedated by other designations and hence left unrecorded. At least the books have not been mentioned in a sample that I have examined of comprehensive papers dealing with type species of a large number of genera, including Blackwelder (1952) on the beetle family Staphylinidae, Hemming (1934) on the Holarctic butterflies, Muesebeck and Walkley (1956) on the hymenopterous superfamily Proctotrupoidea, Sandhouse (1943) on the bees, and Stone (1941) on the dipterous genera of Meigen (1800 and 1803).

(1) Blanchard, Emile. 1845. Histoire des Insectes, traitant de leurs moeurs et de leurs métamorphoses en général, et comprenant une nouvelle classification fondée sur leurs rapports naturels. 2 vols. Paris, Didot, 398 and 524 pp. The two volumes, bound as 1 and 2 on insects, form numbers 8 and 9 of Comte's "Traité complet d'histoire naturelle" (13 vols.). The first volume on insects contains Hymenoptera and Coleoptera (part), the second the remainder of the Coleoptera plus ten other orders. In point of time, this work comes between two other publications by Blanchard, in 1840 and 1849, which are often cited as original sources for type designations.

(2) Chenu, J. C., and collaborators. 1851-61. Encyclopédie d'histoire naturelle. Paris, Marescq et Co. Insects are treated in 3 volumes on Coleoptera (1851-60, with E. Desmarest), 2 on Lepidoptera (1853-57, with H. Lucas), and 1 on "Annelés" (annulate animals) (1859, with E. Desmarest). The last volume (312 pp.) contains 12 orders of insects, as well as myriapods, arachnids, and some non-arthropods. I am not sure that the volumes on Lepidoptera contain any type designations, but many were quickly noticed in the 3 volumes on Coleoptera and that on "Annelés." The wording of the introductions signed by Desmarest leads me to believe that the authorship of these 4 volumes should be credited to Desmarest, rather than to Chenu, or to Chenu and Desmarest. For each of the insect volumes there is a "Table alphabétique" prepared by Desmarest, giving all vernacular names used and their equivalent scientific names.

The designations, although often buried in the text, are clear and unequivocal, in such expressions as "le type du genre," "ayant pour type le. . . ," "le type est. . . ," and "comme type, nous nommerons

le. . . ." Types are not cited for all included generic names, but a considerable number are involved. For example, in the order Diptera, type species are cited for 22 genera by Blanchard (1845) and for 27 genera by Desmarest (1859).

In the dipterous genera, there is fortunately little to disturb existing nomenclature, and it is to be hoped that this will also be true for other groups. Because many of the genera were common and well known, their types had usually been designated earlier by Latreille, Curtis, or Westwood, and almost always the same species was cited by Blanchard or Desmarest, or else the genera were monobasic. In two cases in Desmarest, the designations long antedate those presently accepted, but they are invalid because the species were not originally included. In two other instances, however, valid type designations in Desmarest antedate by fifty years those now recognized. The most prominent genus involved is *Cuterebra*, whose type was designated by Desmarest as "*C. cuniculi* Fabr." (=*Oestrus cuniculi* Clark), luckily the same species designated by Coquillett in 1910, a half century later. A possibly troublesome problem in another family is being studied further.

NOTES ON THE ANYSTIDAE WITH A DESCRIPTION OF A NEW GENUS AND SPECIES, ADAMYSTIS DONNAE, AND A NEW SUBFAMILY, ADAMYSTINAE (ACARINA)[1]

By Frederick Cunliffe, *Kansas Wesleyan University, Salina, Kansas*

The family Anystidae has been characterized as having a palpal thumb-claw complex, chelicerae hinged posteriorly so that they are free to move laterally, and movable chelae hooked, distal, and not opposed to the fixed chelae. The long, prominent palpal thumb or tarsus and the hooklike distal movable chela have been used as key characters to distinguish the Anystidae from the other members of the Anystoidea (Teneriffiidae, Pseudocheylidae, and Pterygosomidae). Also, such characters as the setation of the legs and the body, the coxal arrangements, and the structure of the tarsi and tarsal claws and pulvilli, the peritremes, and genitalia differentiate the Anystidae from the others. Baker and Wharton (1952) state that no genital discs are present, but examination by the phase microscope revealed two pairs of discs in both sexes.

Two undescribed species of mites have been found which apparently belong to the Anystidae. They constitute a new genus, the *Adamystis*. This genus is differentiated from all others in having a simple palpus without the thumb-claw complex. The body and leg setal patterns are also more simplified. Perhaps the genus may eventually form the basis for another family, but until more groups are found and studied it is thought best to leave it in the Anystidae, but in a separate subfamily. Oudemans (1936) divided the Anystidae into two subfamilies,

[1]A contribution of the Pinellas Biological Laboratory, Inc.

the Anystinae with the coxae contiguous and the legs radiating, and the Erythracarinae with coxae I-II and III-IV in separate groups and with the first two pairs of legs pointing anteriorly and the last two pairs pointing posteriorly. The palps of both subfamilies have a thumb-claw complex. This new genus is here considered to constitute a new subfamily, the Adamystinae, distinguished from the others in having simple palpi without the thumb-claw complex and in having contiguous coxae and an elongate body. The simplified palpal arrangement (fig. 3) is not a sudden transition from a strong thumb-claw complex as found in the genus *Bechsteinia* (fig. 9), as a weak but definite one is to be found in the genera *Anystis* and *Walzia* (fig. 8). It might be appropriate here to mention that much work remains to be done at the generic and specific levels in the Anystidae. Descriptions are vague and synonyms appear to be inevitable.

ADAMYSTINAE, new subfamily

With the tarsal claws, empodia, chelicerae, peritremes, and genitalia of the Anystidae. With simple palpi, contiguous coxae and radiating legs, and elongate body. Dorsum of body entirely covered by smooth shield; striae found only laterally and ventrally.

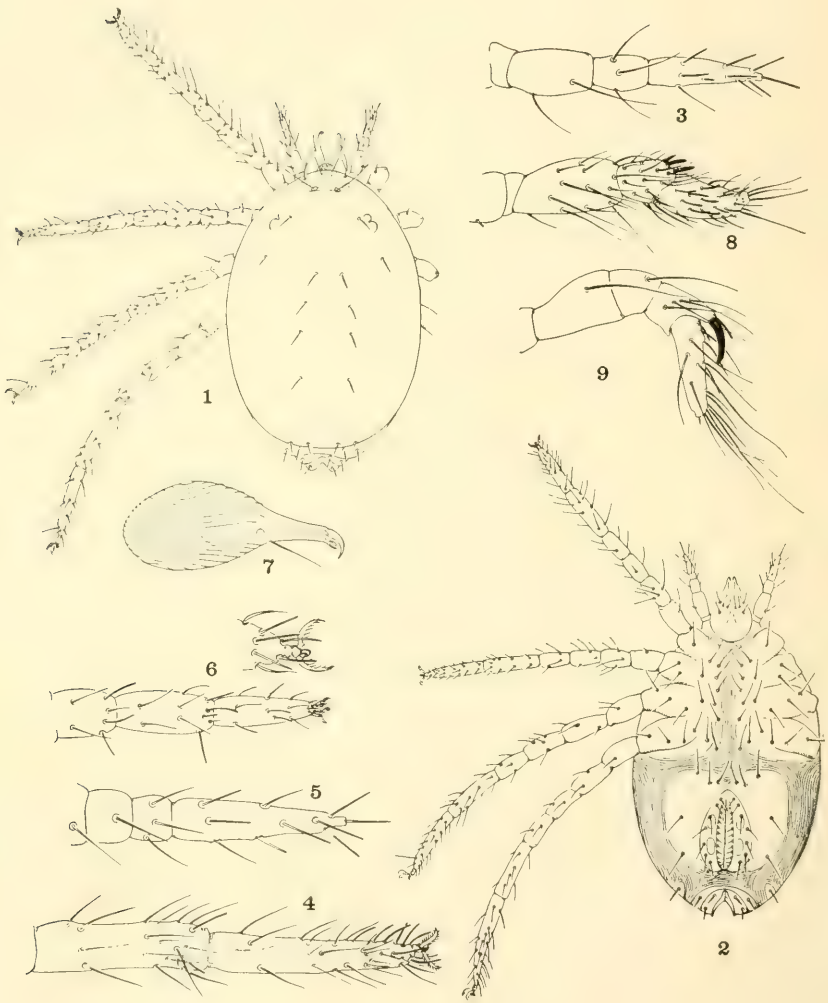
ADAMYSTIS, new genus

Palpus without thumb-claw complex, the tarsus terminal to tibia, thus differing from all other genera in the family. Chelicerae with single dorsal seta, movable chela distal, hook-like. Peritreme external, but lying under anterior fold of body. Dorsum of body with two pairs of eyes; entire dorsum covered by a smooth shield, with short setae. Genital opening posterior, lying in a genital plate or non-striated area, surrounded by striae. Coxae contiguous, legs radiating, body elongate.

Adamystis donnae, new species

Palpus 4-segmented, the basal segment without setae, the others as figured (fig. 3). Chelicerae typical for the family (fig. 7). Peritremes and anterior lobe lying beneath fold of body. Dorsum of body entirely covered by smooth shield with short stout setae (fig. 1); with 2 pairs of eyes present anteriorly and dorsally. Ventrally, the genital opening lies in a smooth plate surrounded by fine striations; the number of genital setae appears to vary between 12 and 14 pairs between individuals and sexes; the para-anals vary between 7 and 8 pairs. The ventral body and leg setae are arranged as figured (fig. 2). The coxae are contiguous; tarsal claws are rayed and the empodium claw-like; leg setae are fewer and weaker than in the known genera, and rodlike sensory setae are numerous on both tarsus I and II (figs. 4 and 6). The male holotype (figured) is 574μ long and 319μ wide. The female is 700μ long and 434μ wide. Both sexes are similar.

The holotype, U. S. National Museum No. 2326, and 13 paratypes (3 males and 10 females) are deposited in the U. S. National Museum. They were collected from lodgepole pine cones, Tahoe City, California, July 23, 1948, by E. Cott and S. F. Bailey, of the University of California at Davis.



Adamystis donnae, new species.—Fig. 1, dorsum of male; fig. 2, venter of male; fig. 3, palpus; fig. 4, tarsus and tibia I; *Adamystis* sp.—Fig. 5, palpus; fig. 6, tarsus and tibia I; detail of tarsus I; fig. 7, chelicera; *Walzia* sp.—Fig. 8, palpus; *Bechsteinia* sp.—Fig. 9, palpus.

A single specimen of a related mite was collected at Duke University from pine needle duff June 22, 1953, by Andrew Spielman, now with the U. S. Navy. The condition of the mount is such that detailed description and figures are difficult to give. The mite is similar to the California species, differing principally in having a seta on the basal segment of the palpus (fig. 5) and in possessing lens-like organs on the lateral and posterior margins of the body—6 pairs surround the anal opening. No name is given to this species but it is mentioned here to strengthen the erection of the new genus.

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A NEW GARGAPHIA FROM FLORIDA

(HEMIPTERA: TINGIDAE)

ROLAND F. HUSSEY, *Biology Department, University of Florida, Gainesville*

Through the courtesy of Mr. Harold A. Denmark, of the Department of Entomology, State Plant Board of Florida, I have been privileged to examine some collections of Hemiptera from various parts of the state. Among these were two specimens of the new species described here. The locality from which they come is in northwestern Florida, less than a mile from the southwestern corner of the State of Georgia.

Gargaphia sororia, new species

Length 4.05 mm., maximum width across hemelytra 1.76 mm., across discoidal area 1.66 mm., across paranota 1.17 mm.

Cephalic spines nearly as in *G. amorphae* (Walsh), basal spines more nearly horizontal and very slightly longer than the median one, median spine oblique, not surpassing tips of the rather short frontal spines which are contiguous at tips and do not reach middle of first antennal segment. Lengths of antennal segments I-IV = 31:14:163:45, first two segments heavily infuscated, nearly black, third segment brown, fourth segment black, first segment one-fourth longer than vertical height of an eye (31:25),[1] third segment much longer than transverse width of pronotum across paranota (163:117). Hood about as long as its height above dorsal margin of eye (31:33).

Paranota more nearly vertical than in *G. amorphae* but formed much as in that species, rather evenly rounded at sides, with four rows of cells at widest part, the veinlets mostly brown or brownish piceous, cells hyaline. Median carina of pronotum scarcely higher than lateral carinae, these not extending forward quite as far as posterior end of hood.

[1]All comparative measurements are expressed in hundredths of a millimeter.

Costal area of hemelytra with four rows of fairly large cells at its widest part, and with four rows of smaller cells opposite discoidal area; veinlets piceous to black opposite apical half of discoidal area and enclosing lightly embrowned cells, so as to form a fairly distinct transverse fascia which attains costal margin; veinlets of apical third or more of hemelytra less heavily embrowned, their cells entirely hyaline; veinlets on short basal part of costal area and on its middle portion largely pale. Subcostal area biseriate from base to middle of hemelytron, uniseriate beyond that point, but with an occasional extra interpolated cell in region of transverse fascia. Discoidal area two fifths as long as hemelytra (112:280), its apical angle strongly displaced outwardly, as in *G. amorphae*, its widest part with four rows of cells about equal in size to those of adjacent subcostal area. Pronotum (except apical part of posterior process), subcostal area in part, discoidal area (except middle portion), and body beneath, black or piceous. Legs brown, apical segment of tarsi black.

Apparently nearest allied to *G. amorphae* (Walsh, 1864), but of somewhat more slender form and distinctly darker coloration, with the first two antennal segments brownish black to black, and with the transverse fascia on the costal area more distinct. In *G. amorphae* the more oblique position of the paranota makes the transverse width across then nearly equal to the length of the third antennal segment (140:159), the subcostal area is triseriate over that portion which is biseriate in the present species, and the discoidal area is nearly half as long as the hemelytra (127:271).

The black first antennal segment causes this new species to run to *G. solani* Heid. in the keys of Drake (1917, Ent. News 28: 227) and Blatchley (1926, Heter. E. N. Amer. 473). It is very distinct from that species, which has the paranota much more widely expanded, with subangularly rounded lateral margins, so that the transverse width across them is distinctly greater than the length of the third antennal segment (174: 152).

In Gibson's key (1919, Trans. Amer. Ent. Soc. 45: 190) *G. sororia*, n. sp. runs to couplet 6, but does not fit either alternative there since the discoidal area is plainly less than half as long as the hemelytra but is much wider than the subcostal area.

Holotype ♂: Gadsden County, Florida, 1 August 1956 (F. W. Mead), in University of Florida collections. Paratype ♂: Same data as type, in collection of State Plant Board of Florida. Mr. Mead informs me that these two specimens were collected by sweeping miscellaneous vegetation on the narrow flood plain of the Apalachicola River at Chattahoochee, Florida. The host plant was not identified.

THE SPREAD OF CATORHINTHA MENDICA STAL

(COREIDAE, HEMIPTERA)

W. V. BALDUF, *University of Illinois, Urbana.*

Catorhintha mendica Stål (1870) is of interest here first for the manner in which it has extended its range within its native North America, and second because the study of its spread indicates the

kinds of evidences that may be applicable in investigations of intracontinental distribution of other insects also.

Evidences are given below which show that *C. mendica* was indigenous to the Great Plains of North America but has now spread eastward almost, or possibly quite, to the Atlantic Coast.

This bug is more than ordinarily favorable for a consideration of the time, direction, and means of spread than some others, because it appears to be monophagous, at least from Illinois eastward, where most of my observations were made. Therefore, information about the source and subsequent spread of its food plant affords data that apply to the dispersal of the bug itself. The indicated food plant is a species of *Nyctaginaceae,—Mirabilis nyctaginea* (Michx.) (Synonyms: *Oxybaphus n., Allionia* n.).

The basic questions involved in this investigation of the intracontinental spread of *Catorhintha mendica* are: (1) What were the borderlines of its original or native geographical range, (2) the agencies that implemented its dispersal, and (3) the period of time of the dispersal?

Mirabilis nyctaginea

Center of Distribution. Whereas *M. nyctaginea* now occurs more or less generally from the Rocky Mountains to the Atlantic Coast, it was confined to much narrower limits until white settlers occupied the western part of the Mississippi drainage basin. The data from correspondence and the literature leave little doubt that the plant was originally restricted to the Great Plains. Typical of evidences on this point are the following instances. The Major S. H. Long expedition up the Missouri found it in Nebraska in the first decade of the 19th century (James, 1825). Nuttall (1818) reported it as common "on the Alluvions of the Missouri," and it was discovered by botanists associated with Lewis and Clark in 1806 on their explorations up the Missouri river into and beyond the Dakotas (Pursh, 1807; Thwaites, 1904).

Researches by Gilmore (1911, 1913), Densmore, (1918) and other ethnologists provided the information that *M. nyctaginea* was well known and widely used for medicinal and other purposes by the Indians of Teton Dakota, Oglala Dakota, and the Omaha, Ponca, and Pawnee of Nebraska. This fact indicates that this plant lived for centuries in the areas of these tribes, and also constitutes a type of evidence that it was native in the Great Plains.

Not only have contemporary botanists of the Plains declared *M. nyctaginea* to be native there, but also the nature of the habitats described in the literature of that area strongly indicate it is indigenous: such as "rocky riverbank," "waste hillsides," "grassy slopes," "virgin prairie," "grassy butte," "banks of sloughs," and "wooded bluffs."

There is evidence that *M. nyctaginea* was native also in the western

parts of Illinois, or even so far eastward as the Illinois River valley. Mead (1846) found it along the banks of the Mississippi River, and Patterson (1876) had it from the sandy river banks and barrens at Oquawka, in adjacent Henderson county. Gleason (1910) reported its occurrence in sandy areas at Havana, Quincy, and Dixon. The Missouri Botanical Gardens has specimens taken before 1843 by Charles Geyer at Beardstown on the Illinois, and Brendel (1887) found it on banks and in fence rows at Peoria.

In addition to the above positive indications that *M. nyctaginea* is native from western Illinois westward, there is even more convincing evidence of a negative sort that shows it originated in the Great Plains. The earliest botanical surveys made in America show the food plant of *Catorhintha mendica* was lacking in eastern Illinois and the states to the east. This is clear from the publications of Pursh (1807), Nuttall (1818), Barton (1818), Brace (1822), Torrey (1824, 1943) and Bigelow (1824). Kellerman (1900) and Schaffner (1914) reported the plant as infrequent in Ohio and introduced from the west.

In a personal communication, Dr. C. C. Deam, veteran botanist of Indiana, informed me that none of the local floras of his state listed *M. nyctaginea* before 1900. Likewise, the botanical reports of Short (1845), Lapham (1857), Bebb (1858, 1860), and Babcock (1872) concerning eastern Illinois do not include it.

From the above positive and negative indications, it is more than probable that *M. nyctaginea* was indigenous to the vast territory bounded on the south by Texas, the west by the Rocky Mountains, the north by Manitoba, and the east by the Mississippi, or perhaps the Illinois River.

Agencies of Dispersal. However, *M. nyctaginea* now occurs widely in eastern Illinois, in Indiana and Ohio, and in states east of Ohio. What then were the means whereby it was enabled to spread beyond its original borders? Annotated herbarial specimens, published floral lists, and personal field notes combine to show that this species occurs predominantly on the rights-of-way of railroads, in freight yards, and about feeding stations. This fact identifies freight cars loaded with surplus agricultural products from the west as the obvious and principal vehicles of dispersal. Moreover, I have observed that it is very largely the east-west roads that link the agricultural midwest and the large populational centers of the east, which have transported the plant eastward.

The nature of the evidence that involves railroads as the agencies of dispersal is illustrated herewith. Pepoon (1927) reported *M. nyctaginea* as then being very common about Chicago in the sand and gravel ballast of railroads, and added that it "does not seem to grow in other habitats." For Indiana, Deam (1940) described it as "infrequent to frequent in railroad ballast throughout the state—more frequent before the right-of-ways were kept clean." Also correspondence with curators of herbaria in eastern universities showed that their samples

of *nyctaginea* originated chiefly along railroads. In eastern Illinois, Dr. A. G. Vestal, University of Illinois, found it only along railroads in 25 years of field work. In 1945 it was present on all northern Illinois railroads where I searched for it, and in 1942 I discovered it in several widely separated counties in Indiana and Ohio.

Dates of Introduction. Two prerequisites were necessary to the outward movement of *M. nyctaginea* from the Great Plains to the older, more densely populated centers east of Ohio—the prairies had to be subjected to the plow for the production of crops, and man-made means of transporting the agricultural surpluses had to be developed. These two conditions began to coexist in the decade of 1850-1860 when, according to Petersen (1937), the ferries over the Mississippi River from Illinois to Iowa were busy day and night transporting farmers from the east. Likewise, steamers on the river were jammed between 1850 and 1871 with future settlers for Minnesota.

The Illinois-Michigan canal opened in 1848 and was the first artificial means of east-west transportation in the Illinois-Iowa area. It linked the Great Plains with the Great Lakes, and thereby established a continuous waterway to the Erie canal, the Hudson, and the Atlantic. The volume of goods carried on the canal increased until 1882 (Coard, 1941). Before that year, some excess farm produce was being moved eastward from Iowa and adjacent areas, hence the canal may have performed an early minor role in the spread of *M. nyctaginea.*

But railroads were the main means of spread. The Michigan Southern, later a component of the New York Central from New York to Chicago, entered the breezy city in 1850. At the same time the Chicago and Rock Island line pushed west parallel to the I-M canal, and was the first railroad to bridge the Mississippi River, an event of 1855. However, railroads permeated the new agricultural region of the Mississippi basin largely after 1860. The decade following 1880 was the era of great railroad construction in America (Conger, 1932). This, with the fact that seven-eighths of the agricultural surpluses produced in 1879 north of Arkansas crossed the river on rails between St. Louis and St. Paul (Dixon, 1909), indicates that the dispersal of *M. nyctaginea* was then approaching its peak rate. The Great Plains were being rapidly transformed from a vast prairie to an enormous farm.

Since large parts of the surplus agricultural products from Iowa, Minnesota, and the Dakotas were carried eastward by freight trains through Chicago, the early records of occurrence of *M. nyctaginea* for this city give additional indication of the time the plant moved out of the Plains. In their flora of Cook County, Ill., and adjacent Lake County, Ind., Higley and Raddin (1902) reported their discovery of a few specimens of this species in 1885 and 1887. Its scarcity at that time compared with its present abundance in the vicinity of Chicago

indicates its introduction had just begun. Also the report from Deam (personal correspondence) that none of the local floras of Indiana contained the species before 1900, and the information given by the Kellermans (1900) and Schaffner (1914) that it was then infrequent and "non-indigenous" in Ohio, supplement the records of Higley and Raddin to show that the spread of *nyctaginea* eastward from the Plains was in progress about 1880 to 1900. However, its earliest escape can have been effected as early as 1870. Moreover, the early establishments along the tracks are doubtlessly being intensified at the present time. Obviously, also, the plant has been aided to spread eastward by many other railroads than those passing through Chicago.

How Railroads Transport the Plant. It is easy to determine how *M. nyctaginea* came to be included in the farm surpluses shipped from its native area. There the plant grew spontaneously among the wild and cultivated forage crops. The forage was either placed as food in cars loaded with cattle and sheep destined for eastern markets, or shipped in large quantities to feeding stations or markets along the railroads. Such feeding stations, numerous along the main railroads, were established in response to a Federal law, which requires that live stock be unloaded at intervals for rest and food. Some stations also house stock to fatten it for later sale in the east. I have information from some managers of feeding stations in northern Illinois that bulk wild hay has been, and is still being, imported from Nebraska for such purposes. In harvesting the hay, some *M. nyctaginea* bearing more or less ripened seeds is included.

In a similar manner, the seeds may gain entrance into grains in the threshing process where the plant grows in or bordering fields of wheat or similar crops. Reports from State and Federal seed-testing laboratories show that seeds of *M. nyctaginea* sometimes are present in samples of grain originating in the Plains.

Whether in grain or hay, the seeds obviously have fallen from railroad cars as the trains bearing farm crops or live stock roll and jolt along hundreds of miles of trackway, or as the materials are unloaded at their destinations, or even as the stock cars lie temporarily on side tracks. Falling here and there, through the years, upon the shoulders and slopes of the roadbeds, some seeds drop to favorable soil to develop and establish the species. The present degree of continuity of its distribution along the tracks depends on the character of the soil medium, the age of the railroad, and the kind of treatment the roadbeds have received since their construction. The stands of the plant are found to be more dense and continuous where vegetation has been allowed to grow somewhat spontaneously, on the right-of-way, but patchy and infrequent where the roadbeds have been modified from time to time by the addition of sundry ballast that tends to suppress the plant, or eradicate it locally. Sprays, fires, and mowing also are common means of retarding the local establishment and intensification of *M. nyctaginea.*

Catorhintha mendica Stål

Its Native Area. The strongest support for my belief that *Catorhintha mendica* was originally indigenous to the Great Plains comes from the fact, established above, that its food plant, *Mirabilis nyctaginea*, is native to that area. Certainly it is now monophagous in Illinois and in Wisconsin, Indiana, and Ohio for, in all cases, I obtained it by sweeping only this four o'clock. Three other species of Nyctaginaceae are listed by Pepoon (1927) for the Chicago area, and by Deam (1940) for Indiana, but they are rarely seen and not to be regarded as established species of the flora, hence are not likely to serve as food plants of the bug.

Also the character of its present distribution in the Plains States gives confirmation to its native occurrence there. Not only does *C. mendica* appear to be more frequent there than eastward, but it inhabits the area generally, including the spacious landscapes lying between railways. This may be deduced from the wide and relatively intensive appearance of its food plant. Also the records of the collections of the bug in those states show it is more plentiful and uniformly distributed than in Illinois and eastward. I am indebted largely to the entomologists of the Plains States, who sent me records on which my view is based. These records indicate that *C. mendica* was native at least in Texas, Kansas, Missouri, Nebraska, Iowa, South Dakota, and Minnesota. To illustrate how such records bear positively on the question of nativity, I cite, in general terms, the facts for Iowa. Through the cooperation of Professor H. E. Jaques, Iowa Wesleyan College, Mt. Pleasant, who conducted the "Iowa Insect Survey" in recent years, I have data that show *C. mendica* was taken in 25 counties that represent all sections of the state from north to south and west to east. Additional records supplied by Doctors C. J. Drake and H. M. Harris from the collections of the Iowa State College, Ames, show the bug occurs in still other counties of Iowa. Accordingly it may be presumed to occur all over Iowa, where *M. nyctaginea* also is indigenous and generally distributed.

My visit of June 1945 to Oquawka, Ill., along the Mississippi River, disclosed that *C. mendica* is present on *M. nyctaginea* growing among native prairie plants in the sandy areas remote from railroads. In the same month, I obtained the bug from this plant at woodland roads through the sandy areas at Havana. Hart (1907) recorded it from the same type of habitat at Havana, and at Camp Point, near Quincy, in Adams County, and at Dixon, Lee County, Ill. In these areas of Illinois, *C. mendica* therefore has, like *M. nyctaginea*, the appearance of being native.

However, the presence of both *M. nyctaginea* and *C. mendica* only along railroads at Savanna, Hanover, Fulton, and Cordova, in western Illinois, and their absence in sandy areas adjacent to the trackways indicate the bug was not native to these places, but migrated down the right-of-ways from the west after *Mirabilis* had established itself

here. Moreover, they were not found in parts of sand tracts remote from railroads at Atkinson and Wichert, Ill. Were they native, they would certainly have occurred here where the extensive acreage of undisturbed sandy soil is favorable to the food plant.

Other explorations of June 1945 produced data which show that the bug and its food plant were adventive in the more easterly parts of northern Illinois. In all the following instances, the insect was netted from *M. nyctaginea* growing only along railroads. The localities are given in the order of their position in the state, from north to south; Huntley, Des Plaines, Bristol, Wenona, Sparland, LaSalle, Peoria, Minonk, Crescent City, Hudson, Carthage, Quincy, Mt. Sterling, Harris, Oakwood, and many stations along railroads in Champaign Co. Records from W. J. Gerhard, Chicago Museum of Natural History, others from the Illinois State Natural History Survey, and some from individuals, show that *C. mendica* was present also in Rock Island, Mercer, Fulton, Morgan, and Union Counties. The latter is the only county in the southern half of the state.

My records for Wisconsin also were obtained by sweeping the insect from *M. nyctaginea,* along or near railroads. In the 1940's, I took it west of Madison; at Millston, in Jackson County, and at Fall Creek, Eau Claire County. It occurred also on *nyctaginea* growing on the berm along U.S. route 53 near Solon Springs in Douglas County. Here the plant probably originated on a nearby railroad property.

Since, as Deam (1940) states, *M. nyctaginea* probably occurs in every county of Indiana, and is confined almost entirely to railroads, it is logical to assume that this monophagous bug, *C. mendica,* is equally limited to railroads, although it may not yet have pervaded to all possible locations. Entomologists have found *C. mendica* in Indiana as follows: Miller, Lake Co.; Monticello, White Co., on *M. nyctaginea,* at rairoad; Roanoke, Huntington Co., on *M. nyctaginea,* at railroad; Lafayette, Tippecanoe Co.; Marion Co. and Knox Co.

For Ohio, I have the following records: Cedar Point, Erie Co. (H. M. Parshley), and Columbus, Franklin Co. (C. J. Drake). In June 1942 I swept *C. mendica* from *M. nyctaginea* growing along east-west railroads at Antwerp, Paulding Co.; Oak Harbor, Ottawa Co.; Fitchville, Huron Co.; and West Lafayette, Coshocton Co.

Through the cooperation of Dr. T. L. Guyton, State Department of Agriculture, Harrisburg, I received specimens of *C. mendica* taken by him along a railway at Lickdale, Lebanon Co., Pa. This is the easternmost point of its occurrence known to me, but it probably has radiated north, east, and south in Pennsylvania and neighboring states. However, considering its innate mode of dispersal as compared with the human lifts given the plant, it may not even today have spread to the extent it may eventually attain.

Mode of Dispersal. I regard *C. mendica* as dependent on *M. nycta-*

ginea for food and habitat from Illinois eastward. Therefore, its spread in this direction depends on the previous establishment of the plant. Again, since the plant rarely occurs there anywhere but on railroads, and the bug has been found only along railways, these man-made means of transport constituted the main avenues down which the insect made its way.

Whereas *M. nyctaginea* was carried by fast-moving freight trains and therefore became spread and established along the entire courses from the midwest to New York, probably in a few years, the bug, *C. mendica*, probably migrated eastward very largely on its own locomotor powers.

C. mendica is quick on foot and also flies well. When the food plant is growing and succulent in May to June and again in August to October, there would appear to be no inducement to migrate. However, in midsummer, and again in late October and November, most plants have become woody, hard, and leafless, and the bug population either reaches a very low level, or appears so owing to migration from the trackway (Balduf, 1942). These migrations are more or less random, hence involve some degree of hazard, for there is little reason to suppose that the bug flies strictly along the railroad, keeping between the line fences. When stands of the plant are as much as a half mile, and often more, apart, as I have observed them, the bug may be imagined sometimes taking off across the adjacent farmland and perishing for lack of the one essential food plant that occurs only on railways.

The rate of spread was probably slow in the early years after 1880. The food plant was at first scarce, spotty, and occurred at long spatial intervals. As trains dropped more and more seeds year after year, and more intense stands developed locally also from seeds of the original clumps, the growths of *M. nyctaginea* approached greater degrees of continuity, which facilitated the successive hops of the insect down the narrow rail paths that stretched long miles eastward.

Although this favorable condition of the plant was sometimes attained, as is evidenced by its common and somewhat continuous occurrence along some roads I have visited since 1940, the establishment of the plant and its bug was, in many cases, hindered by modifications of the roadways since the railroads were first constructed. The roadbeds needed to be strengthened as larger locomotives and heavier car loads came into vogue, single track lines were enlarged to two-way tracks, the banks were reinforced with ballast, and the vegetation often destroyed by section crews.

Summary

Inasmuch as it is monophagous on *Mirabilis nyctaginea*, *Catorhintha mendica* can have established itself east of the Great Plains only when and to the extent that the food plant had previously invaded that eastern area. Records at hand show that *C. mendica*

has now moved eastward down the *nyctaginea* trails on railroads so far as about three-fourths across the state of Pennsylvania.

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NEW SPECIES OF RALLICOLA (Philopteridae: Mallophaga)

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Since reviewing the genus *Rallicola* (Emerson 1955), additional material has been examined. The status of two subspecies can now be clarified, and two new forms are described.

Rallicola ortygometrae californicus (Kellogg and Chapman)

The original description was based on material collected from *Rallus obsoletus=Rallus longirostris obsoletus* Ridgway, and *Rallus virginianus=Rallus limicola limicola* Vieillot. For my review, specimens from *Rallus limicola limicola* Vieillot were not available. From material now available, it is established that the two hosts harbor different forms of the genus *Rallicola*. I designate *Rallus longirostris obsoletus* Ridgway as the type host of *Rallicola ortygometrae californicus* (Kellogg and Chapman, 1899). This host is the first one listed by the authors in their original description. The redescription and figures given in my review are based on material from *Rallus longirostris* subspecies. The specimens found on *Rallus elegans elegans* Audubon also appear to be this subspecies.

Rallicola ortygometrae guami Carriker

Through the courtesy of Dr. Ronald Ward, material from the type host of this species has been examined. The series consisted of: Six females and four males from *Rallus owstoni* (Rothschild), collected August 22, 1931, on Guam by W. F. Coultas. The form is properly a subspecies of *Rallicola ortygometrae*. In my key, it can be separated from *Rallicola ortygometrae affinis* (Piaget) by tergite III in the male; which in *guami is* continuous, and in *affinis* is interrupted. These specimens differ slightly from the description given by Carriker (1949), so the following notes prepared by Dr. Ward and the author are presented.

In the male, abdominal tergite II interrupted medianly, III interrupted medianly for about one-third of the segment length, and the remainder are entire. Male genitalia as shown in figure 1. In the female, abdominal tergites II-VI interrupted medianly, VII-VIII transversely continuous. Sternites III-VI, in both sexes, with four long setae on posterior margins.

Measurements:	*Male*	*Female*
Length of head	0.47mm	0.49mm
Width of head	.36	.38
Width of prothorax	.23	.24
Width of pterothorax	.30	.33
Width of abdomen	.33	.35
Total length	1.55	1.66

Rallicola ortygometrae subporzanae n. sp.

All abdominal tergites, in both sexes, transversely continuous. Abdominal tergites II-III with large anterior median indentation; but posterior one-third of these two tergites continuous. Abdominal tergites and sternites, in both sexes, each with four long setae. Male genitalia as shown in figure 2.

Measurements:	*Male*	*Female*
Length of head	0.48mm	0.44mm
Width of head	.38	.36
Width of prothorax	.22	.21
Width of pterothorax	.32	.32
Width of abdomen	.48	.21
Total length	1.43	1.51

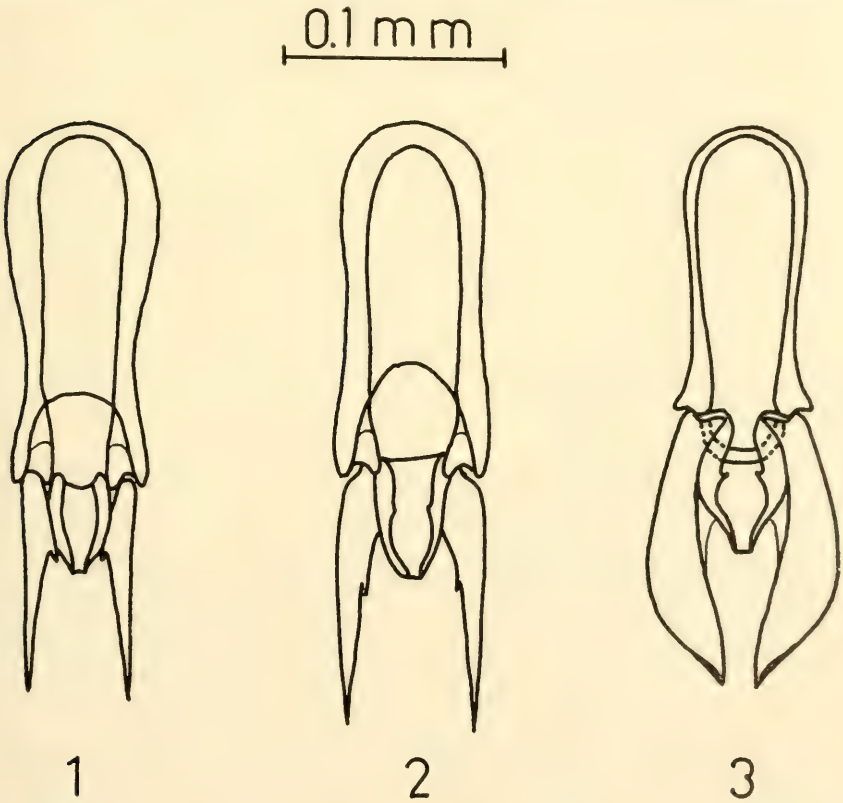
Type host.—Porzana carolina (Linnaeus), Sora rail.

Type material: Holotype male, allotype female, and paratype female collected in Douglas County, Kansas, during May 1909, are in the Snow Entomological Collection, University of Kansas. Paratype female collected at Mattituck, Long Island, New York, on September 10, 1936, by R. Latham, is in the collection of Cornell University.

This subspecies is closest to *Rallicola ortygometrae ortygometrae;* but can be separated from it in that tergite IV is continuous in the new form, and interrupted medianly in *Rallicola ortygometrae ortygometrae* (Schrank).

Rallicola mystax (Giebel)

The type host of this species is *Porzana porzana* (Linnaeus), which is found in Europe. Two collections have been examined that indicate



Male genitalia of *Rallicola* sp., drawn to the same scale:—Fig. 1, *R. ortygometrae guami Carriker;* fig. 2, *R. ortygometrae subporzanae* n. spp.; fig. 3, *R. kelloggi* n. sp.

the species is also found on *Porzana carolina* (Linnaeus) in North America. Two males collected at Moscow, Idaho, on May 2, 1952 by T. D. Burleigh, and one male collected at Tlacotalpam, Vera Cruz, Mexico, on February 19, 1940, by M. A. Carriker, apparently agree in all details with specimens from the type host. These records tend to confuse the situation, as heretofore it has been thought that each species of host was parasitized by only one species of *Rallicola*. Further collections will be necessary to determine if this exists for other hosts.

Rallicola kelloggi n. sp.

Male: Head slender, with a wide hyaline margin. First segments of antennae enlarged and elongated, each with an appendage. Third segments of antennae prolonged distally beyond the junction with segment IV. Posterior margin of pterothorax with four pairs of long setae. Second abdominal tergite interrupted medianly, the remainder transversely continuous; each tergite with a pair of setae located medianly on posterior margin. Abdominal sternites III-VI with four setae on posterior margins; and sternites VII-VIII with two setae on posterior margins. Male genitalia as shown in figure 3.

Female: Antennae filiform. Abdominal tergites II-III interrupted medianly, IV indented medianly, and the remainder transversely continuous. Chaetotaxy, except for the terminal abdominal segments, as in the male. Lateral margins of abdominal sternite IX, each with a fringe of ten medium-length setae.

Measurements:	*Male*	*Female*
Length of head	0.42mm	0.45mm
Width of head	.35	.36
Width of prothorax	.21	.23
Width of pterothorax	.28	.30
Width of abdomen	.38	.45
Total length	1.26	1.42

Type host.—Rallus limicola limicola Vieillot, Virginia Rail.

Type material.— Holotype male, paratype male, and five paratype females in the U. S. National Museum, were collected at Vienna, Maryland, March 6, 1951. Allotype female, two paratype females, and one paratype male in the collection of Ohio State University were collected at Buckeye Lake, Ohio, on May, 15, 1925. Two paratype males in the collection of Dr. G. J. Spencer were collected at Haney, British Columbia, on June 14, 1951, by A. Peake. Three paratype males are in the collection of Cornell University; these specimens are without data except for the host. A paratype male and female in the U. S. National Museum were collected at Leonia, New Jersey, on September 6, 1929, by J. A. Weber.

This form is near *R. sarothurae* Clay, *R. hoogstraali* Emerson, and *R. cuspidatus* (Scopoli). The mesosome of the male genitalia is not elongated and pointed as in *R. sarothurae*, or broadly rounded as in

R. hoogstraali. Tergite V of the female is interrupted medianly in *R. cuspidatus*, and transversely continuous in *R. kelloggi* n. sp.

Host List

The following list includes all species of the genus *Rallicola* found in the United States, Canada, and Alaska, together with their normal hosts.

Rallicola advenus (Kellogg), 1896. *Fulica americana americana* Gmelin, American coot.

Rallicola elliotti Emerson, 1955. *Porphyrula martinica* (Linnaeus), Purple gallinule.

Rallicola fulicae (Denny), 1842. *Fulica atra atra* Linnaeus, European coot.

Rallicola funebris (Nitzsch), 1866. *Aramus scolopaceus pictus* (Meyer), Florida limpkin.

Rallicola kelloggi n. sp. *Rallus limicola limicola* Vieillot, Virginia rail.

Rallicola minutus (Nitzsch), 1866. *Gallinula chloropus cachinnans* Bangs, Florida gallinula.

Rallicola mystax (Giebel), 1874. *Porzana carolina* (Linnaeus), Sora rail.

Rallicola ortygometrae californicus (Kellogg and Chapman), 1899. *Rallus longirostris* subspecies, Clapper rails, and *Rallus elegans elegans* Audubon, King rail.

Rallicola ortygometrae ortygometrae (Schrank), 1781. *Crex crex* (Linnaeus), Cornerake.

Rallicola ortygometrae subporzanae n. ssp. *Porzana carolina* (Linnaeus), Sora rail.

Rallicola porzanae (Piaget), 1880. *Coturnicops noveboracensis noveboracensis* (Gmelin), Yellow rail.

The black rails, *Latterallus jamaicensis* subspecies, are the only hosts from this area likely to harbor a form of *Rallicola* that have not been examined to date.

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NOTICE

Memoir No. 5, A Classification of the Siphonaptera of South America, by Phyllis Truth Johnson, is now available. Price $10.00. Send orders to Mr. Herbert J. Conkle, Custodian, Entomological Society of Washington, Plant Quarantine Branch, ARS, U. S. Department of Agriculture, Washington 25, D. C.

NOTES ON BIONOMICS AND ECOLOGY OF MOSS-MITES I. (ACARI: ORIBATEI)

JOSEF R. WINKLER, *Museum* SLUKO *Olomouc, Czechoslovakia*
(Communicated to Tyler A. Woolley, Colorado A & M College)

Migration on Large Plants

Studies of microcavernicolous life histories demonstrate the occurrence of certain oribatid mites in soil layers, decaying leaves, under stones, beneath the bark of trees, and in similar biotopes. The mites are often very abundant also on small plants growing in the immediate neighborhood of the earth (mosses, lichens, etc.), but their presence on larger plants is rather exceptional and only a small number of migrant species is known. Some oribatid species, for instance *Cymbaeremaeus cymba* (Nic.), *Neoliodes theleproctus* (Herm.), and *N. farinosus* (Koch) are often mentioned in the literature as arboricolous mites. Collections on forest-steppes in the Karlstejn area (Central Bohemia) help to revise these data. On oaklets of this locality *Neoliodes farinosus* was procured in great numbers together with *Phauloppia lucorum* in sweepings of the area. Both of these also occurred in sweepings from the serpentine-steppes of Mohelno (SW Moravia) made by the writer in May 1955.

On localities in the lower parts of the Sumava Mts., (Böhmerwald), *Phauloppia lucorum* and *Cymbaeremaeus cymba* were collected together. The former was distributed rather individually; the latter occurred in great abundance in overgrowths of *Cladonia* and on the trunks of firs. *P. lucorum* was not found in any of the samples of litter from beneath these trees. Specimens of *C. cymba* were rather rare in the litter and those found were usually dead and defective. (Schwarzbach in Böhmenwalde, 18.9.1953, J. R. Winkler)

The writer also studied the migration of *Camisia lapponica* (Trägh.) on leaves of bilberry (*Vaccinium vitis*) in the locality of Pestrice (Stögenwald) not far from Böhmenwalde. Clusters of *Vaccinium* were infested by the scale *Chionaspis salicis* and the aleurodid *Aleurotuberculatus similis Takahashi* (Det. Dr. J. Zahradnik). In this instance the author observed slow, distinct migrations of *C. lapponica* in spite of low temperatures of $-1°$ to $-20°$ C. These observations are unique, for data concerninig migrations of this species on plants are not found in the literature.

The occurrence of *Trichoribates incisellus* (Krammer) on cultivated lucerne (*Medicago sativa*) was observed July 7, 1955, near Karlstejn (Central Bohemia). No data concerning migration of this species on plants of a greater size are known.

Occurrence of cerotegument on *Xenillus tegeocranus* (Herm.)

For some species of mites the presence of cerotegument covering the body is characteristic. In certain instances it may be a valid and prominent taxonomic feature. The carabodid species (*Xenillus tegeocranus* (Herm.) usually has no cerotegument and there are no cases

described in the literature. The writer obtained this rather common species in a number of Bohemian localities. All collected specimens were of normal appearance. In one Bohemian (Lichkov, 3.9.1954) and three Moravian localities (Vlaske 29.8.1954 and Hanusovice, 15.8.1954), however, the author found specimens covered by a thick, dirty amorphous, yellowish-brown cerotegument. The layer covered both propodosoma and hysterosoma and made generic and specific identification impossible. The lamellae were of fantastic form and size. The cerotegument layer was suppressed by boiling specimens in chloralphenol and washing them in carboxylol. They were then mounted in Canada balsam and all characters became visible. The cerotegument, if present, is very adhesive, which necessitates a drastic method of removal. Although the writer boiled specimens in lactic acid and cleared them mechanically, he had better success with the former technique. Factors influencing the production and adhesion of cerotegument are unknown to the writer; he is also at a loss to explain the lack of cerotegument in some mites of the same species, as described above.

THE LARVA OF SIMOPELTA (HYMENOPTERA: FORMICIDAE)

George C. Wheeler and Jeanette Wheeler

Department of Biology, University of North Dakota

The larva of *Simopelta* deserves to be ranked with those of *Leptanilla* and *Proceratium* as the most aberrant and bizarre among the ants. In fact, when we first looked at Borgmeier's (1950) sketch, we doubted that it could be a formicid larva. It had a somewhat dipterous habitus and there are myrmecophilous larvae among the Diptera. So we asked Dr. Borgmeier if he would send us some material for study. His response was most generous—70 larvae.

A detailed study of this material revealed the presence of most formicid larval characters, but since we still had doubts, we sent some to Dr. Willis W. Wirth at the United States National Museum. Dr. Wirth[1] has written us that "the complete series of abdominal spiracles indicate that they are not dipterous. I know of no Diptera higher than the Fungivoridae-Itonididae series which have a complete series of abdominal spiracles. Traces of the usual pair of apical spiracles and the lack of a posterior differentiated pair of spiracles are practically always to be found in the higher Diptera."[1]

Genus SIMOPELTA Mann

Body rather stout and nearly straight. Diameter greatest at abdominal somite IV, decreasing to the anterior end of the abdomen, then increasing to the mesothorax. Prothorax conoidal and capable of being retracted to a limited extent into the mesothorax; basal diameter (in preserved material) abruptly offset from

[1]Obiter dictum: Dr. Wirth showed the larvae to a colleague, who said that if they were ant larvae, he was ready to believe anything.

the anterior end of the mesothorax. Terminal abdominal segment forming a small knob directed postero-ventrally. Tubercles sparse (72); fungiform, doorknob-shaped or irregular. Body and head hairs lacking. Antennae very small and situated high on the head, each with two sensilla. Mandibles falcate; base not dilated; without spinules or medial teeth; apex directed posteriorly, simulating the mouthhooks of maggots. Labial palps lateral.

Simopelta belongs to the section Euponerinae of the subfamily Ponerinae; the larvae of this section are characterized by having body tubercles. The tubercles of *Simopelta* appear somewhat similar to the glutinous dorsal tubercles of *Ponera* and *Euponera*, but otherwise there is little resemblance to other members of the tribe Ponerini. Head shape, high antennae, and the lack of hairs on the head suggest *Leptogenys* in the tribe Leptogenyini. On the other hand, *Simopelta* is unique among known ant larvae in (1) the general shape of the body and the shape of the thorax in particular; (2) the partial retractability of the prothorax; (3) complete absence of hairs; and (4) the shape and position of the mandibles. The lateral position of the labial palps is unusual but not unique.

Simopelta pergandei (Forel)

Young larva—Straight length 1.6 mm; length through spiracles 1.7 mm. Body rather stout and nearly straight. Diameter greatest at abdominal somite IV, decreasing gradually to the posterior end, which would be broadly rounded were it not for the terminal somite that forms a small knob directed posteroventrally; decreasing anteriorly to the anterior end of the abdomen, then increasing to the mesothorax. Prothorax conoidal and capable of being retracted to a limited extent into the mesothorax; basal diameter (in preserved material) abruptly reduced from the diameter of the anterior end of the mesothorax, giving an offset appearance. Head on the anterior end. Anus posteroventral. Leg and gonopod vestiges present. Segmentation indistinct. Body beset with 72 tubercles which are fungiform, doorknob-shaped, or irregular (in preserved material). Tubercles arranged in 8 longitudinal rows; the mesothoracic through the seventh abdominal somite each bearing 8 tubercles. Segmentation indistinct. Integument thickly beset with minute papillae (about 0.0012 mm in diameter). No body hairs. Cranium longer than broad; widest at the bases of the mandibles; dorsal outline rounded. Head with 10 small sensilla but no hairs. Antennae very small and high on the cranium; each with 2 sensilla, each of which bears a minute spinule. Labrum narrow, slightly longer than broad, thick; the blunt ventral surface with 8 sensilla; each lateral surface with 1 sensillum; posterior surface spinulose, the spinules rather long (about 0.009 mm) and arranged in subtransverse rows, the rows so close together that their spinules overlap. Mandibles heavily sclerotized; falcate; base not dilated; without medial teeth; surfaces smooth; apex directed posteriorly. Maxillae not distinctly marked off from the head; the apex bearing a few long slender spinules; palp a low knob with 1 lateral (bearing a spinule) and 3 terminal (2 small with a spinule each and 1 large and encapsulated) sensilla; galea a tall frustum bearing 2 apical sensilla. Anterior surface of labium spinulose, the spinules long and in subtransverse rows, the rows so close together

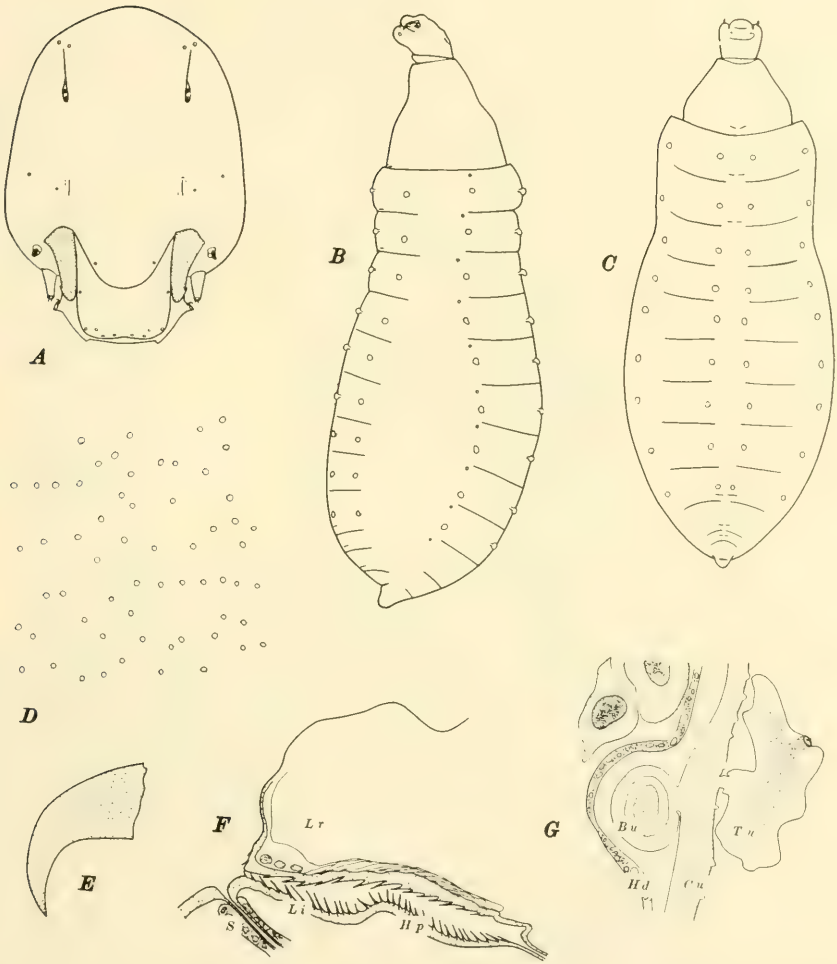

FIG. 1.—*Simopelta pergandei* (Forel), *A*, head in anterior view, X205; *B*, larva in side view, X44; *C*, larva in ventral view, X44; *D*, surface view of cuticular spines, X635; *E*, left mandible in lateral view, X282; *F*, mouth parts in sagittal section, X625; *G*, tubercle and adjacent bulb in section, X635. *Bu*, bulb; *Cu*, cuticle; *Hd*, hypodermis; *Hp*, hypopharynx; *Li*, labium; *Lr*, labrum; *S*, duct of sericteries; *Tu*. tubercle.

that their spinules overlap; palps lateral, each a low knob with 1 lateral (bearing a spinule) and 3 terminal (2 small with a spinule each and 1 large and encapsulated) sensilla; opening of sericteries a long transverse slit on the ventral surface of the labium. Hypopharynx densely spinulose, the spinules long and in numerous transverse rows, the rows so close together that their spinules overlap. (Material studied: numerous larvae from San José, Costa Rica, collected by H. Schmidt.)

Borgmeier 1950 (p. 376) states (translation from Portuguese): "I was able to examine more than 70 larvae of this species. None of them appears to have attained complete development, but at most scarcely 2 mm. in total length (the worker is 3 mm.). Some specimens were treated with lactic acid, and the form and structure were perfectly visible under high magnification. The color is cream. The thoracic segments are sharply marked off from the abdominal segments. There is a slight constriction in the height of abdominal segments 2-3 and they are enlarged in the posterior half of the abdomen. In specimens preserved in alcohol the form is more flattened and more enlarged posteriorly, and thoracic segments 2-3 are usually retracted. Abdominal segments 1-9 bear on the dorsal and ventral surface transverse rows of 4 circular papillae. The integument is naked, without hairs." (Fig. 12 on p. 375, larva in dorsal view.)

REFERENCE

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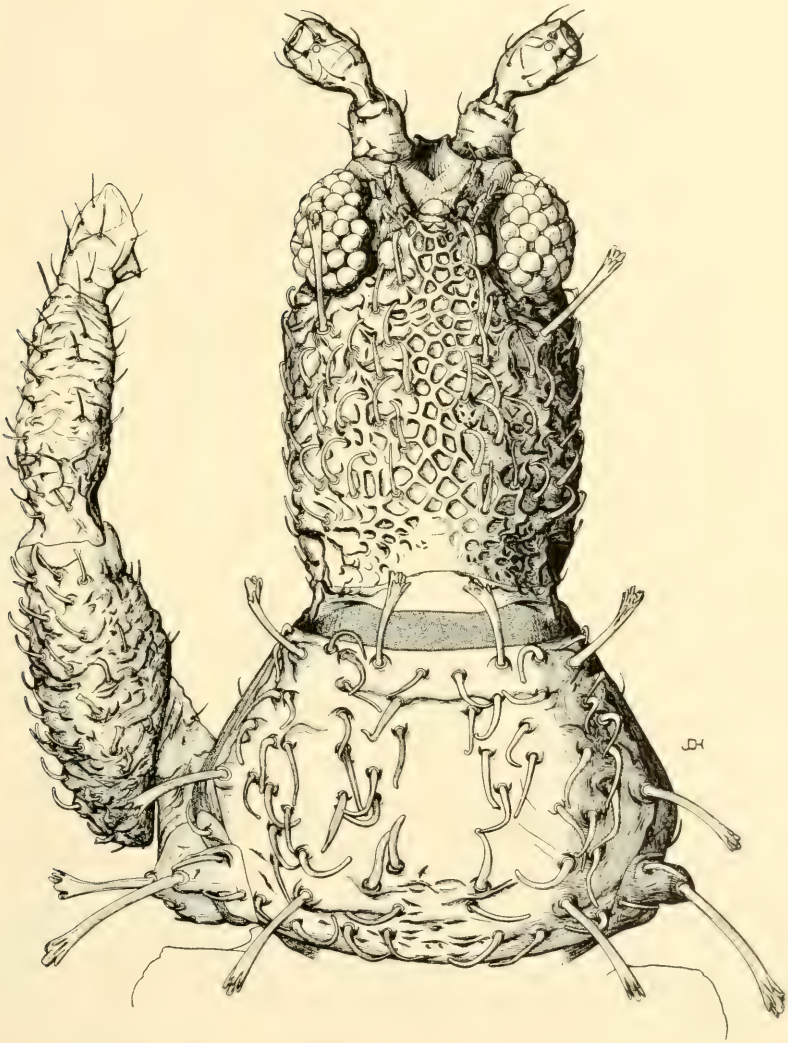
A NOTE ON THILAKOTHRIPS BABULI RAMAKRISHNA

J. DOUGLAS HOOD

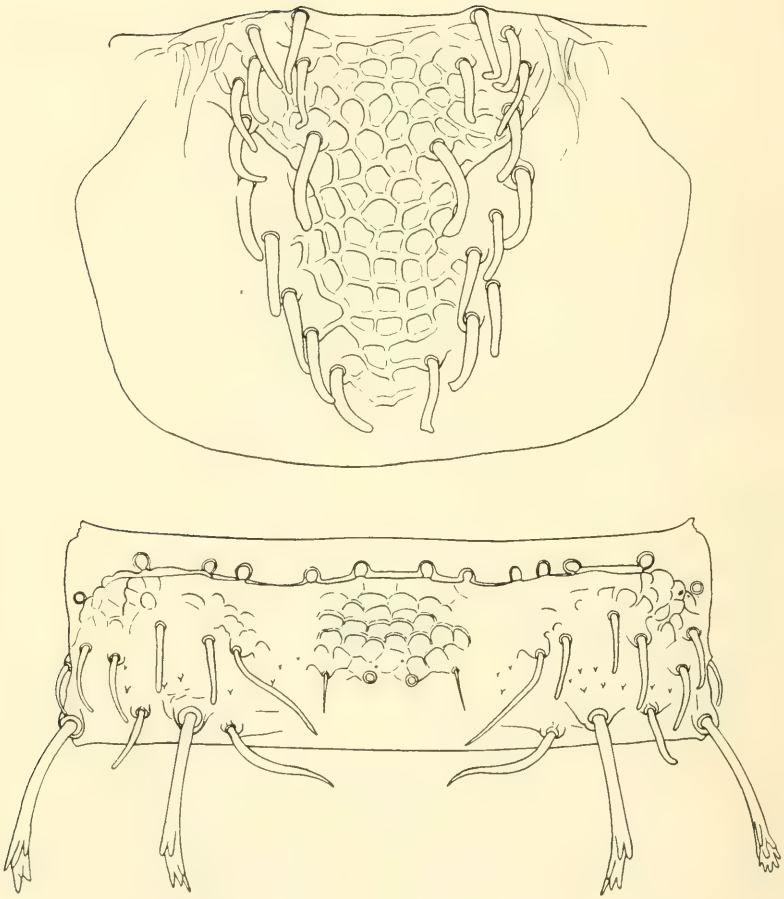
The description of *Thilakothrips babuli* Ramakrishna (Mem. Dept. Agr. India, 10(7):276-277, 1928) was evidently based in large part upon material crushed in the process of mounting and examined with no great care. To the species were attributed several nonexistent characters. I have a paratype which was collected with the holotype; i.e., it was taken at the same place, on the same day, in the same kind of galls, on the same plant, and labeled by the original describer in his own handwriting. This specimen, after treatment with potassium hydroxide, was manipulated into what appears to be a close approximation of its original form, and then remounted. It is the basis for the notes and drawings given below.

Little resemblance is to be seen between the present illustrations (Figs. 1-3) and those accompanying the text of the original description; and several statements made in the description itself need also to be corrected.

Thus, the head is not "dome shaped, converging toward the eyes and widening toward base, where there is a slight lateral expansion like a lappet on each side." Rather, it is nearly parallel-sided, narrowed basally, and not at all out of the ordinary in general form. Nor do the cheeks have "distinct crenulations, which appear more or less like warts, but have no spines or tubercles"; instead, they are



Thilakothrips babuli Ramakrishna. Head and prothorax, ♀, paratype; right fore leg omitted.



Thilakothrips babuli: Metanotum, ♀, paratype (upper); tergum of abdomen, ♀, paratype (lower).

well covered with distinct, though not large, tubercles, and each tubercle, with few exceptions, bears a large, curved, and somewhat finger-like seta. The prothorax is nearly smooth on the disc and without reticulation of any sort. It is set with numerous, heavy, tapering setae —fashioned much like the cephalic ones—and has the conventional six pairs of major setae, in their usual positions: four on the pronotum, one on the epimera, and one on the fore coxae. All of these last have conspicuously dilated tips. In the original description, this part of the body is said to be "not so distinctly reticulate" as the head, and "fringed with numerous curved hyaline bristles which are dilated at the tip, the postero-lateral bristle long, curved . . . other bristles comparatively small."

Following are measurements, in microns except as otherwise noted, of the single specimen, a de-alated macropterous female: Length about 1.6 mm. (distended, 1.86 mm). Head, total length 245, width across eyes 148, least width just behind eyes 129, greatest width across cheeks 151, least width near base 123, width across basal collar 129, greatest width in front of eyes 93, width of frontal costa 19. Eyes, dorsal length 64, dorsal width 40, dorsal interval 68. Median ocellus, diameter 15. Postocular setae, length 63, interval 107, distance from eyes 20. Mouth-cone, length beyond posterior dorsal margin of head 146. Prothorax, median length of pronotum 160, width across coxae 290, length of antero-marginal setae 50, antero-angulars 54, midlaterals 55, epimerals 82, postero-marginals 67, coxals 50. Mesothorax, width across anterior angles 302. Metathorax, greatest width posteriorly 315. Abdomen, greatest width (at segment III) 343; tube (segment X, only), length 163, width across basal collar 62, greatest subbasal width 57, least apical width 29, terminal setae 94; segment IX, seta I 92, II 80. Lengths of antennal segments: I 50 (dorsal, exposed length only 29), II 60, III 60, IV 56, V 54, VI 53, VII 53, VIII 27; total length of antennae 413.

A NEW SPECIES OF DENDROCORIS AND A NEW COMBINATION OF ATIZIES

(HEMIPTERA, PENTATOMIDAE)

G. H. NELSON, *College of Medical Evangelists, Loma Linda, California.*

Since the author's recent revision of the genus *Dendrocoris* (Proc. Ent. Soc. Wash. 57: 49-67, 1955), a new species of *Dendrocoris*, herein described, and a new combination of *Atizies* have been recognized. In the revision *Atizies* was placed as a synonym of *Dendrocoris* on the basis of *A. suffultus* Distant. Another species of *Atizies*, called to the author's attention by Mr. D. Leston, of London, England, was described by L. Ancona N. in "Los jumiles de Taxco (Gro.) *Atizies taxcoensis* spec. nov." (An. del Inst. de Biol. 3:149-162, 19 .) As the reference was not available to the author, Dr. R. I. Sailer, of the U. S. National Museum, kindly checked the original description and drawings. He states that the drawing of the underside shows the bifurcate metasternal plate or metaxyphus that is so characteristic of the Edessini and that *A. taxcoensis* belongs to the genus *Edessa* and is possibly a synonym of *E. conspersa* Stål.

Dendrocoris parapini, new species

This species resembles *D. pini* Montandon closely but has a relatively narrower head (especially noticeable in that part anterior to the eyes) and concave antero-lateral pronotal margins, which are straight or slightly convex in *pini* (see figs. 1 and 2).

Color.—Pale yellow ochraceous above and beneath, with ferruginous tints on head above. Punctures concolorous with body except for dark brown to black punctures along lateral margins of juga, antero-lateral margins of pronotum, and a few along lateral margins of hemelytra. Antennae rufo-ferruginous, paler toward base. Rostrum colored as body with dark markings typical of this genus. Legs colored as body, tarsi rufo-ferruginous. Abdominal segments with dark antero- and postero-lateral angles as seen from a lateral view. Spiracles colored as body.

Structure.—General form oval. Head width to length a ratio of 1.05 to 1, obliquely narrowed to rounded front; vertex and base of tylus convex; juga contiguous in front. Disk of pronotum with a few irregular raised smooth areas laterally and anteriorly; humeri not prominent, lateral margins before humeri slightly concave. Scutellum with impunctate areas along lateral margins and on disk. Hemelytra with impunctate areas located irregularly on their surface. Length: ♀, 6-7 mm. Width: ♀, 3.4-3.8 mm.

Female genitalia.—Essentially as in *pini* except that the genital plates are largely or completely hidden by sixth abdominal segment.

Variation.—Dark punctures occur on the posterior margin of pronotum in one specimen. Coloration and structure quite constant in the specimens available.

Type Material.—Described from seven females.

Holotype: NEW MEXICO: Las Vegas, August 12, H. S. Barber and Schwarz. U. S. National Museum Type Cat. No. 63453.

Paratypes: NEW MEXICO: 1 Las Vegas, August 16, Barber and Schwarz; 1 Santa Fe, July 21, 1926, E. C. Van Dyke; 1 Jemez

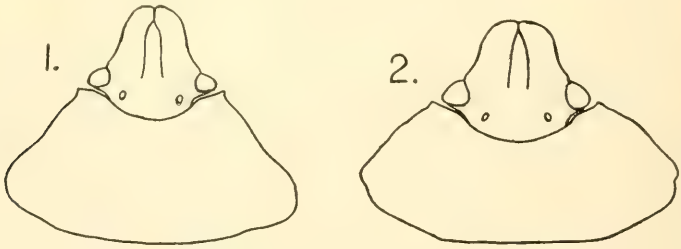


Fig. 1, *Dendrocoris parapini* Nelson, outline of head and pronotum; fig. 2, *D. pini* Montandon, outline of head and pronotum.

Springs, July 1, 1916, J. Woodgate; TEXAS: 3 Jeff Davis Co., June 20, 1952, July 4, 1953, and July 6, 1953, D. J. and J. N. Knull. These paratypes are distributed in the following collections: 2, U. S. National Museum; 3, Ohio State University Collection; 1, California Academy of Sciences.

It is possible that additional specimens of *parapini* are present in some collections under the name *pini* Montandon: Specimens identified as *pini* are especially suspect if they were collected in New Mexico or Texas.

HOST FEEDING OF CULISETA MORSITANS

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The ecology and bionomics of mosquitoes feeding on avian hosts have recently become important, as epidemiological studies involve wild birds and domestic pheasants as hosts of eastern equine encephalitis. However, knowledge of many mosquito species, particularly of the host-feeding preference, is not available. This article reports observations on the biology of one of these little known species, *Culiseta morsitans*.

The biology of the larvae of this species was published by Horsfall in 1955, but little has been reported on the feeding habits of the adult.

Carpenter and LaCasse (1955) say the females of the species rarely, if ever, feed on man. They indicate that *C. morsitans* probably feeds on birds and cite an account of a female feeding upon the blood of a breenfinch (Natvig 1948). However, there is little evidence concerning the source of the blood meal of this species. There is no indication that this mosquito even requires blood, since engorged specimens have not been reported. Wesenberg-Lund (1921) examined thousands of wild females and found none with blood in the alimentary tract.

Experimental.—Biweekly collections of *morsitans* adults were obtained from diurnal resting places in the vicinity of a domestic pheasant pen at Shade Swamp, Connecticut, throughout the early summer of 1956. During two 4-week periods, prior to and after 6-week-old pheasants were placed in the pen, the number of female *C. morsitans* containing fresh blood were counted and recorded. Blood smears from specimens containing fresh blood meals were prepared for microscopic examination.

Results.—Within a 4-week period, from June 16 to July 14, 1956, pheasants were placed in the pen, the number of female *C. morsitans* contained fresh blood meals out of a total of 115 females of this species collected. However, the collection taken during the first week after the pheasants were in the pen, July 14 to July 21, contained 18 blooded specimens out of 27. The incidence of blooded specimens in collections during the next 2 weeks remained high and then dropped in the fourth week. In the second week, July 21 to July 28, 6 were blooded out of 14 collected. In the third week, July 28 to August 4, 6 were blooded out of 23 specimens. During the fourth week, August 4 to August 11, 1 out of 14 had engorged with blood. In this 4-week period after the young pheasants were placed in the pen, a total of 31 blooded specimens out of 88 *C. morsitans* were collected. The percentage incidence of blooded specimens for this 4-week period was 35.2 percent as compared with 2.6 percent for the previous 4-week

period. Blood smears prepared for microscopic examination revealed that 6 out of 6 blood-engorged specimens contained nucleated red blood cells.

Discussion—During the past 3 years this laboratory has been concerned with the ecology of mosquitoes feeding on pheasants, because of the repeated occurrence in Connecticut of eastern equine encephalomyelitis in domestic pheasants. Particular observations have been made of *Culiseta* (Wallis 1953) since Chamberlain *et al.* (1951) reported isolation of the virus from *C. melanura* and Holden *et al.* (1954) reported isolation of three strains of virus from pools of the same species collected near a pheasant pen in New Jersey.

During the early summer months, adult *C. morsitans* were routinely collected in diurnal resting places in past years, but it was not until 1956 that careful observation of blood-engorged specimens could be correlated with the stocking of the pheasant pen. The sharp increase in the number of specimens containing blood was startling, and could not be connected with any other change in the environment. Wild bird and other potential host populations within the area were apparently constant during the two periods. It may be postulated that since a smaller total number of adults was in the cave collections in the latter 4-week period, the percentage of fed specimens would naturally increase. Also, the females in the population may not have been ready to feed earlier in the season. However, the proportion of blood-engorged specimens during the first week the pheasants were available was considerably higher than for subsequent weeks. From this, it appears that a backlog of females ready to feed was built up in the population and the young pheasants provided a suitable host population.

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SUMMARY REPORTS OF SOCIETY OFFICERS FOR 1956
CORRESPONDING SECRETARY

Membership as of January 1, 1956 (adjusted figure)			506
Reductions:			
Resigned	1		
Dropped	21		
Deceased	1		
Total		23	
Elected to membership		26	
Net gain in membership		3	
Total membership, on Dec. 31, 1956			509

Classes of Membership	
Active dues paying	486
Life	5
Retired	14
Honorary	4
	509

The membership is distributed among 41 States, the District of Columbia, and 21 foreign countries.

Circulation of the Proceedings (October 1956 issue):		
Unstamped, poundage rate		
States	396	
District of Columbia	34	
U. S. Possessions	15	445
Stamped, foreign countries		153
Chain mail		118
Total		716

Distribution:	
To members	473
To subscribers	243
Total	716

The Proceedings go to members and subscribers in 47 States, the District of Columbia, 4 Territories, and 46 foreign countries.

Respectfully submitted, KELVIN DORWARD, *Corresponding Secretary.*

TREASURER

General Fund

Cash on hand—January 1, 1956	$ 535.17	
Receipts during 1956	3,599.75	
Total		$4,134.92
Cash on hand—December 31, 1956	268.20	
Expenditures during 1956	3,866.72	
Total		$4,134.92

Publication Fund

Cash and securities on hand—January 1, 1956	$6,044.28	
Receipts and Earnings during 1956	1,296.10	
Total		$7,340.38
Cash and Securities on hand—December 31, 1956	6,724.98	
Expenditures during 1956	615.40	
Total		$7,340.38

Copies of the Treasurer's report, approved by the Auditing Committee, are on file with the Corresponding Secretary and the Treasurer.

Respectfully submitted, P. X. PELTIER, *Treasurer*

CUSTODIAN

During the calendar year 1956 the office of the Custodian sold 53 Memoirs for $288.10; Proceedings, including one complete set, for $384.40; and reprints and miscellaneous papers amounting to $15.10. The total value of sales amounted to $684.60.

Memoirs on hand December 31, 1956 were as follows: No. 1, 108; No. 2, 47; No. 3, 253; and No. 4, 984. Orders have been indicated or actually received for about 20 of the new Memoir No. 5.

It might be interesting to note that in 1953 items sold amounted to $1,918; 1954, $544; 1955, $554; 1956, $690.

We have already received one order for a complete set of the Proceedings this year [1957]. This brings up again the problem of providing complete sets after the present supply of about 15 complete sets is exhausted. A few numbers are in very short supply and one number is completely exhausted. The Executive Committee is giving consideration to this matter.

Respectfully submitted, H. J. CONKLE, *Custodian.*

EDITOR

Six numbers of Volume 58 of the *Proceedings*, a total of 368 pages, have been published in 1956. Eighteen pages were devoted to advertising (exclusive of back covers) and 350 pages to scientific papers, notes, book reviews, obituaries, and minutes of meetings. This is in contrast to 304 pages published in 1955, 294 of which were devoted to scientific papers and notes, obituaries, book reviews,

and minutes of meetings. During 1956, 8 published pages were paid for by their authors; in 1955, 8½ were so paid. Volume 58 contains 55 original contributions averaging 6½ pages in length. Volume 57 contained 50 original contributions averaging 5⅔ pages in length.

Memoir No. 5, entitled "A Classification of the Siphonaptera of South America," by Dr. Phyllis Johnson, is in preparation. The manuscript has been edited, set in galley, and proofread by the author, and the dummy has been prepared.

Respectfully submitted, RICHARD H. FOOTE, *Editor.*

SOCIETY MEETING

The 659th regular meeting of the Society was held in room 43 of the U. S. National Museum, Thursday, January 3, 1957. President Frank L. Campbell called the meeting to order at 8 p.m., and there were 35 members and 20 visitors present. The minutes of the previous meeting were read, corrected, and approved.

President Campbell announced the following committees for 1957. *Advertising:* Price G. Piquett, chairman, A. H. Bender, John H. Fales, and George S. Langford; *Auditing:* Harold Morrison, chairman, and L. B. Reed; *Membership:* William E. Bickley, chairman, Engel L. R. Gilbert, Jack C. Jones, M. P. Jones, Robert T. Mitchell, Edgar A. Taylor, and Rose E. Warner; *Memoirs:* Reece I. Sailer, chairman, Richard H. Foote, Alice V. Renk (ex officio), Jerome G. Rozen, Jr., and G. W. Wharton; *Notes and Exhibition of Specimens:* R. H. Nelson, chairman, Louis G. Davis, Elizabeth E. Haviland, and W. N. Sullivan, Jr.; *Program:* J. F. Gates Clarke, chairman (elected), Theodore R. Gardner, Karl V. Krombein, Howard B. Owens; *Reserve Stock:* H. J. Conkle, chairman (elected), Paul X. Peltier, and Helen Sollers.

H. M. Armitage, President of the Entomological Society of America, brought greetings from the Pacific Coast Entomological Society and the Entomological Societies of Northern and Southern California. In a few lively remarks in behalf of the Entomological Society of America, he said that he would not remind Society members they should join the E. S. A., as he was sure they already belonged. President Campbell observed that the E. S. A. was also represented at the meeting by its immediate past president, B. A. Porter, but gave Dr. Porter a well-earned rest by calling on R. H. Nelson for a report on the recent meetings. The E. S. A. has about 3,700 members and hopes that the number may grow to 4,000 in 1957.

R. I. Sailer exhibited third and fourth instars of the wheel bug, *Arilus cristatus* (L.). These wheel bug nymphs had hatched in early December from eggs laid in late September. The nymphs had fed exclusively on nymphs of the stink bug *Euschistus servus* Say. Specimens of adult wheel bugs mounted with various species of prey were also shown. The prey included a honey bee, wasp, mantispid, scarab, mantid, and a walking stick. T. J. Spilman asked how the bug managed to pierce the armorlike exoskeleton of an insect such as a scarab. Dr. Sailer replied that in the case of stink bugs he had seen the wheel bug insert its stylets through the intersegmental membranes of the abdomen and legs. In one instance a stink bug was killed by a thrust through the basal articulation of its rostrum. [Author's abstract.]

B. A. Porter exhibited a can of "maguey worms," lepidopterous larvae used as food in Mexico. The cans are widely offered for sale in Mexican grocery stores. Dr. Armitage commented that he had sampled the fried grasshoppers, and that 50,000 cans from Tokyo were placed on the U. S. market this year; he did not recommend them.

The principal paper of the evening was "The Development of Commercial Entomology in the United States," by Mortimer D. Leonard, of the Shell Chemical Corporation. [The paper as read will be published in the Proceedings of the Tenth international Congress of Entomology.] "Commercial Entomology" refers to activities of entomologists, and "Official Entomology" to their activities in Federal, State, and other nonprofit agencies. The first commercial entomologist started in 1904. The growth in numbers of entomologists employed by business and industry was indicated and some of the reasons for the increase were analyzed. The continually widening field of activities was traced and the present more important kinds of business which employ graduate entomologists were briefly described. Although it is estimated that only about 15 percent of all professional entomologists are presently connected with profit-making activities, an increasing number of trained entomologists will undoubtedly enter the commercial field as time goes on. The rate of increase will depend to a considerable extent on the imagination and aggressiveness of entomologists themselves, in pointing out how business can profit by a greater use of their specialized knowledge and services. The development of more adequate curricula in our colleges and universities can contribute greatly to better enable students to enter the commercial field and attention should be given toward this end. [Author's abstract.] The paper was discussed by President Campbell and by members Porter, Nelson, Bishopp, and Armitage.

The Shell Chemical Corporation furnished the second part of the scheduled program, a new film, "The Rival World," on the insect menace. The film was exhibited by Robert E. Hamman, Washington representative of the Agricultural Chemicals Division of the Corporation. Dr. Bishopp commented on the improvement in the migratory locust problem. He remarked "This film is splendid in its coverage and technical qualities. I feel, however, that it overstresses the migratory locust problem although that is a spectacular example of the destructiveness of insects. Unfortunately it conveys the impression that no headway has been made in conquering the migratory locust. The impression I have gained from contacts in Egypt and the Middle East is that the systematic scouting and timely use of insecticides by the various countries has greatly reduced the losses and terror chargeable to the locusts. In this the good work of Bill Mabee, of the U. S. Department of Agriculture, and his associates have played an important part."

The visitors introduced were Mrs. Bishopp; F. D. Butcher, entomologist with the U. S. Army Forces in the Far East, stationed in Camp Zana, Japan, and his wife and son Frederick; Dr. Keizo Yasumatsu, who will shortly return to his home in Japan; and G. W. Dekle, of the Florida State Plant Board. Honorary Member H. G. Barber was also presented.

The meeting adjourned at 10 p.m.—KELLIE O'NEILL, *Recording Secretary.*

THE PUBLICATION FUND

Now that Memoir No. 5 has been published, the Executive Committee of the Entomological Society of Washington wishes to call attention to the Publication Fund of the Society. Our Constitution, as amended in December 1956, states,

"The Society shall maintain a separate fund to be known as the Special Publication Fund. At the discretion of the Executive Committee, any unrestricted portion of the Special Publication Fund may be used for publishing memoirs, handbooks, or other special publications. In any one year, a sum not exceeding the previous five years' income from interest on the Special Publication Fund monies may be taken from this Fund and applied toward the publication of the Proceedings; such sum to be returned to the Special Publication Fund at the discretion of the Executive Committee. The Special Publication Fund will be derived from bequests and gifts, from the sale of complete sets of the Proceedings of the Entomological Society of Washington, from the sale of Memoirs, Handbooks, or other special publications, from the fees of life and sustaining members, and from the sum of fifty cents from the annual dues of each member."

The Publication Fund was started by a bequest of $1,400 by the late Frederick Knab in 1918. In 1927 a donation of $1,000 by the late E. A. Schwarz was added to it. Since that time no bequests or gifts have been added to this fund. The Executive Committee wishes to arouse the interest of members and friends of the Society in obtaining additional funds for the publication of Memoirs by the Society. Further contributions of any amount will be welcome. At present the publication of each additional Memoir is mainly dependent upon funds derived from the sales of those already published.

Contributions to charitable, or educational institutions up to 20 percent of gross income may be deducted in computing Federal income taxes. The form printed below is suggested for the use of those who desire to leave the Society any personal property, such as money, stocks, bonds, works of art, or other objects of value.

FORM OF BEQUEST

Know All Men by These Presents, That I _____

of the city of _____, county of _____,

and state of _____, do hereby give, grant, and convey unto The Entomological Society of Washington, at Washington, in the District of Columbia, an organization to promote the study of entomology in all of its bearings, the sum of _____ dollars ($_____) to have and to hold the same unto itself and its successors forever for the promotion of the purposes thereof.

(Place and date)

WITNESSES: SEAL

Date of publication, Vol. 59, No. 3, was June 21, 1957.

Vol. 59 OCTOBER 1957 No. 5

PROCEEDINGS
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ENTOMOLOGICAL SOCIETY
of
WASHINGTON

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CONTENTS

(Date of publication, Vol. 59, No. 4, was Sept. 18, 1957)

THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON

ORGANIZED MARCH 12, 1884

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 over 18 years of age who have an interest in the science of entomology. Annual dues for members are $4.00; initiation fee is $1.00 (U. S. currency).

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

Published bimonthly beginning with February by the Society at Washington, D. C. Members in good standing are entitled to the *Proceedings* free of charge. Non-member subscriptions are $5.00 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.[1] Acceptable papers submitted by members will be published in the order received and will be given precedence over those by non-members. Immediate publication may be obtained at a cost to the author of about $10.00 per printed page, plus cost of *all* engraving. Titles of papers should be concise but comprehensive and should indicate the systematic position of the subject insect. By-lines 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 4-5/16 x 6" (26 x 36 picas); this usually allows explanatory matter to appear on the same page. Cost of illustrations in excess of that for one full-page line cut will be borne by the author.

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Purchase of reprints by institutions whose invoices are subject to notarization or other invoice fees will have the cost of such fees added to the purchase price.

[1]Miss Alice V. Renk, Stored-Product Insects Section, AMS, U. S. Dept. Agriculture, Plant Industry Station, Beltsville, Md.

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 59 OCTOBER 1957 NO. 5

A REVIEW OF THE TYPHOCTINAE

(HYMENOPTERA: MUTILLIDAE)

KARL V. KROMBEIN[1] AND RUDOLF M. SCHUSTER[2,3]

The genus *Typhoctes*, since its recognition by Ashmead in 1899, has been repeatedly transferred, assigned first to one group and then another, depending on the personal views or concepts of the various workers on the aculeate Hymenoptera. The genus has been included in the Myrmosidae by Ashmead and Bradley (1917), in the Chyphotinae of the family Mutillidae by André (1903), and in the Brachycistidinae of the family Tiphiidae by Malloch (1926). More recently it has been set off, by Reid (1941), as a group by itself without commitment as to its taxonomic status. The genus has most commonly been considered as closely related to *Chyphotes* Blake. Fox (1899), for instance, stated that the *Typhoctes* might well be separated subgenerically from *Chyphotes* proper, though he did not do so. When Ashmead (1899) established the genus *Typhoctes* for *Mutilla peculiaris* Cresson, he gave characters for the male sex, but without citing the species on which they were based. The only known species that could fit his diagnosis of the male sex was *Chyphotes attenuatus* (Blake), which correlation was accepted, with more or less reservation by André (1903) and Bradley (1917). Buzicky (1941) again removed *Typhoctes* from near *Chyphotes*, and returned the male *Chyphotes attenuatus* to its correct position within the latter genus. The junior author (Schuster 1949) has already commented on the recent return by Pate (1947) to Ashmead's discredited conception

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[2]Department of Botany, University of Massachusetts, Amherst, Mass.

[3]Material in the collections of the following individuals and institutions has been studied: U. S. National Museum (USNM); R. M. Bohart (RMB); H. E. Evans, Cornell University (HEE); P. D. Hurd, California Insect Survey (CIS); K. V. Krombein (KVK); C. D. Michener, University of Kansas (KU); W. R. M. Mason, Canadian Department of Agriculture (CNC); C. E. Mickel, University of Minnesota (UM); J. A. G. Rehn, Academy of Natural Sciences of Philadelphia (ANSP); E. S. Ross, California Academy of Sciences (CAS); R. M. Schuster (RMS); and P. H. Timberlake, Citrus Experiment Station (PHT). We wish to express our appreciation for the valuable material that has been loaned to us. We are indebted to Dr. I. H. H. Yarrow, British Museum (Natural History) for some valuable notes on the type of *Typhoctes guatemalensis* Turner.

of *C. attenuatus* as the male sex of *Typhoctes*. In a brief tentative arrangement of the nearctic Mutillidae, the junior author, (Schuster 1946), adhering to tradition for want of proof that the genus belonged elsewhere, placed *Typhoctes*, questionably, in the Chyphotini, of the subfamily Apterogyninae.

Later Schuster (1949) recognized that *Chyphotes* and *Typhoctes* were more distantly related, and the latter genus was placed in a separate subfamily, the Typhoctinae, while *Chyphotes* was maintained as a distinct tribe in the Apterogyninae. Four essential characters serve to make any close connection between *Chyphotes* and *Typhoctes* highly improbable. They are:

1. The petiole form of the two genera is fundamentally different —that of *Typhoctes* is unmodified, with the tergite reaching the propodeum, while in *Chyphotes* the first tergite is abbreviated anteriorly, rather or very suddenly, and fails to reach the propodeum.

2. The eye form is fundamentally different—in *Typhoctes* it is elongate-ovate, in *Chyphotes* short ovate to subcircular.

3. The thoracic shape of the females is fundamentally different—the prothorax is large in *Typhoctes*, with the alitrunk caudad of the prothorax differentiated into a distinct mesothoracic region, virtually obliterated dorsally, but separated by a distinct suture from the fused metathoracic-propodeal region, while the distinct mesopleuron is separated by a complete suture from the fused metapleural-propodeal region; in *Chyphotes* the small prothorax is much narrower, strongly transverse, and set off from the subglobose, fused meso-metathoracic-propodeal region that lacks all traces of dorsal or pleural sutures separating the meso-and metathorax.

4. There are no antennal "tubercles" in *Typhoctes*, but they are well developed in *Chyphotes*.

In the same paper Schuster based his conception of the male of the Typhoctinae on *Anommutilla* Mickel and that of the female on *Typhoctes* Ashmead. His reasons for considering that *Anommutilla* represents the male sex of *Typhoctes* were so convincing that the senior author (Krombein, 1951) published this synonymy. The characters validating such an association are:

1. *Anommutilla* and *Typhoctes* are the only nearctic genera of Mutillidae with the vertexal expansions of the upper and inner margins of the antennal fossae undeveloped; i.e., antennal "tubercles" are absent,

2. They are the only two nearctic genera in which the pronotum is exceedingly strongly developed—in the male sex of all other known nearctic genera the pronotum is very short, at most less than half as long along midline as the mesoscutum, while in the female sex, as indicated by the position of the spiracles, the pronotum is always very strongly transverse with a large mesonotum,

3. The tarsal claws are similarly armed among the nearctic genera only in *Chyphotes* which is known in both sexes,

4. The formula of the tibial calcaria is identical, 1-2-2 (not 1-1-2 in the male as stated erroneously by Mickel, 1936),

5. The petiole is unique, consisting of a basal, slender, terete, stalk-like anterior portion, and a somewhat flattened, transverse, nodose, posterior portion,

6. The position of the short felt lines of second tergum is suggestively similar,

7. The rather short and stout scape, contrasted to the long, slender flagellum occurs elsewhere only in *Chyphotes* among nearctic genera,

8. The similarity in shape of the metasternal process.

In addition to the foregoing, there is the important corroboratory evidence afforded by the facts that *Anommutilla* males and *Typhoctes* females are now known to have an identical range in America north of Mexico, and that both sexes of a new species have been taken together, though not in copula, in the Borego Desert of southern California.

Subfamily TYPHOCTINAE Schuster, 1949

The North and Central American Typhoctinae apparently has its closest relative in the South American Eotillinae. The relationships between the two subfamilies were discussed at length by the junior author (Schuster, 1949). Reexamination of the males of Typhoctinae shows that some of the alleged characters separating that sex from males of Eotillinae are based on errors. For example, according to Mickel (1936) the males we refer to the Typhoctinae were supposed to have only one calcarium on the mid tibia and to have entirely simple pubescence. Actually, *Typhoctes* males have most of the erect vestiture inconspicuously but definitely subplumose, and the mid tibia has two apical calcaria. Therefore, the chief differences between males of the two subfamilies are that the Typhoctinae have reniform eyes, marginal cell longer than stigma, third discoidal cell longer than high, and hind wing lacking anal lobe or preaxillary incision, while the Eotillinae have ovate-elliptical eyes, marginal cell shorter than stigma, third discoidal cell higher than long, and hind wing with well-developed anal lobe and preaxillary incision. The characters of the forewing cited above are quite possibly of less than subfamilial significance. Also, the presence of an anal lobe is a primitive character, and apparently that structure has been independently lost several times in the Mutillidae, so its presence or absence here also may not be of cardinal importance by itself. However, we consider that the difference in eye shape is of fundamental importance, and we are maintaining the Typhoctinae and Eotillinae as separate subfamilies, at least until the eventual discovery of females of Eotillinae may demonstrate that this separation is untenable.

A comparative study of the genitalia of *Eotilla* and *Typhoctes* considerably strengthens the assumption of a close relationship between the two groups. The digitus and cuspis in the two genera are strikingly similar (compare Figs. 1 and 3 with Fig. 7). The parameres

also are nearly identical in form. However, in *Eotilla* the parameres bear simple, scattered fine hairs both on their outer and inner margins (Fig. 7), while *Typhoctes* has similar, scattered, unequally long hairs only on the outer faces of the parameres, while the inner faces of the parameres bear a comb-like line of short, equal, rigid, approximated bristles (Figs. 1, 2, 3b). The two groups, however, differ considerably in the form of the aedeagus. In Eotillinae and in the Apterogyninae it is essentially tiphioid in form and may be presumed to be primitive, as has been previously assumed by the junior author (Schuster, 1949). The two halves of the aedeagus are closely united in an essentially terete shaft, which does not appear bilobed at the summit. In contrast, in *Typhoctes* the aedeagus consists of two obviously discrete plates, only loosely united, and, *in situ*, is clearly, distinctly bilobed. In spite of this latter difference, we still assume as did one of us (Schuster, 1949) that "the correct position of *Typhoctes* is undoubtedly close to the Eotillinae."

The diagnosis which follows will serve as both a subfamilial and generic diagnosis, since the subfamily Typhoctinae includes only a single genus.

Male. Head transverse, with large, elongate, subreniform eyes that are slightly emarginate on their inner orbits, and that have distinct facets; antennal "tubercles" absent, the antennal insertions opening directly frontally, not obliquely downward and laterad; scape short, bicarinate, equal in length to pedicel and first flagellar segment combined; mandible edentate at tip and with a small, subapical inner tooth (thus bidentate), ventrally neither excised nor armed; maxillary palpi 6-segmented, labial palpi 4-segmented.

Alitrunk with prothorax well developed, dorsally nearly truncate at apex, and virtually as long medially as laterally; mesoscutum distinctly transverse; endophragmal pit approximated to the meso-metapleural suture, the metapleuron wide above, narrowed below to the endophragmal pit, where the metapleuron appears to disappear (the metapleural-propodeal suture distinct above endophragmal pit, but completely lost below, the propodeum and metapleuron thus indistinguishably fused below); tibial calcaria 1-2-2[4]; tarsal claws with a small tooth at middle on their inner margins.

Petiole of abdomen with a basal, slender, terete portion, and a distal, dilated, rather transverse portion, which is again strongly constricted at its juncture with second tergum; the first sternum slightly convex, the distal part nearly flat, smooth, nitid, impunctate, lacking a median keel; basal, terete portion of petiole clearly formed by both tergum and sternum; second segment with distinct sublateral felt line on each side of tergum, limited to basal half of tergum, no felt lines on second sternum; hypopygium simple, unmodified.

Wings with venation relatively well preserved, a distinct, elongate sclerotized stigma, a large marginal cell, longer on costa than stigma, three submarginal

[4]Mickel (1936) gave the formula as 1-1-2 for the type of *Anommutilla difficilis*. The more easily visible right mid tibia of Mickel's type has only one calcarium, the second presumably having been broken off, but the less easily visible apex of the left tibia has two calcaria.

cells, the third (cell R_1) truncate on its outer edge, with the vein R_1 not angulate, not giving rise to a spurious vein; third discodial cell truncate on outer side, elongate; hind wings lacking all trace of anal lobe and preaxillary excision, the subbasal hamuli present; cubitus arising on vein M considerably distad of the transverse median vein, the submedian cell thus much shorter than median cell.

Vestiture moderately coarse, simple except most of erect hairs on head, thorax and abdomen finely and very inconspicuously subplumose.

Female. Head rather similar to that of male, the eyes separated from base of mandibles by a distinct malar space; antennae equally elongate, scape not carinate below; hypostomal carina less strongly developed, not developed outward to posterior mandibular condyles as distinct ridges; maxillary palpi 5-segmented, labial palpi 4-segmented; ocelli absent; mandibles as in male; eyes weakly convex, narrowly ovate, facetted, large; antennal "tubercles" very poorly developed; clypeus as in male.

Alitrunk highly modified, but distinctly tripartite dorsally; pronotum very large, truncate behind, the dorsal face subquadrate to obtrapezoidal, separated by a distinct suture dorsally from mesonotum; mesonotum short, strongly transverse, reduced virtually to a semi-invaginated, transverse sclerite, separated by a distinct suture from the elongate, fused metathoracic-propodeal part of the alitrunk; mesopleuron evenly swollen, devoid of an oblique sulcus, and continuous with the metapleuron from which it is separated by a distinct, quite oblique suture; metapleuron and propodeum completely fused, endophragmal pit absent; metasternum well developed, lying between the middle coxae; posterior coxae armed dorsally with a vestigial tooth; trochanters small, obliquely terminated; tibial calcaria 1-2-2; tarsal claws slender and armed, distad of middle, with a sharp inner tooth.

Gaster with petiole as in male, but distal two-thirds slightly more strongly dilated, the basal portion virtually terete, very slender, formed by both tergum and sternum (though the tergal element, as in the male, appears to be reduced); sternum much as in male; second segment very strongly constricted from the nodose first segment, both dorsally and ventrally, quite elongate, relatively slightly convex (the gaster oval, rather than circular in cross-section), with sublateral felt lines exactly corresponding to those of the male as regards length and position; pygidium and hypopygium simple, neither defined by lateral carinae.

Vestiture simple throughout.

This subfamily includes only one genus, *Typhoctes* Ashmead (=*Anommutilla* Mickel), which is known from western North America south to Guatemala. Nothing is known as to the host relationships of this group.

Genotype: *Mutilla peculiaris* Cresson. Monotypic and by designation of Ashmead, 1899.

Key to Females

1. Pronotal dorsum subquadrate, scarcely narrowed behind, the length including neck subequal to greatest width; integument almost entirely black except legs, fused metanotum-propodeum and first abdominal tergum red in part; Guatemala. ..... *guatemalensis* Turner

Pronotal dorsum obviously narrowed behind, obtrapezoidal; integument in large part reddish 2

2. Neither pronotum nor vertex with dense, appressed, pale sericeous pubescence; thorax highly polished and very sparsely punctate 3

Pronotum always, and vertex occasionally, with dense, appressed, pale sericeous pubescence; thorax not so shining, more densely punctate. (Least transfacial distance 1.25-1.3 times the eye height; head width 1.6-1.7 times the least transfacial distance; pronotum stout, the length including neck 0.9-1.0 times the greatest width; fused metanotum-propodeum stouter, rather abruptly declivous posteriorly; longer calcar of hind tibia 0.55 times as long as hind basitarsus) 4

3. Legs entirely and venter of thorax in part with scattered, erect black setae; fused metanotum-propodeum feebly rugose anteriorly and laterally; disk of first tergum shallowly rugosopunctate; first two terga with somewhat sinuate, apical bands of appressed silvery hairs, the bands broader at sides and narrowed in middle; Mexico ..... *glaber* André

Legs and venter of thorax with only pale erect hair; fused metanotum-propodeum with only fine, scattered punctures; disk of first tergum with fine, separated punctures; first two terga each with an even, narrow apical band of appressed silvery vestiture. (Tibial calcaria entirely white, the longer one on hind tibia 0.67 times as long as hind basitarsus, the tibial spines rather weak; third tergum without appressed pubescence discally or on apical band; malar space long, 0.43 times the eye-height; least transfacial distance 1.15 times the eye-height; head width 1.7 times the least transfacial distance; pronotum slender, rather elongate, the length including neck 1.1 times the greatest width; fused metanotum-propodeum slender and elongate, gradually sloping posteriorly; metasternal process weakly sulcate along midline, virtually impunctate, the apical margin emarginate but not bilobate.) Southern California ..... *williamsi*, new species[5]

4. Third tergum without appressed discal pubescence or an apical band; tibial calcaria entirely white; lower front and sides of propodeum closely striate, impunctate or virtually so; metasternal process keeled along midline and weakly punctate, the apical margin emarginate but not bilobate; malar space one-third the eye-height. (Tibial spines stronger than in *williamsi* but less than in *peculiaris;* vertex with dense, appressed, pale sericeous pubescence; first tergum with an even, narrow, apical band of appressed silvery vestiture.) Southwest Texas to southern Arizona ..... *striolatus*, new species

Third tergum with moderately abundant, appressed discal pubescence and with a narrow apical band of appressed setae; tibial calcaria white with black tips; lower front without striae, the propodeal sides punctate and occasionally apparently striate when punctures are dense and confluent in rows; metasternal process not or only very weakly keeled, the apical margin moderately

[5]Atypically colored specimens of *guatemalensis* Turner may run here. See notes in specific discussion of *guatemalensis*.

to strongly emarginate and bilobate; malar space one-fourth the eye-height. ..... *peculiaris* (Cresson) 5

5. Vertex without dense, appressed, pale sericeous vestiture; apical band of appressed silvery vestiture on first tergum greatly broadened at sides; apical band on third tergum dark; metasternal process nearly smooth or with coarse punctures posteriorly only; mid and hind tibiae with somewhat fewer spines; Washington, Idaho, Utah, California and western Arizona..... ..... *peculiaris peculiaris* (Cresson)

Vertex with a band of dense, appressed, pale sericeous vestiture; apical band on first tergum narrow and even; apical band on third tergum silvery at least in middle; metasternal process coarsely and contiguously punctate; mid and hind tibiae with more numerous spines; central Arizona and southeastern Colorado east to western Kansas and Texas..... *peculiaris mirabilis* (Cockerell)

Key to Males

(Males of *p. mirabilis*, *glaber* and *guatemalensis* are unknown.)

1. Ocelli smaller, the postocellar line slightly shorter (0.94) than ocellocular line; tibial calcaria white, narrowly tipped with black; genitalia (Fig. 3) stouter. (Dorsum of head, thorax and abdomen partly or entirely with erect, black hairs, those on abdomen relatively slender and barely subplumose, the decumbent vestiture sparser; inner eye margins less divergent above, the least transfacial distance 0.75 times the transfacial distance through anterior ocellus; first flagellar segment 0.80 times as long as second; legs entirely dark, longer calcarium of hind tibia 0.64 times as long as hind basitarsus; apex of hypopygium slightly retuse.) ..... *peculiaris peculiaris* (Cresson)

Ocelli somewhat larger, the diameter half again as large as in *p. peculiaris*, the postocellar line 1.1-1.5 times as long as ocellocular line; tibial calcaria entirely white; genitalia (Figs. 1, 2) more slender..... 2

2. Vestiture sparser, the erect hairs on dorsum of head, thorax and abdomen partly or entirely dark, those on gaster stouter and more noticeably subplumose; decumbent vestiture sparser; legs black, longer calcarium of hind tibia 0.60 times as long as hind tarsus; inner eye-margins less divergent above, the least transfacial distance 0.75 times the transfacial distance through anterior ocellus; first flagellar segment 0.67 times as long as second; postocellar line 1.1 times as long as ocellocular line; apex of hypopygium slightly retuse; genitalia (Fig. 2) as figured..... *striolatus*, new species

Vestiture denser, the erect hairs entirely glittering white except on last two terga, those on gaster more slender and barely subplumose; decumbent vestiture denser, obscuring sculptural details on pronotum and mesopleuron; legs red, longer calcarium of hind tibia 0.67 times as long as hind basitarsus; inner eye-margins more divergent above, the least transfacial distance 0.67 times the transfacial distance through anterior ocellus; first flagellar segment 0.75 times as long as second; postocellar line 1.5 times as long as ocellocular line; apex of hypopygium broadly rounded; genitalia (Fig. 1) as figured .... *williamsi*, new species

Typhoctes guatemalensis Turner

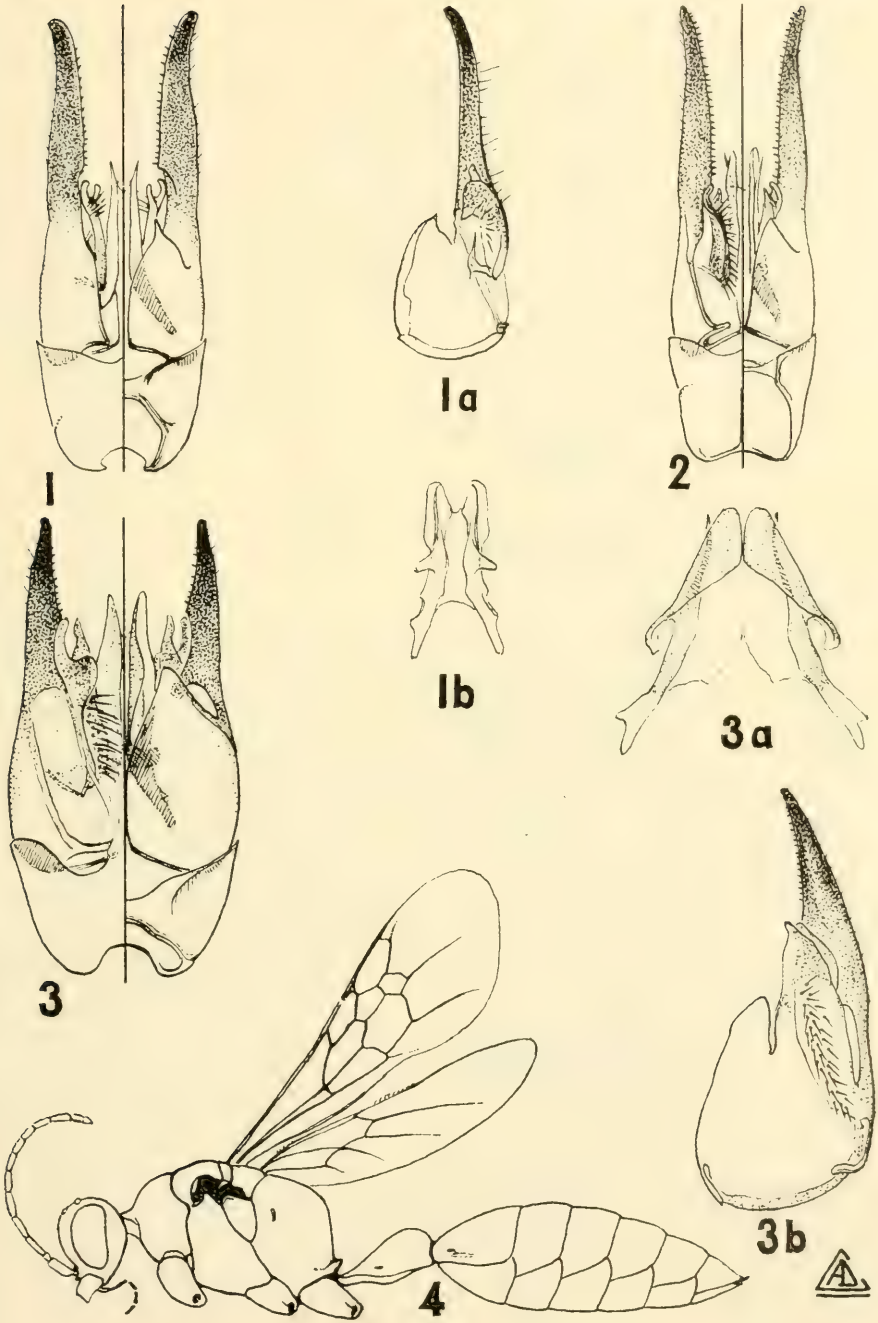
Typhoctes guatemalensis Turner, 1909. Ann. Mag. Nat. Hist. (8) 3: 485 (♀; San Geronimo, Guatemala; type in British Museum).—Reid, 1941. Trans. Roy. Ent. Soc. London 91: 385, figs. 15, 16.

We have not seen material of this rather distinctive species. It differs from the other known females by a combination of the almost quadrate pronotal disk (as figured by Reid) which lacks dense appressed vestiture, the almost entirely black integument, the more densely punctate head with punctures tending to become longitudinally confluent, the longitudinally striate pronotum, and the finely, horizontally striate "pleurae." Turner's description is quoted below.

Dr. Yarrow has furnished some notes on Turner's type. He says that it agrees with the first half of couplet 1 in the foregoing key, but that the pronotal length including the neck is 1.1 times its greatest width (the neck is hidden beneath the head on the card mount, but the ratio is not less than 1.1). Additional material of *guatemalensis* may possibly differ from the type in some details of coloration, in which case specimens would trace to the second half of couplet 3 in our key. Dr. Yarrow indicates the following characters for *guatemalensis* as compared with *williamsi:* Legs and venter of thorax with pale hair; fused metanotum-propodeum longitudinally rugose except on sides where the rugosity is more or less diagonally transverse, the anterolateral areas in front of spiracles smooth as is the basal declivous dorsal area; disk of first tergum rugosopunctate; first four terga (and possibly the fifth) with even, apical pale bands becoming progressively narrower. (Tibial calcaria pale, the longer one on hind tibia 0.61 times as long as hind basitarsus; hind tibia with spines only apically, three ventral and one dorsal, not very stout; third tergum with apical pale band, appressed hair on all terga reddish brown; malar space short, 0.29 times the eye-height; ventral characters not visible.)

"♀. Head subquadrate, a little broader than long, broader than the pronotum, punctured closely, the punctures tending to become confluent longitudinally, very thinly clothed with black pubescence; eyes extending rather nearer to the base of the mandibles than to the posterior margin of the head, elongate ovate; ocelli absent. Antennae filiform, nearly as long as the thorax, the second joint of the flagellum half as long again as the first and a little longer than the third, the apical joints slender but short. Pronotum a little narrower than the head, as

Fig. 1, *Typhoctes williamsi*, n. sp., male genitalia, left half ventral view, right half dorsal view (Borego paratype); fig. 1a, the same, left paramere, digitus and cuspis, mesal view (Fish Creek Mts. paratype); fig. 1b, the same, aedeagus, unflattened, ventral view. Fig. 2, *T. striolatus*, n. sp., male genitalia, left half ventral view, right half dorsal view. Fig. 3, *T. p. peculiaris* (Cr.), male genitalia, left half ventral view, right half dorsal view (Turlock, Calif.); fig. 3a, the same, aedeagus, flattened, ventral view (Mt. Diablo, Calif.); fig. 3b, the same, left paramere, digitus and cuspis, mesal view. Fig. 4, *T. williamsi*, n. sp., lateral outline view of male (Borego paratype). (Drawings by A. D. Cushman).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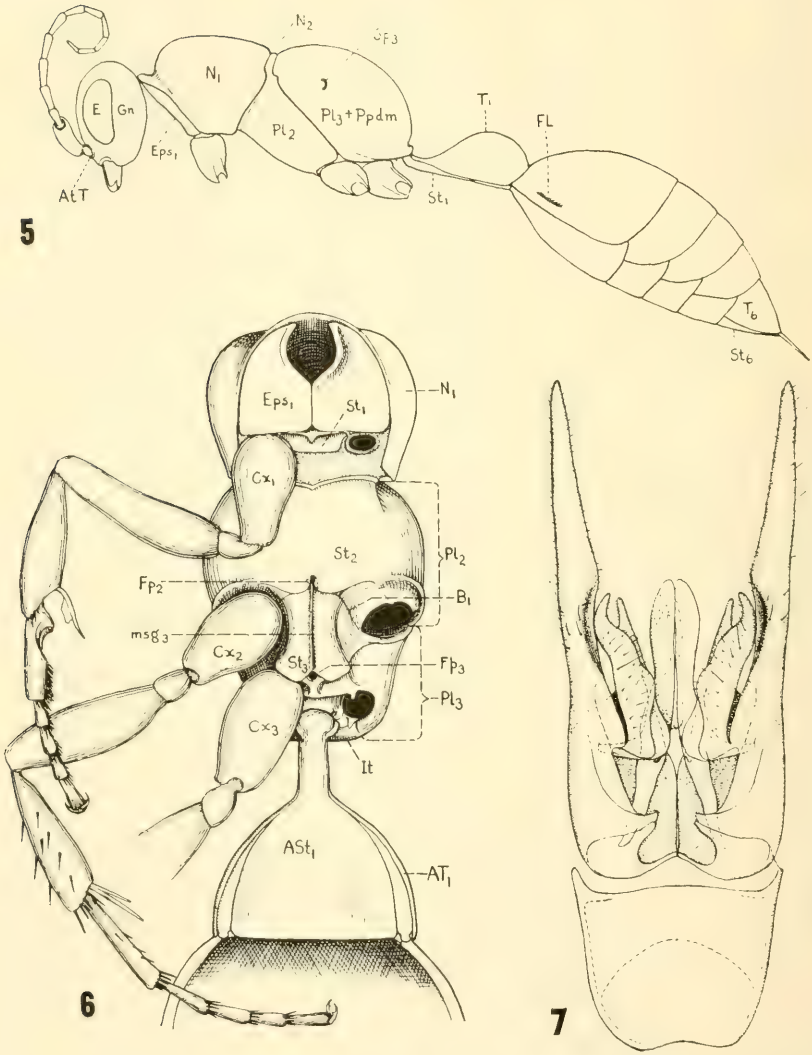

Fig. 5, *Typhoctes peculiaris mirabilis* (Ckll.), lateral outline view of female, Fig. 6, the same, ventral view of alitrunk. Fig. 7, *Eotilla mickeli* Schus., male genitalia, ventral view (Chile). (Drawings by junior author, from Ent. Amer. 29 (n.s.), pl. 14).

broad as the metanotum, from which it is separated by a deep transverse suture; longitudinally striated and sparsely clothed with long, greyish pubescence. Pleurae finely horizontally striate. Metanotum longer than the pronotum, longer than broad, obliquely sloped posteriorly, not truncate, longitudinally striated in the middle and at the base, obscurely punctured at the sides and apex. Abdomen shining, very finely and closely punctured, very sparsely clothed with long cinereous pubescence on the sides and apex, a transverse band of short whitish pubescence at the apex of each segment; first segment triangular, attached to the thorax by a short petiole, the second segment large, twice as long as the third, with a strong constriction between the first and second segments. Intermediate tibiae with two apical spines.

"Black; the two basal joints of the flagellum testaceous; the metathorax (except a large black spot at the base), the first abdominal segment (except a triangular black spot at the apex), the base of the posterior tibiae, and the intermediate and posterior trochanters and coxae ferruginous; calcaria white.

"Length 7 mm."

Male. Unknown.

Typhoctes glaber André

Typhoctes glaber André, 1903. Ann. Soc. Ent. France 72: 448 (♀, Mexico; type in Paris Museum?)

This species is known to us from the original description only. Apparently it is rather similar to the female of *williamsi* in having a shining integument with rather sparse, erect vestiture and no dense, appressed pubescence on pronotum or head. It is noticeably larger than *williamsi* and differs in having black hairs on the legs, apical bands of silvery appressed hair on first and second terga which are sinuate and broader at sides than in middle, and in having a more coarsely punctate first tergum.

A translation of the original description is given below. The characters which we have set in italics separate *glaber* from *williamsi*.

Length 11 mm. Entirely deep ferruginous, somewhat shining, apices of antennae and mandibles blackish; the first two abdominal segments each margined apically by a border of long, silvery hairs which is *somewhat sinuate, wider laterally than medially* where it disappears in part. Pubescence of body somewhat sparse; dorsum covered with long, pilose, sparse blackish pubescence, *which is also evident ventrally*, where it is mixed with white hairs. Legs sparsely covered with *blackish hairs;* calcaria white; tibial and tarsal spines black.

Head rounded, subquadrangular, as wide as thorax, finely and sparsely punctate; eyes large, elongate oval, slightly convex, nearer to occiput than to articulation of mandibles; frontal ridges indistinct; mandible rather narrow, terminating in a sharp point; antennae very slender, scape rather short, all the segments of flagellum elongate, the second segment much longer than the first, scarcely longer than the third. Thorax visibly contracted between pronotum and mesonotum; pronotum an inverted trapezoid, narrower behind than in front, somewhat flattened dorsally, finely and very sparsely punctate; the rest of thorax oval, not divided, rounded in back, *feebly rugose in front and on the sides*, sparsely punc-

tate on the disk. Abdomen elongate, fusiform; first segment joined to thorax by a slender, cylindrical petiole which is much shorter than the rest of segment; the hind part of first segment triangular as seen from above, visibly contracted at apex, *very shallowly rugosopunctate and bearing some widely separated coarse punctures* in addition; second segment very finely and rather densely punctate; apical segments almost smooth and more shining.

Male. Unknown.

Typhoctes williamsi,[6] new species
(Figs. 1 and 4)

Females of this species differ from those of *striolatus* and *peculiaris* in a large number of features, chief among them being the much more elongate and slender alitrunk with the fused metathorax-propodeum appearing somewhat obpyriform and constricted anteriorly (in lateral profile most inflated just anterior to the insertion of mid coxae), the very reduced sculpture with the integument in general highly polished, and the virtual absence of glittering appressed pubescence on head and pronotum.

In the latter feature, *williamsi* closely approaches *glaber* André from Mexico. It differs from that species in the entirely white, glittering hairs on the legs and in the narrow, complete and even bands of silvery hairs at the apices of the first two abdominal terga. *T. williamsi* also has the punctation of the first abdominal tergum fine throughout, while in *glaber* it is described as coarse distally.

The male of *williamsi* is the most distinctive of the three species known in that sex, being distinguished at once by the red legs, extremely dense, almost entirely white, glittering vestiture, and broadly rounded apical margin of the hypopygium. Other differences are as noted in the key.

There is a possibility that *williamsi* may prove to be only subspecifically distinct from *glaber*, but the original description of that species fails to mention characters which might enable us to reach a definite conclusion on this point. Certainly, the two are at least subspecifically distinct.

Dr. Williams states (personal communication to senior author) that most of the males taken by him at Borego were visiting two or three mats of *Euphorbia polycarpa* Benth. on the desert sands. The single female was caught while it was running over the sand in the late morning. Dr. Bohart states that the single female taken by him was captured near a nest of *Pogonomyrmex* and was superficially very similar to the ants in appearance.

Type.—♂; Borego Desert, San Diego Co., California; May 12, 1955 (F. X. Williams; on mat *Euphorbia*) (California Academy of Sciences).

[6]For Francis X. Williams, collector of most of the type series.

Male.—Length 6.5 mm., forewing including tegula 4.5 mm. Shining, black, legs entirely light red except most of tarsi which are infuscated, mandible except tip darker red, antenna beneath reddish, brown above, tibial calcaria entirely white. Wings very pale hyaline, forewing slightly infumated toward apex; veins basally testaceous, brown apically. Vestiture long, rather coarse, almost entirely glittering white, the last two terga with erect black hair, and mid and hind tibiae externally with a few scattered, erect dark hairs; erect hairs on head, thorax and abdomen slender as in *peculiaris,* only very slightly subplumose.

Clypeus with very dense, decumbent hair, surface sculpture not visible; front and temples with similar, but somewhat sparser decumbent vestiture and long, scattered erect hairs; vertex with much sparser decumbent vestiture and some erect hairs; occiput with moderately dense, erect hair; first flagellar segment three-fourths as long as second; least transfacial distance two-thirds the transfacial distance through middle of anterior ocellus and three-fourths the eye-length; ocelli larger than in *p. peculiaris,* the diameter half again as large; distance between anterior and posterior ocelli half as great as postocellar distance, the latter distance half again as great as ocellocular distance; entire head correspondingly more densely punctate than in typical *peculiaris.*

Thoracic dorsum with abundant appressed pubescence which is densest on pronotum, and also with erect hairs which are about as long and as dense as on occiput; thoracic dorsum with small punctures which are correspondingly denser than in *p. peculiaris,* the mesonotum more sparsely punctate on disk than at sides; lateral surface of pronotum and mesopleuron with appressed pubescence which is very dense on latter, and also with erect, scattered hairs on latter; upper part of metapleuron with vestiture similar to that of mesopleuron; propodeum with most of pubescence appressed, rather dense on dorsum, sparser on sides, and very sparse posteriorly.

Coxae laterally with dense, coarse subappressed pubescence; femora, tibiae and tarsi with fine, dense, short appressed pubescence; femora beneath with long, scattered, erect white hairs; longer calcarium of hind tibia 0.67 times as long as hind basitarsus.

Abdomen with abundant erect pubescence, that on first tergum longer and somewhat sparser than on succeeding terga; first and second terga with narrow apical bands of appressed hair, the third to fifth terga with similar but much narrower bands consisting of a single row of setae; second to sixth sterna each with a row of appressed simple setae at apex; second to fifth terga with punctures of two distinct sizes, a series of somewhat larger and more scattered ones and others which are smaller and more abundant; first sternum smooth; second sternum with discal punctures noticeably larger than elsewhere on abdomen and sparser than on succeeding sterna; punctures of third to sixth sterna moderately dense, uniform in size; hypopygium with apical margin broadly rounded; genitalia (of paratype) as figured (Fig. 1).

The male paratypes vary in length from 5.0 to 7.0 mm. The Borego Desert series agrees very well in all essentials with the type, but the three specimens from San Bernardino County have the forelegs castaneous rather than light red, and the punctation of first and second terga of the specimen from Boron is sparser than normal.

Allotype.—♀; same data as type but April 23, 1955 (CAS).

Female.—Length 6.5 mm. Shining, uniformly light orange-red except tarsi very slightly infuscated, tibial calcaria entirely white. Long erect hairs of head and thoracic dorsum black or dark brown, on venter of head and thorax, legs and abdomen glittering white; appressed pubescence on thoracic dorsum and disk of second tergum very sparse, pale golden, the disk of third tergum with a very few, inconspicuous, similar, appressed hairs; sides of thorax (except absent on pronotum), legs and abdomen except disk of second tergum silvery pubescent.

Head lacking appressed pubescence except for a very few hairs between eyes and on antennae, lower half of front with scattered small punctures; upper half of front and vertex virtually impunctate except along inner eye margins, highly polished; occiput with punctures more concentrated; malar space long, 0.43 times the eye-height; least transfacial distance 1.15 times the eye-height; head width 1.7 times the least interocular distance; first and second flagellar segments subequal in length.

Pronotum obtrapezoidal, more elongate than in *peculiaris* and *striolatus*, dorsally highly polished and only remotely and finely punctate, the length including neck 1.1 times greatest width, some sparse decumbent pubescence anteriorly on disk, the long erect setae denser anteriorly than posteriorly, the virtually impunctate, polished lateral surfaces with only a few weak, short setae; dorsal surface of fused metanotum-propodeum more elongate than in *striolatus*, polished, with sparse decumbent pubescence anteriorly, and scattered, erect, long setae; punctures fine and scattered; posterior slope of propodeum gradual, with sparse, appressed silvery vestiture; mesopleuron with close punctures and moderately abundant, appressed silvery pubescence; fused metapleuron-propodeum punctate anteriorly only, no traces of striae; metasternal process smooth, nitid, virtually impunctate, ecarinate, slightly sulcate along midline, emarginate at apex but not bilobate.

Coxae laterally with subappressed, dense, short silvery hair; coxae beneath, femora and tibiae with scattered, long, erect silvery setae; mid and hind tibiae with a preapical row of two short, weak spines on outer surface and a second row bearing only a single preapical spine; longer calcarium of hind tibia two-thirds as long as hind basitarsus.

First and second terga each with an even, narrow apical band of appressed silvery vestiture; first tergum also with scattered, decumbent, silvery sericeous hairs on rest of disk and moderately abundant, long, erect white setae; second tergum with scattered, decumbent pale golden setae on disk and scattered, erect, partly fuscous setae which are more concentrated anteriorly; succeeding terga with only scattered, erect, largely fuscous setae.

The single female paratype is 5.6 mm. long, and is very similar to the type in coloration, vestiture and punctation.

Paratypes.—13 ♂♂; Borego Desert, San Diego Co., California; April 23 (3 ♂♂), April 29 (4 ♂♂), May 12 (6 ♂♂), all 1955 (F. X. Williams; mostly on mat *Euphorbia*) (CAS, USNM, BM, RMS, HEE, KVK). 1 ♀; Borego Valley, San Diego Co., California; April 18, 1957 (R. M. Bohart) [USNM]. 1 ♂; Fish Creek Mts., Imperial Co., California; April 20, 1955 (W. R. M. Mason) (CNC).

1 ♂; 10 mi. s. of Mecca, Riverside Co., California; April 4, 1937 (P. H. Timberlake) (PHT). 1 ♂; 14 mi. w. of Boron, San Bernardino Co., California; April 25, 1953 (P. D. Hurd) (CIS). 1 ♂; Needles, San Bernardino Co., California; April 3, 1951 (J. W. MacSwain) (CIS). 1 ♂; Kramer Hills, San Bernardino Co., California; May 1, 1953 (P. D. Hurd) (USNM).

In addition to the type series, three other individuals have been seen which are apparently referable to *T. williamsi*, but may represent a separate race: 1 ♀, 6 ♂♂; Thousand Palms, Riverside Co., California; April 7 (3 ♂♂), 12 (♂), 16 (♂), 25 (♀), 26 (♂), all 1955 (W. R. M. Mason) (CNC). The males are essentially inseparable from the male described above, but the single female differs in three features, as follows: the gaster, except for the petiole, is piceous to black; the third abdominal tergum has a rather conspicuous median patch of appressed, silvery hairs; the mesopleuron tends to have the setigerous punctation longitudinally confluent to the point where it appears obscurely longitudinally striolate, rather than distinctly punctate. Although the differences in pigmentation and vestiture give this latter female a wholly deviant aspect, we believe that recognition of it as a separate taxon to be premature. The fact that it occurred in the same locality with males inseparable from "normal" *T. williamsi* males appears to indicate that it represents an extreme individual of *T. williamsi*. The critical cephalic indices of this female are essentially identical with the allotype of *T. williamsi:* least transfacial distance 1.17 times the eye-height; head width 1.7 times the least interocular distance. Until and unless it can be shown that this female is incorrectly associated with *T. williamsi* males, it appears preferable to refer it to this species.

Typhoctes striolatus, new species

(Fig. 2)

The female of *striolatus* is most closely similar to that of *peculiaris mirabilis* with which it agrees in general aspect, particularly in the presence, on all but worn individuals, of a glittering vestiture of appressed, pale golden hairs on the vertex and pronotum. However, it differs from this, as well as typical *peculiaris*, in several noteworthy structural characters that prohibit considering these forms as specifically identical, such as: the lateral faces of the propodeum are conspicuously striolate; the metasternal process is weakly punctate throughout, distinctly keeled along midline, and merely weakly emarginate at the apex, with the process on each side of the emargination not elaborated as a distinct rounded lobe; third abdominal tergum with only sparse, long, erect hairs, lacking appressed silky vestiture.

The male associated with these females is also certainly specifically distinct from males of typical *peculiaris* (males of *p. mirabilis* are unknown). It differs at once from males of both *peculiaris* and *williamsi* in the somewhat stouter, more definitely subplumose, erect

hairs on the gaster, and the comparatively sparser punctation and vestiture. Some noteworthy characters separating it from males of *peculiaris* are the somewhat enlarged ocelli, entirely pale tibial calcaria, distance between anterior and posterior ocelli three-fourths the postocellar line, the latter 1.1 times the ocellocular distance, and the more slender genitalia. It is separated from males of *williamsi* by having the eyes less strongly divergent above, comparatively longer postocellar line, entirely black legs, the longer calcarium of hind tibia relatively shorter, and minor genitalic differences.

Type. ♀ ; Phoenix, Maricopa Co., Arizona; October 15, 1933 (R. H. Crandall) (U. S. National Museum, Type No. 63261, donated by K. V. Krombein).

Female.—Length 6.0 mm. Shining; head, thorax, legs and first abdominal tergum red, a shade darker than in *williamsi;* sides and base of second tergum red shading into deep castaneous on rest of disk, and terminal segments all black; tibial calcaria entirely white. Vestiture partly of long, scattered, erect setae which are mostly black, but pale on head beneath, pronotum in part, legs beneath, and second and third sterna; head above, temples and pronotum with conspicuous, very dense, appressed, pale golden sericeous pubescence.

Lower half of front with several weak, oblique striae just above antennal insertions, running outward and slightly upward to lower inner eye margin; vertex adjacent to inner eye margins similarly striolate with striae parallel to eyes; lower two-thirds of front with scattered punctures bearing long erect setae; upper part of front, temples, central portions of vertex and occiput with dense, small punctures bearing the decumbent vestiture; malar space short, one-third the eye-height; head width 1.7 times the least interocular distance; front between eyes 1.25 times the eye-height; first and second flagellar segments subequal in length.

Pronotum obtrapezoidal, shorter and stouter than in *williamsi*, the length including neck 0.9 times the greatest width, the disk and sides closely and delicately wrinkled to rugulose-striolate, bearing dense, silky decumbent vestiture, disk with erect setae denser on anterior half; dorsum of fused metanotum-propodeum with close, fine, irregular, sinuous, transverse wrinkles and scattered, erect, long setae and fine, sparse, inconspicuous decumbent setae; posterior slope of propodeum abruptly declivous as compared to *williamsi*, smooth except for a few, straight, transverse wrinkles above abdominal insertion; fused metapleuron-propodeum obliquely and closely striate, with few interspersed punctures, except for a small, smooth triangular area below propodeal spiracle; metasternal plate strongly shining, virtually devoid of punctation, with a sharp median keel, the apex merely emarginate but not bilobate.

Coxae laterally with subappressed, rather dense, short, silvery hair; coxae beneath, femora and tibiae with scattered, long, erect setae, partly blackish, partly silvery; mid tibia with two preapical rows of three short, rather stout black spines, posterior tibia with the two preapical rows bearing only 1-2 such spines each; longer calcarium of hind tibia 0.55 times as long as hind basitarsus.

First and second terga each with an even, narrow apical band of appressed silvery vestiture; first tergum also with a few, scattered, decumbent silvery setae

on rest of disk and moderately abundant, long, erect, dark setae; second tergum with moderately dense, inconspicuous, short, decumbent brown vestiture except narrowly at base and on sides, and with moderately abundant, erect, long black setae; succeeding terga with only scattered, erect, black setae.

Female paratypes vary in length from 4.8 to 6.8 mm, and the first flagellar segment is darker on basal half. The specimens from Arizona are extremely similar to the type. The three from Texas show some variation in that two specimens lack the frontal striae, all three have the irregular wrinkles on dorsal surface of fused metanotum-propodeum mainly oblique instead of transverse, and in two specimens the terminal abdominal segments are not castaneous but concolorous with the first and second terga.

Allotype.— ♂ ; The Basin, Big Bend National Park, Chisos Mts., Brewster Co., Texas, 5400 ft. elev.; July 8-14, 1948 (H. E. Evans; visiting honeydew on oak) (U. S. National Museum, donated by H. E. Evans).

Male.—Length 6.8 mm., forewing including tegula 4.0 mm. Shining, black, mandible except tip reddish, flagellum and tarsi brown, tibial calcaria entirely white. Wings almost hyaline though slightly darker than in *williamsi,* the forewing slightly infumated beyond veins; veins light brown, stigma and costa darker. Vestiture long, rather coarse, correspondingly much sparser than in *williamsi;* most of vestiture glittering white, but many of erect hairs of head and dorsum of thorax and abdomen light brown, those on last two abdominal terga almost entirely light brown; erect hairs of gaster stouter than in *peculiaris* and *williamsi,* and more plainly subplumose.

Clypeus with moderately large, contiguous punctures, vestiture silvery except for a few fuscous hairs medially, appressed and rather dense; temples and lower front with equally large but more separated punctures bearing mostly decumbent vestiture but with some erect hairs; upper front with finer, closer punctures, most of vestiture denuded but what is left mostly appressed; vertex with quite scattered, larger punctures; occiput with punctation again more dense; first flagellar segment two-thirds as long as second; least transfacial distance three-fourths the transfacial distance through anterior ocellus and three-fourths the eye-length; ocelli enlarged as in *williamsi;* distance between anterior and posterior ocelli three-fourths the postocellar line, the latter distance 1.1 times the ocellocular line.

Anterior declivity of pronotum with contiguous punctures and erect vestiture, disk with sparse punctation and mixed decumbent and erect hairs, lateral surface contiguously punctate, and with appressed hairs; mesonotum with sparse pubescence, the disk largely impunctate, laterally and anteriorly with closer punctures; scutellum and postscutellum with vestiture denser, mostly decumbent, punctures subcontiguous; mesopleuron with coarse, subcontiguous punctures, and rather abundant appressed and erect vestiture; upper part of metapleuron similarly punctate and hairy, though somewhat more sparsely so; propodeum with large round punctures and mostly appressed vestiture, punctures on dorsum subcontiguous anteriorly and becoming sparser posteriorly until most intervals are about half as wide as punctures on posterior surface, the latter surface with several transverse wrinkles above abdominal insertion; lateral surface of propodeum about as closely punctate as posterior surface.

Coxae laterally with dense, coarse, subappressed pubescence; femora beneath with long, scattered white hairs; femora, tibiae and tarsi with dense, fine, short appressed pubescence; longer calcarium of hind tibia 0.60 times as long as hind basitarsus.

Abdominal vestiture sparse as compared to *williamsi;* first and second terga with narrow apical bands of appressed hair, the third to fifth with similar but narrower bands consisting of a single row of setae, the apical decumbent fringes of setae of first five terga all silvery (in *peculiaris* those of terga 3-5 fuscous and much less conspicuous); second to sixth sterna each with a row of appressed simple setae at apex; second to fifth terga with punctures of two distinct sizes as in *williamsi* though comparatively sparser, a series of somewhat larger and more scattered ones, and others which are smaller and more abundant; first sternum smooth; second sternum with discal punctures noticeably larger than elsewhere on abdomen though sparser than in *williamsi;* punctures of third to sixth sterna finer, sparser than in *williamsi;* hypopygium with apical margin very slightly retuse; genitalia as figured (Fig. 2), noticeably more slender than in typical *peculiaris.*

Paratypes. 2 ♀♀; same data as type but April 24 and April 26, 1933 (KVK). 1 ♀; Presidio, Presidio Co., Texas; June 26, 1930 (E. R. Tinkham) (UM). 2 ♀♀; northwest Wilson Co., Texas; March-May 1945 (H. B. Parks) (RMS, USNM).

Typhoctes peculiaris (Cresson)

This polytypic species is represented by two races, the nominate subspecies which occurs in Washington, Idaho, Utah, California and western Arizona, and *peculiaris mirabilis* from central Arizona and southeastern Colorado eastward to western Kansas and Texas. The females are larger than the females of the other two species occurring in America north of Mexico, but this size distinction is not apparent in the males, perhaps because of too limited a series in that sex. Both sexes of *peculiaris* are distinguished from the other U. S. species by the dark-tipped tibial calcaria.

The females are separated from those of *williamsi* and *striolatus* by the presence of moderately abundant appressed, fuscous, sericeous vestiture on the third abdominal tergum, the shorter malar space, and the more strongly spinose mid and hind tibiae. In addition, females of *peculiaris* are quite distinct from those of *williamsi* by the presence of dense, appressed sericeous vestiture on pronotum, the comparatively dense punctation, and different proportions of head and thorax. The females of *peculiaris,* particularly those of *p. mirabilis,* are superficially more similar to those of *striolatus,* but in addition to the characters listed at the beginning of this paragraph, females of *peculiaris* differ from those of *striolatus* in the absence of a median keel on metasternal process, and usually in lacking striae on the lateral surface of propodeum, any apparent striation on this area due to the punctures being confluent in rows, forming rugae, rather than to a basic grooving of the integument without punctures.

The males (those of *p. mirabilis* unknown) differ from the other known males in the stouter genitalia and the somewhat smaller ocelli. In addition, they differ from males of *williamsi* in having entirely black legs, relatively sparser punctation and vestiture, some erect black hairs on head and thorax, the inner eye margins less strongly divergent above, the postocellar distance less than ocellocular distance, and the slightly retuse apical margin of hypopygium. They differ from males of *striolatus* in having the erect hairs on gaster thinner and barely subplumose, the relatively longer first flagellar segment and longer calcarium of hind tibia.

Typhoctes peculiaris peculiaris (Cresson), new status
(Fig. 3)

Mutilla peculiaris Cresson, 1875. Trans. Amer. Ent. Soc. 5: 119 (♀; California; type in Academy of Natural Sciences, Philadelphia).—Blake, 1886. Trans. Amer. Ent. Soc. 13: 203.—Dalla Torre, 1897. Cat. Hym. 8: 71.

Typhoctes peculiaris (Cresson), Ashmead, 1899. Jour. N.Y. Ent. Soc. 7:53.—Ashmead, 1903. Canad. Ent. 35: 202.—André, 1903. Gen. Ins., Fasc. 11, p. 11.—Bradley, 1917. Trans. Amer. Ent. Soc. 43: 288.—Schuster, 1949. Ent. Amer. 29 (n.s.): 82 *et seq.*—Krombein, 1951. U. S. Dept. Agr., Agr. Monogr. 2: 751 (synonymizes *Anommutilla difficilis* Mickel under *peculiaris*).

Cyphotes peculiaris (Cresson), Fox, 1899. Trans. Amer. Ent. Soc. 25: 278 (synonymizes *Chyphotes mirabilis* Cockerell under *peculiaris*).—Melander, 1903. Trans. Amer. Ent. Soc. 29: 327.

Anommutilla difficilis Mickel, 1936. Ann. Ent. Soc. Amer. 29: 295 (♂; Oakley, Idaho; type in U. S. National Museum).—Schuster, 1949. Ent. Amer. 29 (n.s.): 117 *et seq.*

The females of typical *peculiaris* are distinguished at once from those of *p. mirabilis* by the lack of dense, appressed, pale sericeous pubescence on vertex, the somewhat finer sculpture of fused metanotum-propodeum and metasternal process, the much broader apical silvery band on first abdominal tergum, and the dark apical band of hairs of the third tergum.

Female.—Length 6.5-11.3 mm. Rather dull because of dense punctation, the legs, terminal abdominal terga and all sterna shining; integument red, a darker shade than in *williamsi*, the apex of mandible, a narrow annulus at base of first flagellar segment, the terminal flagellar segments and tarsi darker; tibial calcaria white except extreme tips dark brown or black. Long, erect black setae on head, sides of pronotal disk, fused metanotum-propodeum, legs and abdominal terga; shorter, erect white setae on pronotal disk, sides and venter of thorax, legs, first and second terga and all sterna except apical three; pronotum entirely covered (and often occipital area, in part) with dense, appressed, pale, glittering sericeous vestiture.

Front and vertex with close, moderately large punctures, no striae, rather dense erect setae and some scattered, decumbent golden to fuscous setae; temples and adjacent occipital regions less closely punctured and with decumbent silvery setae; malar space one-fourth as long as eye-height; front between eyes 1.3 times

the eye-height; head width 1.6 times the least interocular distance; first and second flagellar segments subequal in length.

Pronotum shorter than in *williamsi*, similar to that of *striolatus*, the length including neck subequal to greatest width, with dense small punctures bearing the decumbent vestiture; fused metanotum-propodeum dorsally with rather dense, decumbent, golden to fulvous pubescence which becomes sparser and silvery on posterior and lateral surfaces, the dorsal surface with close, small punctures which are sparser on posterior surface, and lateral surface rugosopunctate or locally with striolation weak and interrupted by irregular punctation; propodeum more abruptly declivous and stout as compared to *williamsi;* metasternal plate not or only weakly keeled along midline, surface smooth and nearly impunctate, except sometimes coarsely and contiguously punctate posteriorly, apical margin deeply emarginate and usually rather strongly bilobate.

Coxae laterally with subappressed, rather dense, silvery, short hair; coxae beneath, femora and tibiae with scattered, long erect setae; mid and hind tibiae more strongly spinose than in *williamsi* or *striolatus*, but with fewer spines than in *p. mirabilis*, the mid tibia usually with one or two preapical rows composed of one or two spines, and hind tibia with a single posterior row of two or three and one or occasionally two of the anterior row; longer calcarium of hind tibia 0.55 times as long as hind basitarsus.

First tergum with a broad apical band of appressed silvery pubescence which is quite narrow at midline and very much broadened toward sides, the surface basad of this band with appressed fulvous to fuscous pubescence and comparatively abundant erect setae; second tergum also with a broad apical band of appressed silvery pubescence (broader than in *williamsi*) which is usually narrower at midline, the rest of disk with rather dense fulvous to fuscous appressed pubescence, obscuring the sculpture, and scattered, erect setae; third tergum with sparser, appressed, fulvous to fuscous pubescence and a very narrow, darker, apical band and scattered erect black setae; succeeding two terga with scattered erect black setae.

Male.—Length 6 to 7.5 mm., forewing including tegula 4 to 4.5 mm. Black, shining; antennae and tarsi dark brown; mandible red except apex; tibial calcaria white except extreme tips dark brown. Wings moderately infumated, the apices beyond veins darker. Vestiture long, moderately coarse, correspondingly sparser than in *williamsi*, glittering white except for some black erect hairs on the following—head in part, thoracic dorsum in part, second tergum in part, and succeeding terga except laterally; erect hairs of gaster slender, less plumose in appearance than in *striolatus*.

Clypeus with moderately large, contiguous punctures, vestiture decumbent and rather dense; temples and front with smaller, slightly sparser punctures, the temples with appressed pubescence, the front with both erect and appressed hair; vertex with sparser punctures and both types of vestiture; occiput more closely punctate and with denser setae; first flagellar segment four-fifths as long as second; least transfacial distance three-fourths the transfacial distance through anterior ocellus and three-fourths the eye-height; ocelli smaller than in *williamsi*, the diameter two-thirds as great; distance between anterior and posterior ocelli slightly more than half the postocellar distance, the latter distance 0.94 times the

ocellocular distance; punctation of head correspondingly sparser than in *williamsi*.

Pronotal punctation and vestiture intermediate in density between that of *williamsi* and *striolatus*, decumbent vestiture all pale, the erect hairs pale on declivity and sides of disk, black elsewhere on disk; rest of thoracic dorsum intermediate between that of *williamsi* and *striolatus* in density of punctation and vestiture, the erect hair mostly black with some white hairs laterally; lateral surface of pronotum and mesopleuron with rather coarse, contiguous punctures bearing moderately dense, pale, mostly decumbent and suberect vestiture; upper part of metapleuron with somewhat finer and more separated punctures; propodeum with large round punctures and mostly appressed, pale vestiture, punctures on dorsum contiguous anteriorly, becoming sparser posteriorly until most interspaces are at least half as wide as punctures on posterior surface, the latter surface with several transverse wrinkles above abdominal insertion.

Coxae laterally with dense, coarse, subappressed pubescence; femora beneath with long, scattered white hairs; femora, tibiae and tarsi with fine, dense, short appressed vestiture; longer calcarium of hind tibia 0.64 times as long as hind basitarsus.

Abdominal vestiture intermediate in density between that of *williamsi* and *striolatus*, the erect setae slender as compared to *striolatus* and very slightly subplumose; first and second terga with very narrow apical bands of appressed vestiture, the third to fifth with similar but narrower bands consisting of a single row of setae, quite inconspicuous and fuscous except occasionally partly pale in middle on third; second to sixth sterna each with a row of appressed simple setae at apex; second to fifth terga usually with punctures of two distinct sizes as described for *williamsi* but occasional specimens with sparser punctation and the minute punctures mostly or entirely lacking; erect vestiture of first tergum all pale, of second occasionally all white but usually black except laterally and at apex, of succeeding terga mostly black except occasionally along sides; that of sterna mostly pale with occasional interspersed black setae; hypopygium with apical margin slightly retuse; genitalia as figured (Fig. 3), stouter than in *striolatus* or *williamsi*.

WASHINGTON: 1 ♀; Grand Coulee, Steamboat Rock, Grant Co.; July 10, 1902 (A. L. Melander) (MCZ).

IDAHO: 1 ♀, 1 ♂; Oakley, Cassia Co.; July 7, 1927 (♂, type of *difficilis*) and July 23, 1930 (♀) (USNM).

UTAH: 1 ♀; U. A. C. Farm No. 2, Logan, Cache Co.; August 16, 1925 (A. C. Burrill) (RMS).

ARIZONA: 1 ♀; Gila Bend, Maricopa Co.; March 26, 1940 (R. H. Crandall) (KVK).

CALIFORNIA: 2 ♀♀, 2 ♂♂; Borego Desert, San Diego Co.; April 23, 1955 (1 ♂), April 17, 1956 (1 ♂ on *Euphorbia polycarpa*, 1 ♀ running on sand nearby), April 30, 1957 (♀) (F. X. Williams) (CAS, KVK). 1 ♀; San Felipe Creek, San Diego Co.; September 9, 1938 (P. H. Timberlake) (PHT). 1 ♀; Banning, Riverside Co.; July 16, 1950 (J. W. MacSwain) (CIS). 1 ♀; Crystal Lake, Los Angeles Co.; June 29, 1950 (J. W. MacSwain) (CIS). 18 ♀♀, 1 ♂; Tanbark Flat, Los Angeles

Co.; June 19 (2 ♀♀, J. W. MacSwain), June 22 (2 ♀♀, F. X. Williams), June 23 (2 ♀♀, F. X. Williams), June 24 (2 ♀♀, P. D. Hurd), June 25, (4 ♀♀, 1 ♂, F. X. Williams, H. F. Robinson, P. D. Hurd), June 27 (1 ♀, P. D. Hurd), July 7 (1 ♀, F. X. Williams), July 8 (3 ♀♀, F. X. Williams), July 10 (1 ♀, F. X. Williams), all 1950 (CIS, RMB). 1 ♂, Kramer Hills, San Bernardino Co.; May 1, 1953 (P. D. Hurd) (CIS). 1 ♂; Oro Grande Wash, 11 mi. s. of Adelanto, San Bernardino Co.; May 26, 1941 (P. H. Timberlake) (PHT). 2 ♀♀; Yermo, San Bernardino Co.; April 28, 1949 (E. G. Linsley, J. W. MacSwain, R. F. Smith) (CIS). 1 ♂; Apple Valley, San Bernardino Co.; May 19, 1955 (W .R. M. Mason) (CNC). 1 ♀; Victorville, San Bernardino Co.; September 13, 1936 (J. Hansen) (RMS). 1 ♂; Lebec, Kern Co.; June 8, 1952 (E. I. Schlinger) (USNM). 2 ♀♀; Big Pine, Inyo Co.; September 4, 1956 (R. M. Bohart) (RMB). 1 ♀; 3 mi. s. of Olancha, Inyo Co.; August 6, 1948 (P. D. Hurd, J. W. MacSwain) (CIS). 4 ♀♀; Bishop Creek, Inyo Co., 8400 ft. elev.; August 2, 1936 (G. E. Bohart) (CIS). 1 ♀, 1 ♂; Arroyo Seco Camp, Monterey Co.; June 6, 1956 (♂) and June 5, 1957 (♀) (R. M. Bohart) (RMB). 1 ♀; Little Pinoche Valley, Fresno Co.; May 11, 1920 (E. O. Essig) (CIS). 1 ♀; Bass Lake, Madera Co.; July, 1946 (CIS). 2 ♂♂; Turlock, Stanislaus Co.; September 28, 1953 (R. R. Snelling) (USNM). 1 ♀, 1 ♂; Tuolumne City, Tuolumne Co.; June 3 (♂) and June 14 (♀), 1953 (J. G. Rozen) (CIS). 1 ♀; Hot Creek,, Mono Co.; August 1, 1936 (CIS). 1 ♀; Mokelumne Hill, Calaveras Co. (USNM). 2 ♂♂; Mt. Diablo, Contra Costa Co., 2000 ft. elev.; July 26, 1949 and July 17, 1950 (F. X. Williams) (CIS). 3 ♀♀; Antioch, Contra Costa Co.; July, 1937 (E. S. Ross) (CIS), August 8, 1952 (W. E. Ferguson) (CIS) and September 10, 1947 (J. W. MacSwain) (USNM). 1 ♂; 13 mi. NE of Chico, Butte Co.; May 23, 1956 (R. M. Bohart) (RMB). 1 ♀; Hat Creek P. O., Shasta Co.; July 12, 1955 (J. W. MacSwain) (CIS). 1 ♀; Norval Flats, Lassen Co., 5500 ft. elev.; August 22, 1950 (J. O. Martin) (USNM). 1 ♀; "Cal." (USNM). 1 ♀; "California" (ANSP; type of *peculiaris*).

Typhoctes peculiaris mirabilis (Cockerell)
(Figs. 5 and 6)

Cyphotes mirabilis Cockerell, 1896. Canad. Ent. 28: 285 (♀; Mesilla Valley, New Mexico; type in U. S. National Museum).

Typhoctes mirabilis (Cockerell), Malloch, 1926. Proc. U. S. Natl. Mus. 68, Art. 3, p. 3, fig. 14.

Typhoctes peculiaris mirabilis (Cockerell), Schuster, 1949. Ent. Amer. 29 (n.s.): 134, figs. 15, 16.

Females of this subspecies are separated from those of typical *peculiaris* by the characters cited in the description below. Superficial-

ly, females of *p. mirabilis* are very similar to those of *striolatus* because of the dense, appressed, pale pubescence on both vertex and pronotum, but differ at once as noted in the discussion of *peculiaris sens. lat.*

Males of *p. mirabilis* are unknown. Presumably they will be very similar to those of typical *peculiaris* in most details, perhaps differing most notably only in certain minor details of the vestiture.

Female.—Length 7 to 11 mm. Similar to typical *peculiaris* except in the following details: vertex with dense, appressed, pale golden sericeous vestiture as on pronotum; sculpture of fused metanotum-propodeum coarser, punctures of dorsal and posterior surfaces larger, and lateral surface with larger, subcontiguous punctures occasionally confluent in rows; metasternal plate entirely coarsely and contiguously to confluently punctate; mid and hind tibiae with more numerous spines, usually with two preapical rows of three spines each, occasionally four; apical silvery band of first tergum much narrower on sides, essentially equally wide throughout; and third tergum with apical band silvery, at least medially.

ARIZONA: 1 ♀; Heiser Spring, Wupatki Natl. Mon., Coconino Co.; July 23, 1949 (L. C. Wyman) (USNM). 1 ♀; Joseph City, Navajo Co.; August 6, 1950 (J. W. MacSwain) (CIS). 1 ♀; Prescott, Yavapai Co.; June 29, 1932 (P. H. Timberlake) (PHT). 2 ♀♀; Tucson, Pima Co.; June 1, 1933 (Bryant) (UM) and August 6, 1946 (H. E. Evans) (HEE). 1 ♀; Baboquivari Mts., Pima Co.; May 7, 1938 (F. H. Parker) (UM). 1 ♀; Patagonia, Santa Cruz Co.; July 20, 1940 (D. J. and J. N. Knull) (OSU). 1 ♀; Madera Canyon, Santa Rita Mts., Santa Cruz Co.; July 26, 1955 (F. X. Williams; at light) (CAS). 1 ♀; Santa Rita Mts., Santa Cruz Co.; September 30, 1939 (Bryant) (UM). 1 ♀; Huachuca Mts., Cochise Co. (USNM).

NEW MEXICO: 2 ♀♀; Jemez Springs, Sandoval Co.; August 1, 1914 (UM) and July 10, 1954 (Cazier and Gertsch) (AMNH). 1 ♀; College Campus, Mesilla Valley, Dona Ana Co.; July 1896 (T. D. A. Cockerell) (USNM, type of mirabilis).

TEXAS: 2 ♀♀; 6-10 mi. w. of Fort Davis, Jeff Davis Co., 5000 ft. elev.; July 15-23, 1948 (H. E. Evans; 1 ♀ on *Sphaeralcea angustifolia*) (HEE). 2 ♀♀; Abilene, Taylor Co.; October 10, 1943 (C. L. Remington) (USNM, RMS).

KANSAS: 1 ♀; Norton Co., 2270 ft. elev.; August 24, 1912 (F. X. Williams) (KU). 1 ♀; Graham Co. (KU). 1 ♀; Seward Co., 2600 ft. elev.; August 18, 1911 (F. X. Williams) (KU). 1 ♀; Stanton Co., 3000 ft. elev.; July 30, 1911 (F. X. Williams) (KU). 1 ♀; Stanton Co., 3000 ft. elev. (S. J. Hunter) (KU). 2 ♀♀; Morton Co., 2800 ft. elev.; August 5, 1911 (F. X. Williams) (KU).

COLORADO: 1 ♀; Limon, Lincoln Co.; August 20, 1937 (G. P. Englehardt) (KVK). 1 ♀; San Luis, Costilla Co.; July 21, 1929 (H. G. Rodeck) (UM). 1 ♀; Antonito, Conejos Co.; August 5, 1900 (UM).

MEXICO: CHIHUAHUA: 3 ♀♀; Samalayuca; June 24, 1947 (Crazier, Michener and Bradt) (AMNH).

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NEW SPECIES AND RECORDS OF MALLOPHAGA FROM GALLINACEOUS BIRDS OF THAILAND[1]

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The Mallophaga described and identified in the following notes, except for one small series in the British Museum (NH), were collected in Thailand by R. E. Elbel, H. G. Diegnan, and Boonsong Lekagul during the period April 1953 to April 1955. Host identifications were

[1] This investigation was supported by research grant E-1722 from the National Institute of Allergy and Infectious Diseases of the National Institutes of Health, Public Health Service.

furnished by Mr. Deignan, and are in accordance with the classification to be discussed in his forthcoming "Check-list of the Birds of Thailand." Skins of the birds from which the lice were collected are now in the U. S. National Museum. Collections were made possible by assistance from the U. S. National Museum and the United States Operations Mission to Thailand. The holotype and allotype of the new species described herein have been deposited in the U. S. National Museum. Dr. Theresa Clay, British Museum (NH), loaned considerable material for comparison, and offered many helpful suggestions. The authors gratefully acknowledge the assistance given by Dr. Clay, Dr. Phyllis T. Johnson, and Mr. Deignan during the preparation of this report.

AMBLYCERA

Amyrsidea monostoecha (Kellogg).

Menopon monostoechum Kellogg, 1896. Proc. Calif. Acad. Sci. (2), 6: 530, pl. 72, fig. 4. Type host: *Phasianus nychthemerus=Lophura nycthemera nycthemera* (Linnaeus).

Specimens collected.—4 males and 4 females at Ban Na Muang, Na Haeo, Dan Sai, Loei; off *Lophura nycthemera jonesi* (Oates). The species was described from specimens taken off a Silver Pheasant in San Francisco, Calif. The specimens taken agree with Kellogg's descriptions and illustrations, but have not been compared with the types or with material from type host.

Amyrsidea phaeostoma (Nitzsch).

Menopon phaeostomum Nitzsch, 1866. Z. ges. Nat. Wiss. 28: 391. Type host: *Pavo cristatus* (Linnaeus).

Specimens collected.—4 males and 3 females on Phu Kho Mountain, Kan Luang, Na Kae, Nakhon Phanom; off *Pavo muticus imperator* Delacour. Two species of Amyrsidea are found on *Pavo cristatus,* this being the larger of the two forms. The specimens collected appear to be conspecific with material from the type host. They agree with specimens which Dr. Clay has compared with the figures in the Nitzsch Manuscript presently in the British Museum (NH). The smaller species of *Amyrsidea,* which is more common on domestic pea fowls, was not collected. The male genitalia are illustrated in figure 15.

Amyrsidea uniseriata (Piaget).

Menopon uniseriatum Piaget, 1880. Les Pediculines: 464, pl. 37, fig. 4. Type host: *Phasianus praelatus=Lophura diardi* (Bonaparte).

Specimens collected.—29 males and 15 females on Phu Lom Lo Mountain, Kok Sathon, Dan Sai, Loei; 1 male and 2 females at Ban Sang Kho, Khok Phu, Sakon Nakhon; 3 males and 2 females on Phu Phak Khi Nak Mountain, Kok Sathon, Dan Sai, Loei; 4 males and 2 females on Khao Sawan Mountain, Sieo, Loei; and 1 male and 4 females at Ban Muang Khai, Tha Li, Loei; off *Lophura diardi* (Bonaparte). This species apparently has not been reported since the original de-

scription. Specimens have been compared with the Piaget types in the British Museum (NH), and they appear to be conspecific. The male genitalia are illustrated in figure 14.

Colpocephalum echinatum Ewing.

Colpocephalum echinatum Ewing, 1930. Proc. Ent. Soc. Wash., 32: 118. Type host: *Pavo muticus muticus* Linnaeus.

Specimens collected.—8 males and 8 females on Phu Kho Mountain, Kan Luang, Na Kae, Nakhon Phanom; off *Pavo muticus imperator* Delacour. Specimens have been compared by Dr. Johnson with Ewing's types in the U. S. National Museum, and they appear to be conspecific.

Menopon gallinae (Linnaeus).

Pediculus gallinae Linnaeus, 1758. Syst. Nat., ed. 10: 613. Type host: *Phasianus gallus* (*"domesticus"*)=*Gallus gallus "domesticus."*

Specimens collected.—6 males and 3 females at Ban Sang Kho, Khok Phu, Sakon Nakhon; 2 males and 2 females on Phu Lom Lo Mountain, Kok Sathon, Dan Sai, Loei; 2 males and 3 females at Ban Muang Khai, Tha Li, Loei; and 11 males and 12 females on Khao Sawan Mountain, Sieo, Loei; off *Lophura diardi* (Bonaparte). This species is rather common on both domestic and wild chickens. We are unable to distinguish between the specimens taken off *Lophura diardi* and those collected off chickens.

ISOCHNOCERA

Cuclotogaster phayrei n. sp.

Male.—General shape and chaetotaxy as shown in figure 5. Abdominal tergites on segments II and III, divided medianly. Accessory dorsal plates, not divided medianly, on abdominal segments III-VI. Genitalia as shown in figure 16.

Female.—Similar to the male in general shape, but slightly larger; being 1.68 mm in total length. Antennae filiform. Abdominal tergites divided medianly in segments II-VII. Posterior margin of vulva bilobed; with 16 to 18 short setae evenly spaced on the margin, and 16 to 18 minute setae scattered on the surface.

This species is closely related to *Cuclotogaster gedgii* (Clay), 1938, found on *Francolinus clappertoni gedgii* Ogilvie-Grant. The male of *C. gedgii* has accessory dorsal plates on abdominal segments II-VII, and they are divided medianly on segments II, III, VI, and VII. The male of *C. phayrei* has accessory dorsal plates on abdominal segments III-VI, none of which are divided. The male genitalia of the two forms differ greatly. The female of *C. phayrei* possesses more setae on the margin of the vulva than does *C. gedgii*. The undivided tergite on abdominal segment VIII is also distinctive.

Type host.—*Francolinus pintadeanus phayrei* (Blyth).

Type material.—Holotype male, allotype female, 2 paratype males and 1 paratype female were collected at Ban Hua Thanon, Khlong Khlung, Kamphaeng Phet.

Cuclotogaster subinsolitus n. sp.

Male.—General shape and chaetotaxy as shown in figure 6. Posterior pterothoracic setae arranged: 1, 2, 2, 1, 1, 2, 2, 1. Abdominal tergite on segment II is divided medianly, the remainder being transversly continuous. Accessory dorsal plates, on abdominal segments IV-VII; none of which are divided medianly. Genitalia as shown in figure 17.

Female.—Similar to the male in general shape, but larger; being 2.02 mm in total length. Antennae filiform. Dorsal posterior pterothoracic setae arranged: 1, 2, 2, 2, 2, 1. Abdominal tergites on segments II-VII, divided medianly. Except for terminal segments, abdominal chaetotaxy same as in the male. Chaetotaxy and structure of genital region same as that given by Clay (1938) for *C. insolitus.*

This species is closely related to *Cuclotogaster insolitus* (Clay), 1938, found on *Arborophila rufogularis tickelli* (Hume). The form is distinguished from *C. insolitus* by the more rounded anterior margin of the head and by being considerably larger. In the male of *C. insolitus*, the tergal plates on abdominal segments II-VI are divided medianly; in *C. subinsolitus*, only the tergal plate on abdominal segment II is divided medianly. The male genitalia of the two forms appear to be very similar. The female of *C. subinsolitus* does not have the tergal plate on abdominal segment VIII divided medianly.

Type host.—*Arborophila brunneopectus brunneopectus* (Blyth).

Type material.—Holotype male, allotype female, 9 paratype males, and 10 paratype females collected on Phu Lom Lo Mountain, Kok Sathon, Dan Sai, Loei.

Goniocotes parviceps (Piaget).

Goniodes parviceps Piaget, 1880. Les Pediculines: 277, pl. 23, fig. 2. Type host: *Pavo cristatus* Linnaeus.

Specimens collected.—8 males and 6 females on Phu Kho Mountain, Kan Luang, Na Kae, Nakhon Phanom; off *Pavo muticus imperator* Delacour. *Goniocotes parviceps* (Piaget) and *Goniocotes rectangulatus* Nitzsch are two closely related forms found on *Pavo cristatus.* Both are atypical, and are occasionally included in the genus *Goniodes.* The females possess characters typical of those found in other species of *Goniocotes.* The sexual dimorphism exhibited in the head of the male and the male genitalia indicate an affinity to the genus *Goniodes;* these are illustrated in figures 9, 10, and 11. We believe that both species should be retained in *Goniocotes* until a more complete study can be made of the genus. *Goniocotes yngarejsuf* Eichler 1950, was described and illustrated from female specimens taken off *Pavo cristatus.* The descriptions and illustrations agree completely with females of *Goniocotes parviceps* taken from that host. Specimens collected off *Pavo muticus imperator* have been compared with material from the type host and they appear to be conspecific. The male genitalia are complex and there are minor differences, but these appear to be no greater than the differences between individuals collected off the same host.

Goniodes cervinicornis Giebel

Goniodes cervinicornis Giebel, 1874. Insecta Epizoa: 199. Type host: *Phasianus nycthemerus*=*Lophura nycthemera nycthemera* (Linnaeus).

Specimens collected.—1 male at Ban Na Muang, Na Haeo, Dan Sai, Loei; 1 female on Phu Lom Lo Mountain, Kok Sathon, Dan Sai, Loei; and 10 males and 19 females on Phak Khi Nak Mountain, Kok Sathon, Dan Sai, Loei; off *Lophura nycthemera jonesi* (Oates). Clay redescribed and illustrated this species from material taken off museum skins of the type host. These specimens agree with Clay's descriptions and illustrations.

Goniodes chloropus n. sp.

Male.—General shape and chaetotaxy as shown in figure 7. Temples not expanded beyond width of preantennal region of forehead. Membraneous portion of clavi well developed. First antennal segment enlarged and bearing a thickened process. Lateral margins of prothorax each with three short setae. Genitalia as shown in figure 12.

Female.—General shape and chaetotaxy as shown in figure 8. Temples expanded to a width greater than that of the preantennal region of forehead. Clavi only slightly developed. Antennae filiform. Ventrally, a row of short stout setae in the lateral lobes of the terminal abdominal segment.

While this species belongs to Clay's (1940) "species group I," it does not particularly resemble any of the known species. The wide marginal carnia of the forehead, the male genitalia, and the structure and chaetotaxy of the female genital region distinguish it from all known species of the genus.

Type host.—*Arborophila charltonii chloropus* (Blyth).

Type material.—Holotype male, allotype female, 3 paratype males, and 2 paratype females collected at Ban Hua Thanon, Khlong Khlung, Kamphaeng Phet.

Goniodes coronatus (Giebel).

Goniocotes coronatus Giebel, 1874. Insecta Epizoa: 302. Type host: *Crypturus coronatus*=*Rollulus roulroul* (Scopoli).

Specimens collected.—12 males and 5 females on Khao Phap Pha Mountain, Ban Na, Phattalung; off the type host. These specimens agree with Clay's (1940) descriptions and illustrations.

Goniodes diardi Clay.

Goniodes diardi Clay, 1940. Proc. Zool. Soc. Lond. (B), 110: 70, figs. 2a and 48c. Type host: *Lophura diardi* (Bonaparte).

Specimens collected.—1 male and 1 female at Ban Na Muang, Na Haeo, Dan Sai, Loei; 4 males and 2 females on Phu Phak Khi Nak Mountain, Kok Sathon, Dan Sai, Loei; 1 male and 3 females at Ban Sang Kho, Khok Phu, Sakon Nakhon; 2 males and 5 females on Phu Lom Lo Mountain, Kok Sathon, Dan Sai, Loei; and 1 male and 2 females at Ban Muang Khai, Tha Li, Loei; off *Lophura diardi* (Bonaparte). All specimens agree with Clay's descriptions and illustrations.

Goniodes pavonis (Linnaeus).

Pediculus pavonis Linnaeus, 1758. Syst. Nat., ed. 10: 613. Type host: *Pavo cristatus* Linnaeus.

Specimens collected.—7 males and 9 females on Phu Kho Mountain, Kan Luang, Na Kae, Nakhon Phanom off *Pavo muticus imperator* Delacour. These specimens agree with Clay's (1940) descriptions and illustrations.

Goniodes processus Kellogg and Paine.

Goniodes processus Kellogg and Paine, 1914. Rec. Indian Mus., 10: 226, pl. 15, fig. 9. Type host: *Arborophila rufogularis rufogularis* (Blyth).

Specimens collected.—7 males and 6 females on Phu Lom Lo Mountain, Kok Sathon, Dan Sai, Loei; off *Arborophila brunneopictus brunneopictus* (Blyth). Clay (1940) redescribed and illustrated this species from specimens taken off museum skins of *Arborophila rufogularis tickelli* (Hume), and reported collections from skins of five other species and subspecies of *Arborophila*. She also noted (p. 25): "Specimens from skins of *A. b. brunneopictus* (Blyth), *A. b. henrici* (Oustalet), and *A. erythrophrys* (Sharpe) from Borneo do not appear quite typical, and may prove to be a new subspecies." The specimens collected agree with the illustrations and descriptions given by Clay, but have not been compared with specimens from the type host.

Lipeurus boonsongi n. sp.

Male.—General shape and chaetotaxy as shown in figure 4. Postantennal constriction not pronounced, breadth at temples almost equal to that of the praentennal region. Four dorsal setae on prothorax. Two short and three long setae in each posterior lateral angle of pterothorax. Abdominal tergal plates narrow and transversely continuous. Eight medium-length setae on margin of genital opening. Genitalia as shown in figure 18.

Female.—Slightly larger than male; total length being 2.13 mm. Head without postantennal constriction, temples slightly expanded. Antennae filiform. Prothorax with two dorsal setae. Pterothorax as in the male. Abdominal tergal plates wide and transversely continuous. Eight medium-length and twelve short setae on margin of genital opening.

This species is closest to *Lipeurus fimbriatus* Clay, 1938, found on *Melanoperdix nigra nigra* (Vigors). It can be separated from that species by the shape of the head, male genitalia, and the chaetotaxy of the terminal abdominal segments.

Type host.—*Francolinus pintadeanus phayrei* (Blyth).

Type material.—Holotype male, allotype female, 2 paratype males and 2 paratype females collected at Ban Hua Thanon, Khlong Khlung, Kamphaeng Phet. Three male paratypes and six female paratypes collected in Burma are in the British Museum (NH).

Lipeurus deignani n. sp.

Male.—General shape and chaetotaxy as shown in figure 3. Marked postantennal constriction, breadth at temples almost equal to that of preantennal region.

First antennal segment enlarged and bearing a short blunt appendage. Four dorsal setae on prothorax. Two short and five long setae in each posterior lateral angle of pterothorax. Wide abdominal tergal plates. Chaetotaxy of genital region as in *Lipeurus brunneipictus* (Giebel). Male genitalia as shown in figure 19.

Female.—Similar to *L. brunneipictus*, except for the chaetotaxy on the margin of the vulva. This form has twenty-eight long and medium-length setae on the margin of the vulva, as compared with twenty setae of the same sizes on the vulva of *L. brunneipictus*. Total length is 2.96 mm.

This species is closest to *Lipeurus brunneipictus* (Giebel), 1877, found on *Lophura ignita rufa* (Raffles). It can be separated from that species by the shape of the first antennal segment of the male, the wide abdominal tergal plates of the male, the male genitalia, and the chaetotaxy of the genital region of the female.

Type host.—*Lophura diardi* (Bonaparte).

Type material.—Holotype male, allotype female, 3 paratype males, and 5 paratype females collected at Khao Sawan Mountain, Sieo, Loei. Other paratypes are: 25 males and 26 females collected on Phu Lom Lo Mountain, Kok Sathon, Dan Sai, Loei; 7 males and 4 females collected at Siracha, Chon Buri; 6 males and 7 females collected at Ban Sang Kho, Khok Phu, Sakon Nakhon; 11 males and 16 females collected on Phu Phak Khi Nak Mountain, Kok Sathon, Dan Sai, Loei; 2 males and 1 female collected at Ban Na Muang, Na Haeo, Dan Sai, Loei; and 1 male and 1 female collected at Ban Muang Khai, Tha Li, Loei.

Lipeurus introductus Kellogg

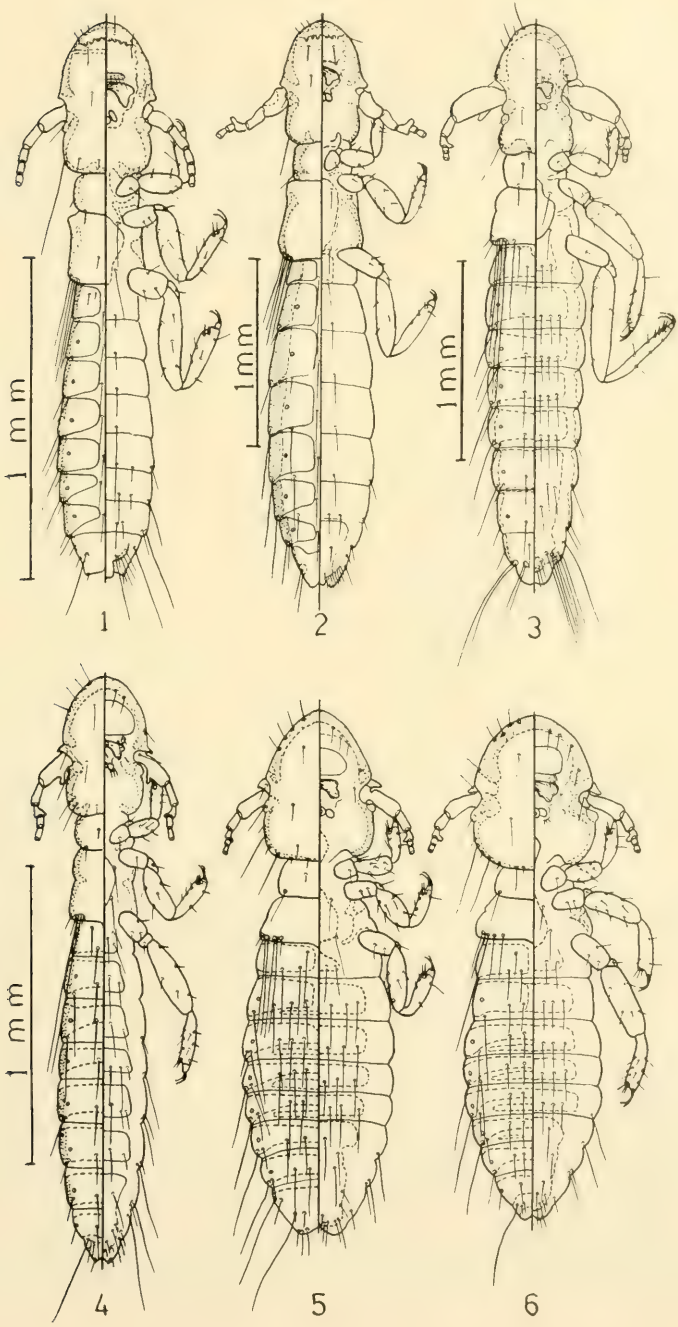
Lipeurus introductus Kellogg, 1896. Proc. Calif. Acad. Sci. (2), 6: 500, pl. 68, figs. 1 and 5. Type host: *Phasianus nycthemerus*=*Lophura nycthemera nycthemera* (Linnaeus).

Specimens collected.—1 male and 3 females at Ban Na Muang, Na Haeo, Dan Sai, Loei; 1 female on Phu Lom Lo Mountain, Kok Sathon, Dan Sai, Loei; and 9 males and 18 females on Phu Phak Khi Nak Mountain, Kok Sathon, Dan Sai, Loei; off *Lophura nycthemera jonesi* (Oates). The species was described from specimens taken off a Silver Pheasant in San Francisco, California. Clay (1938) redescribed and illustrated the form as *Lipeurus subsellatus* Harrison, 1916, a synonym, from specimens taken off museum skins of the type host. The specimens collected agree with Clay's descriptions and illustrations.

Oxylipeurus annamensis n. sp.

Male.—General shape and chaetotaxy as shown in figure 2. Posterior margin of the modified chitin of the forehead with six prominent serrations. First antennal segment enlarged and elongated, with a circular-shaped clear area. Abdominal tergites, except for terminal segment, divided medianly. Posterior sternal plate

Fig. 1. *Oxylipeurus formosanus* (Uchida), dorsal-ventral view of male; fig. 2. *Oxylipeurus annamensis* n. sp., dorsal-ventral view of male; fig. 3. *Lipeurus deignani* n. sp., dorsal-ventral view of male; fig. 4. *Lipeurus boonsongi* n. sp., dorsal-ventral view of male; fig. 5. *Cuclotogaster phayrei* n. sp., dorsal-ventral view of male; fig. 6. *Cuclotogaster subinsolitus* n. sp., dorsal-ventral view of male.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prolonged into a short, thickened modified process. On each side of this process, a row of eight setae. Genitalia as shown in figure 13.

Female.—Slightly larger than the male, being 3.42 mm in total length. Forehead as in the male. Antennae filiform. Chaetotaxy of thorax and abdomen similar to the male, except for terminal segment. Terminal abdominal segment deeply bicleft. Margin of vulva bicleft, with a row of 24 to 26 setae.

This species is closely related to *Oxylipeurus piagetinus* Hopkins, 1950, found on *Lophura ignita ignita* (Shaw). In *O. piagetinus*, the posterior margin of the modified chitin of the forehead is straight; whereas in *O. annamensis*, this margin is prominently serrated.

Type host.—*Lophura diardi* (Bonaparte).

Type material.—Holotype male, allotype female, 4 paratype males and 4 paratype females were collected at Ban Sang Kho, Khok Phu, Sakon Nakhon. Other paratypes are: 8 males and 10 females collected on Phu Lom Lo Mountain, Kok Sathon, Dan Sai, Loei; 5 males and 1 female collected on Phu Phak Khi Nak Mountain, Kok Sathon, Dan Sai, Loei; 9 males and 10 females collected on Khao Sawan Mountain, Sieo, Loei; 1 female collected at Ban Na Muang, Na Haeo, Dan Sai, Loei; and 7 males and 3 females collected at Ban Muang Khai, Tha Li, Loei.

Oxylipeurus formosanus (Uchida).

Lipeurus formosanus Uchida, 1917. J. Coll. Agric. Tokyo, 3: 179, fig. 1. Type host: *Arborophila crudigularis* (Swinhoe).

Specimens collected.—29 males and 15 females on Phu Lom Lo Mountain, Kok Sathon, Dan Sai, Loei; off *Arborophila brunneopectus brunneopectus* (Blyth). These specimens have been compared with material from the type host collected in Formosa. We are unable to find any significant differences between the two populations. The male is illustrated in figure 1. The male genitalia are of the same type as found in *Oxylipeurus annamensis*.

Oxylipeurus megalops (Piaget).

Lipeurus megalops Piaget, 1880. Les Pediculines: 675, pl. 16, fig. 8. Type host: *Cryptonyx coronatus*=*Rollulus roulroul* (Scopoli).

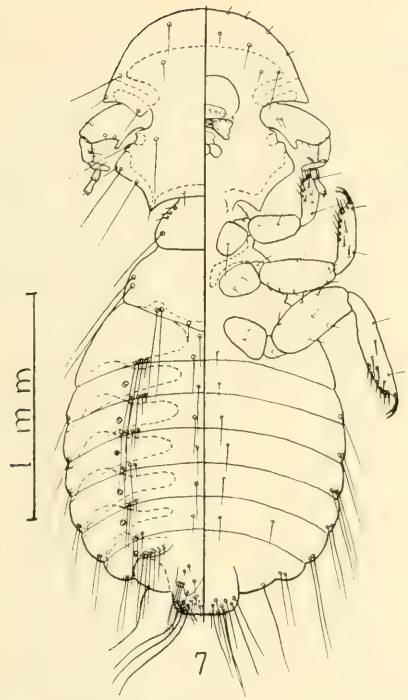
Specimens collected.—7 males and 11 females on Khao Phap Pha Mountain, Ban Na, Phattalung; off the type host. These specimens agree with Clay's (1938) descriptions and illustrations.

Oxylipeurus unicolor (Piaget).

Lipeurus unicolor Piaget, 1880. Les Pediculines: 354, pl. 28, fig. 6. Type host: *Arborophila brunneopectus javanica* (Gmelin).

Specimens collected.—11 males and 10 females on Phu Lom Lo Mountain, Kok Sathon, Dan Sai, Loei; off *Arborophila brunneopectus brunneopectus* (Blyth). Clay (1938) redescribed and illustrated the species from material taken off museum skins of the type host, and re-

Fig. 7. *Goniodes chloropus* n. sp., dorsal-ventral view of male; fig. 8. *Goniodes chloropus* n. sp., dorsal-ventral view of female; fig. 9. *Goniocotes parviceps* (Piaget), dorsal-ventral view of male; fig. 10. *Goniocotes parviceps* (Piaget), male genitalia; fig. 11. *Goniocotes rectangulatus* Nitzsch, male genitalia.



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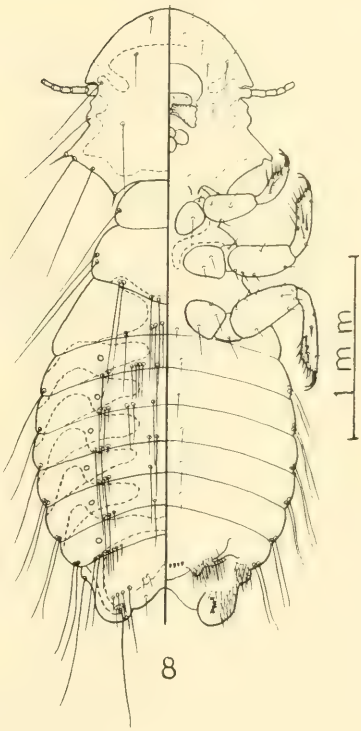

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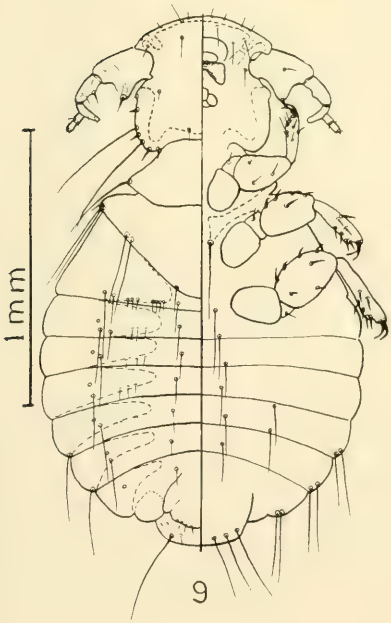

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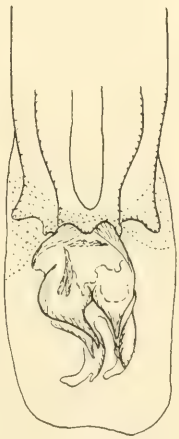

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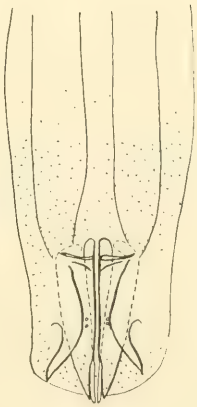

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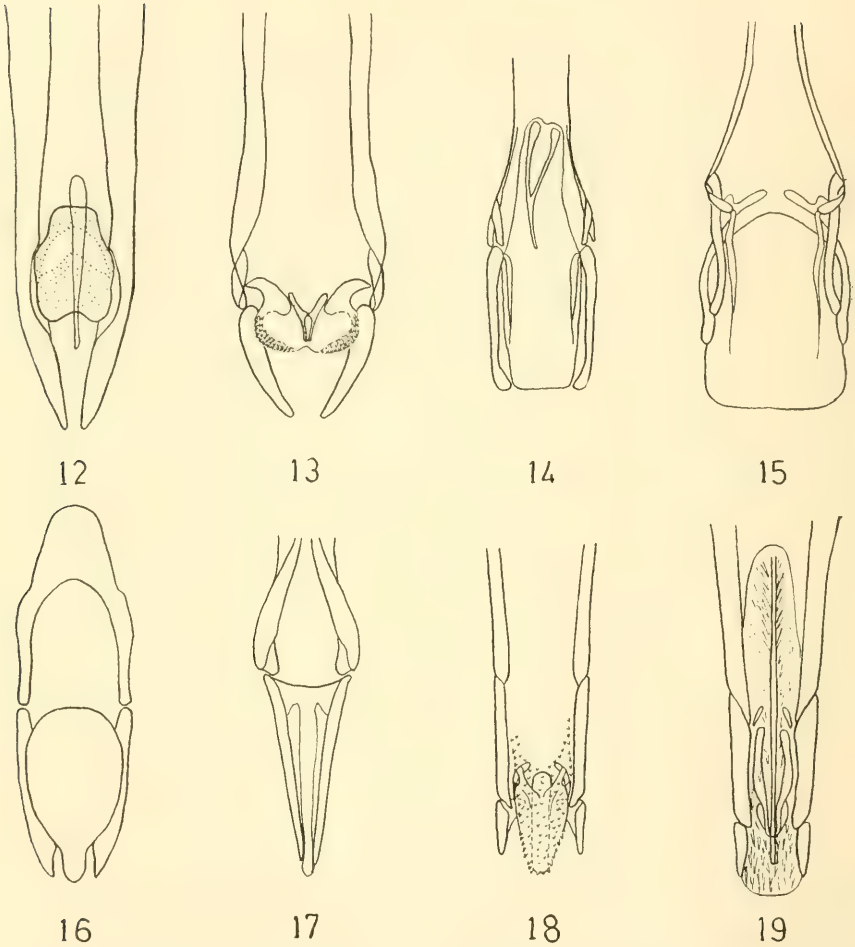

Fig. 12. *Goniodes chloropus* n. sp., male genitalia; fig. 13. *Oxylipeurus annamensis* n. sp., male genitalia; fig. 14. *Amyrsidea uniseriata* (Piaget), male genitalia; fig. 15. *Amyrsidea phaecostoma* (Nitzsch), *male genitalia;* fig. 16. *Cuclotogaster phayrei* n. sp., male genitalia; fig. 17. *Cuclotogaster subinsolitus* n. sp., male genitalia; fig. 18. *Lipeurus boonsongi* n. sp., male genitalia; fig. 19. *Lipeurus deignani* n. sp., male genitalia.

ported collections from skins of 15 other species and subspecies of *Arborophila*. The specimens collected agree with Clay's descriptions and illustrations.

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BLACK FLIES ATTRACTED TO MEAT BAIT[1]

(DIPTERA: SIMULIIDAE)

Bait traps with ground beef as the attractant, set during the summer months of 1954-55 at O'Sullivan Dam, Grant County, Wash., yielded considerable numbers of black flies, *Simulium vittatum* Zett. A preliminary investigation of the literature and personal correspondence with Dr. Alan Stone and Dr. Herbert Dalmat have failed to show any records of black flies having been attracted to meat bait traps.

The traps were placed in the field at six stations, each representing a somewhat different ecological habitat; some were located in dry sage and sand types of environment, whereas others were established along the grassy margins of seepage ponds. The traps were placed in the field at approximately 7 a.m. and allowed to remain until 7 p.m.

The bait traps were of the old-fashioned fly trap variety, that is, a common cylindrical screen with an inverted cone, a white cloth used as a tie at the top, and the entire trap supported by an unpainted plywood frame.

The bait was ground beef with ample quantities of tallow, placed on a piece of white paper towel (which also helps to attract insects) and anchored to the ground with small sticks or nails. The advantage of using ground beef in this area is its moisture-retaining qualities. Freshness of the bait also appeared to be an important factor. Un-

[1] This study was supported in part by United States Public Health Grant E-579 and in part by the State of Washington Initiative Measure No. 171 for medical and biological research.

refrigerated meat that was allowed to age and putrefy seemed to be superior to freshly prepared meat.

Black flies were collected in small, though constant numbers, in all traps from July 12 to October 11, 1954, and from July 9 to August 22, 1955. Altogether, 881 males and 512 females were collected in 1954 and 42 males and 62 females in 1955. The large number for 1954 was due chiefly to a peak of capture on August 17, when a trap left out accidentally for 3 days yielded 766 males and 347 females. This peak was probably not wholly due to the unusually long time of exposure, since a similar, though much smaller peak occurred in 1955; it may have been due to mass emergence of adults.—HARRY G. DAVIS AND MAURICE T. JAMES, *Dept. of Zoology, State College of Washington, Pullman, Wash.*

THE VALIDITY AND CHANGE OF NAME OF TWO SPECIES OF WYEOMYIA. (DIPTERA, CULICIDAE)

In 1939, when Lane and Cerqueira were working on the "Os Sabetíneos da América" (1942), Del Ponte made available to them a draft description and specimens of a *Dendromyia* which he considered a new species and was about to publish under the name of *rooti*. Considering inadequate the material on which the description was based, and, deeming insufficient the characters that were being given to separate this species, Lane and Cerqueira did not include it in their study. Later, when suitable specimens were obtained, they described the species as *Wyeomyia* (*Dendromyia*) *delpontei* (1942).

Dr. Alan Stone has now called our attention to the fact that Del Ponte mentioned in his paper (1939) sufficient characters for his species, thus making *rooti* a valid name. Such being the case, *Wyeomyia* (*Dendromyia*) *delpontei* Lane & Cerqueira, 1942 becomes a synonym of *Wyeomyia* (*Dendromyia*) *rooti* Del Ponte, 1939. Consequently, *Wyeomyia* (*Antunesmyia*) *rooti* Lane & Cerqueira 1942 becomes an homonym; but, as this species remains valid, we are here changing its name to *alani*, new name, based on the given name of our informant.

The situation of the species under discussion stands therefore as follows:

Wyeomyia (Autunesmyia) alani, new name

1942 *Wyeomyia* (*Antunesmyia*) *rooti* Lane & Cerqueira, Arq. Zool. São Paulo 3: 587 nec *Wyeomyia* (*Dendromyia*) *rooti* Del Ponte, 1939, Physis 17: 535-541.

1953 *Wyeomyia* (*Antunesmyia*) *rooti* Lane, Neotropical Culicidae 2: 941.

Wyeomyia (Dendromyia) rooti Del Ponte 1939.

1939 *Dendromyia rooti* Del Ponte, Physis 17: 535-541.

1942 syn. *Myeomyia* (*Dendromyia*) *delpontei* Lane & Cerqueira, Arq. Zool. São Paulo 3: 613.

1953 *Wyeomyia* (*Dendromyia*) *delpontei* Lane, Neotropical Culicidae 2: 988.

JOHN LANE and
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THE SYSTEMATIC RELATIONSHIPS OF THE PALEANTARCTIC SIPHLONURIDAE (INCLUDING ISONYCHIIDAE) (EPHEMEROPTERA)[1]

GEORGE F. EDMUNDS, JR., *University of Utah*

The primitive mayflies of the family Siphlonuridae (including Isonychiidae) of Australia, New Zealand, and southern South America are of great interest to ephemeropterists, but their interrelationships never have been clearly understood. Recent works by Demoulin (1955, Bull. Inst. Roy. Sci. Nat. Belg. 31(22): 1-15; (58): 1-16) and Riek (1955, Austral. Jour. Zool. 3: 266-280, 2 pls.) have helped to clarify the systematics of the group.

On the basis of the morphology of the nymphs there are four remarkably distinct groups, each represented by one genus in each of the three land masses, except that one of the groups has two representatives in South America. Although the groups are easily characterized in the nymphal stage, the definition of these groups in the adult stage is difficult, primarily, it is hoped, because of inadequate knowledge of the family.

The Siphlonurinae are represented by three genera which have very similar nymphs, *Nesameletus* in New Zealand, *Ameletoides* in Australia, and *Metamonius* in South America. The Oniscigastrinae are represented by the remarkable *Oniscigaster* in New Zealand, *Tasmanophlebia* (=*Tasmanophlebiodes*) in Australia, and *Siphlonella* in South America.

A third group is represented by mayflies with peculiar carnivorous nymphs having threadlike multi-segmented labial and maxillary palpi. This group is represented by *Ameletopsis* in New Zealand, *Mirawara* in Australia, and *Chiloporter* and probably *Chaquihua* in South America. The relationship between *Ameletopsis* and *Chiloporter* is quite obvious. Demoulin (1952, Bull. Ann. Soc. Ent. Belg. 88: 170-172) at one time considered these genera synonymous, but they were restored to generic status by Edmunds and Traver (1954, Proc. Ent. Soc. Wash. 56: 236-240). The genus *Mirawara* of Australia was included by Edmunds and Traver (*op. cit.*) in the family Isonychiidae without critical study because of the statement by Harker (1954, Trans. Roy. Ent. Soc. London, 105: 251) that the genus was related to *Coloburiscus*. Riek (*op. cit.*) has since described the nymph of *Mirawara* and revealed the relationship to *Ameletopsis*. The nymph of *Mirawara* is almost certainly the one which Tillyard (1933, Proc. Linn. Soc. N.S. Wales 58: 5) reported as *Ameletopsis* in Australia. More recently Demoulin (1955, Bull. Inst. Roy. Sci. Nat. Belg. 31: 11) has described a new genus, *Chaquihua*, which is apparently related to *Mirawara* and is therefore placed in the Isonychiidae. The nymph of *Chaquihua* is unknown, but some *Ameletopsis*-like nymphs in the California Academy of Sciences Collection, collected west of

[1] This research was supported by grants from the National Science Foundation (NSF-G2514) and the University of Utah Research Fund.

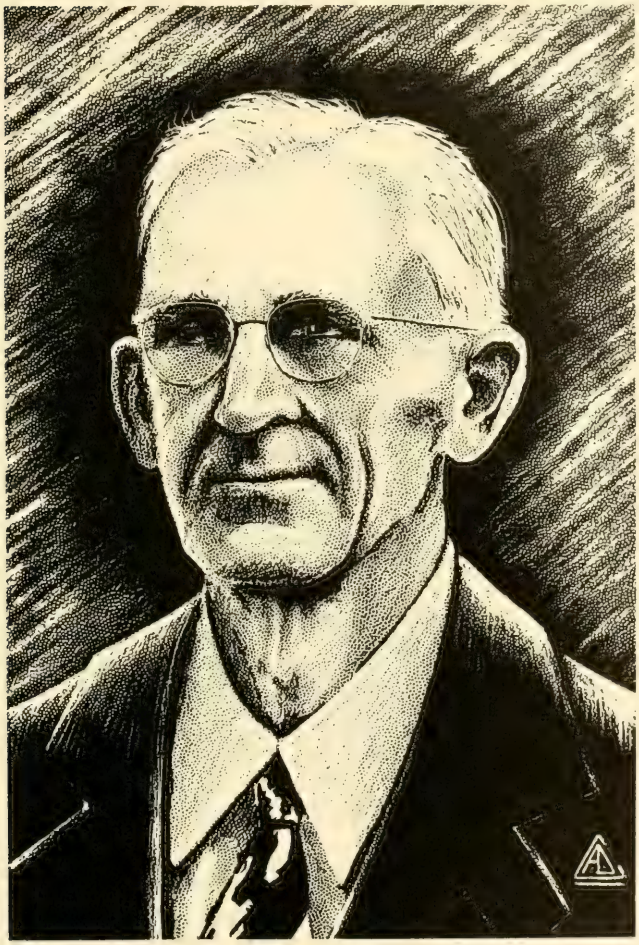
Angol, Chile by Ross and Michelbacher are probably the nymphs of *Chaquihua*. The wing pads have *Chaquihua* type venation, but reveal no angular costal projection at the base of the hind wing. In Demoulin's (*op. cit.* :15) summary of the genera of the Siphlonuridae and Isonychiidae, he places *Chiloporter* and *Ameletopsis* in the Siphlonuridae and *Mirawara* and *Chaquihua* in the Isonychiidae. I propose that the four genera form a **new subfamily, Ameletopsinae,** in the family Siphlonuridae.

The isonychiine mayflies are represented by *Coloburiscus* in New Zealand, *Coloburiscoides* in Australia, and by *Murphyella* in South America. These nymphs have such common features as maxillary and coxal gills, the forelegs with long setae, and similar mouthparts. The abdominal gills have a fibrilliform tuft in *Coloburiscoides*, but not in *Coloburiscus; Murphyella* nymphs have no abdominal gills.

The isonychiine mayflies are still not adequately characterized in the adult stage, and from a practical standpoint it is probably best to regard them as a subfamily of the Siphlonuridae. Burks (1953, Bull. Ill. Nat. Hist. Surv. 26(1) : 108) originally proposed the group as a subfamily of Baetidae, but Edmunds and Traver (*loc. cit.*) raised the group to family level. The isonychiine branch most certainly originated from the Siphlonuridae, but after branching from this group has apparently been ancestral to two distinct families, the Heptageniidae and Oligoneuriidae. Because the isonychiine branch was the probable ancestor of these families, Edmunds and Traver (*loc. cit.*) felt that the group should be regarded as a full family. Although this still appeals to me from the theoretical standpoint, it is not a regular practice in classification. For example, the reptilian stem which was ancestral to the mammals is not placed as a separate class from the reptiles because it was ancestral to another class, the Mammalia. For this reason I am inclined to now regard the Isonychiinae as only a subfamily of Siphlonuridae.

In view of the clarification of relationships of the paleantarctic Siphlonuridae, the following table summarizes the systematic and geographical relationships of the genera. A similar table published by Demoulin (*loc. cit.*) summarizes his impression of the relationships as viewed prior to the publication of Riek's (*op. cit.*) paper on the Australian Siphlonuridae.

Groups of SIPHLONURIDAE	South America	Australia	New Zealand
Siphlonurinae	Metamonius	Ameletoides	Nesameletus
Ameletopsinae	Chaquihua Chiloporter	Mirawara	Ameletopsis
Oniscigastrinae	Siphlonella	Tasmanophlebia (=Tasmanophlebioides)	Oniscigaster
Isonychiinae	Murphyella (=Dictyosiphlon	Coloburiscoides	Coloburiscus



ROBERT ASA CUSHMAN
1880-1957

Robert Asa Cushman, recognized abroad as well as in this country as an outstanding authority on the classification of those parasitic Hymenoptera that comprise the family Ichneumonidae, died at his home in Altadena, Calif. on March 28, 1957. He and Mrs. Cushman had moved there from Washington in 1944, when he retired from active service in the Department of Agriculture on account of poor health.

Mr. Cushman was born in Taunton, Mass., on November 6, 1880. After completing his early education he studied at the University of New Hampshire and at Cornell University, and in 1906 he was ap-

pointed a field agent in the U. S. Bureau of Entomology. His first assignments involved studies of the cotton boll weevil and its parasites, with headquarters at Tallulah, La., and Dallas, Tex.; but in 1911 he was transferred to the Division of Fruit Insect Investigations and stationed at Vienna, Va. With this move he began part-time duty with the Department of Agriculture staff of insect taxonomists at the National Museum. This arrangement was continued when his field station assignment was shifted a few years later to North East, Pennsylvania, where he was engaged on studies of grape pests and their parasites. Finally, in 1920 he was transferred to Washington and stationed at the National Museum for full-time duty in the field he loved best and for which he was so admirably fitted, the taxonomy of the ichneumon flies.

Although not an especially prolific writer Mr. Cushman, nevertheless, published a large number of papers (which are cited in an accompanying article by Dr. Henry Townes). Many of these represent significant contributions to a sound knowledge of the classification of the Ichneumonidae, made the more useful by Cushman's possession of a gift for clear expression and nice use of the English language.

Late in 1927 he was sent to the Philippines to arrange for the packing and transfer to the U. S. National Museum of the C. F. Baker collection of insects, which had been bequeathed to the Museum on the condition that the Museum send someone to the Philippines to attend to its packing and shipment. It contained approximately 300,000 pinned insects and was one of the largest single accessions to the National Museum's insect collections.

Mr. Cushman was elected to membership in the Entomological Society of Washington in 1911, and during his many years at the National Museum he attended the Society's meetings very regularly and contributed importantly to their programs and discussions. He was recording secretary of the Society from 1919 to 1921, second vice-president in 1923, first vice president in 1924, and president in 1925.

Cushman was an extremely friendly person who liked people, and who, in turn, was liked by all who were acquainted with him. His passing leaves those who worked with him and who knew him best with a deep sense of loss. He is survived by his widow and by a son, Arthur D., who is a scientific illustrator in the U. S. Department of Agriculture.

C. F. W. MUESEBECK

A BIBLIOGRAPHY OF THE SCIENTIFIC PUBLICATIONS OF R. A. CUSHMAN

HENRY TOWNES

Mr. Cushman's list of published titles includes 113 items. In sequence, they are a good mirror of his scientific career, beginning with papers on the biologies of various insects, then turning more and more to their hymenopterous parasites. Shortly, he started contributions on the taxonomy of the parasitic Hymenoptera, at first on Bra-

conidae, Chalcidoidea, and Ichneumonidae, but soon concentrated his interests on the Ichneumonidae to the exclusion of the others, and also to the exclusion of papers on biologies. His earlier work on biologies had its effect on his taxonomy, as he became impressed with the importance of biological characteristics, larval morphology, and the morphology of the ovipositor tip. These characters led him to an understanding of ichneumonid classification in advance of others of his day. Though he published no comparative studies on ichneumonid larvae, his unusual knowledge of them was a foundation for his opinions on the phylogeny of the family.

Mr. Cushman's taxonomic papers reflect his duties and opportunities at the U. S. National Museum. Descriptions of new species reared from hosts of economic importance fill many of them. He had access to a fine library and many important types, which resulted in nomenclatorial work in which he tried to bring some order out of the chaos of names left by his predecessors. An interesting fact is that among Cushman's tools were Foerster's original manuscript notebooks on the classification of the Ichneumonidae, from which Foerster published in 1868 a synopsis of all the genera, describing 509 genera as new. Foerster's published synopsis is very brief, but his notebooks include fuller treatments and in many cases keys to the species under the genera. Cushman's comments on the application of many of Foerster's generic names stem from a study of these manuscripts. The notebooks were acquired from Dr. O. Schmiedeknecht in the early 1920's. Schmiedeknecht had also made use of them in his publications.

Mr. Cushman's best known contributions are the series of papers on the subfamily Pimplinae, published in 1920, quite early in his career. His best work, however, is in his later revisions, like those on the Nearctic Mesostenini (1929) the genus Exenterus (1940), and the revision of the genera of Ophionini (his last paper). The high quality of these later revisions reflects a long devotion to the subject, high intellectual standards, and the use of good collections.

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CARABUS AURATUS L. (COLEOPTERA, CARABIDAE) IN NORTH AMERICA

Fifteen specimens in the collection of the University of Vermont, Department of Zoology, apparently represent the first record of the common European carabid, *Carabus auratus* L., from North America. Twelve of the specimens were taken by Dr. Floyd Werner at South Barre, Vt., on May 7, 1952. Three others were collected by C. Parsons at Plainfield, Vt., on June 12, 1950. Presumably the species was accidentally introduced in a manner similar to that postulated for *C. nemoralis* Müll. and *C. granulatus* L. (Van Dyke, 1944). Whether the colony has persisted has not as yet been ascertained. *Carabus auratus* can easily be distinguished from other North American members of the genus, both native and introduced, by its coloring, bright metallic green above with orange legs; and by the sculpture of the elytra, each with three carinae, but without striae. Reference: Van Dyke, E. C., 1944, Ent. Amer. 24:87-137.—Ross T. Bell, *Department of Zoology, University of Vermont, Burlington, Vt.*

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IXODES DOWNSI, A NEW SPECIES OF TICK FROM A CAVE IN TRINIDAD, BRITISH WEST INDIES (ACARINA-IXODIDAE)

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The new species of *Ixodes* here described was found among numerous lots of ticks collected from various hosts in Trinidad by personnel of the Trinidad Regional Virus Laboratory and sent to me by Dr. Thomas H. G. Aitken for identification. The species is based on 1 male, 1 female, and 3 nymphs found crawling on the wall of Aripo Cave, and 1 larva from a bat captured in the same cave. All measurements are in millimeters.

Ixodes downsi n. sp.

(FIGS. 1 to 4)

Holotype.—Male, from wall of Aripo Cave, Trinidad, March 20, 1955, W. G. Downs, coll. Deposited in the Rocky Mountain Laboratory, RML No. 33481.

Allotype.—Female, data as for holotype.

Paratypes.—3 nymphs, data as for holotype; 1 larva from a bat, *Anoura g. geoffroyi*, from Aripo Cave, Trinidad, March 20, 1955, W. G. Downs, coll. RML 33590. All deposited in the Rocky Mountain Laboratory.

DESCRIPTION

MALE: Length, tips of scapulae to posterior margin of body, 3.07, maximum width, 2.15. Body suboval, wider anteriorly. Color yellow brown, legs paler.

Capitulum.—Length, tips of palpi to posterior margin of basis capituli, 0.58. Greatest width 0.38, at level of insertion of palpi. Basis small, posterior margin a little concave, elevated, and continuing into a tapering neck. Surface of basis with a few punctations. Cornua absent. Palpi rather long and thick, tumescent dorsally and with numerous stout hairs; segments 2 and 3 without sutural line separating them, their combined length about 0.37. An expanse of membraneous tissue posterior to palpal segment 1 dorsally, laterally, and ventrally. In ventral view, the basis is long, lateral margins nearly straight and diverging to base of palpi, posterior margin merging into a neck. Auriculae absent. Hypostome shorter than the palpi, broad, notched apically; shape and dentition as figured. Length of toothed portion about 0.190.

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Scutum.—Surface smooth and shining and with a few very small punctations. Scapulae short, blunt. Cervical grooves divergent, rather deep anteriorly, becoming shallower posteriorly and attaining the margin of the faintly indicated pseudoscutum. Lateral carinae absent. Hairs few, short and scattered, more numerous peripherally and on the prominent marginal body fold.

Ventral plates.—Pregenital plate ill-defined. Median plate about one and one-half times as long as the anal plate. Adanal plates broader anteriorly. Short fine hairs on all plates, more numerous on the epimerals. Punctations few, fine, and inconspicuous. Genital and anal grooves well marked. Anal groove rounded in front of the anus, a little convergent posteriorly. Hairs short and fine except those on trochanters and on ventral surfaces of all segments except the tarsi are heavier and forked.

Legs.—Moderate in length and size. All coxae with a short external spur; a minute internal spur on coxa I. Trochantal spurs absent. Tarsi I, II, and III tapered abruptly; tarsus IV tapered gradually. Length of tarsus I, 0.66; metatarsus, 0.56. Length of tarsus IV, 0.72; metatarsus, 0.56.

Spiracular plate.—Subcircular, greatest dimension about 0.30. Goblets numerous and small.

Genital aperture. Situated between coxae III.

FEMALE: Unfed. Length, tips of scapulae to posterior margin of body, 2.53; width, 1.87. Suboval, wider posteriorly. Capitulum, scutum, and legs yellow brown, other parts pale yellow. Body with numerous fine pale hairs dorsally and ventrally.

Capitulum.—Length, tips of palpi to tips of cornua, 0.64; greatest width of basis, 0.47. Basis capituli broad, lateral margins posterior to insertion of palpi short and convex, posterior margin concave and somewhat sinuous; cornua short, blunt. An expanse of membraneous tissue posterior to the base of palpal segment 1 as in the male. Palpi moderate in length, stout, and rounded apically. Porose areas large, broader than long, shallow, and occupying much of the dorsal surface of the basis. Palpal segment 1 a simple ring visible dorsally, laterally, and ventrally. Segments 2 and 3 fused leaving no visible suture, their combined length 0.31. Ventrally the basis is constricted behind the short blunt auriculae; surface smooth, mildly convex, broadly rounded posteriorly. Transverse sutural line faint. Hypostome shorter than the palpi, slightly indented apically. Median denticles a little smaller than the laterals. Denticles arranged 3/3 apically, then 2/2. Length of toothed portion, 0.26.

Scutum.—Length, 1.21; width, 1.00. Shape as figured. Scapulae short, blunt. Emargination broad, shallow. Anterolateral areas slightly rugose. No lateral carinae. Cervical grooves broad, shallow, first converging then diverging, and extending to the posterolateral margins of the scutum. Punctations few, small, and scattered. An irregular row of fine, pale hairs extends across the scutum anteriorly and into the anterolateral fields as figured.

Legs.—Similar to those of the male in size and length. Hairs on trochanters and on ventral surfaces of all segments except the tarsi not as stout as in the male. A broad, blunt external spur on coxa I; a similar but shorter spur on coxae II, III, and IV. Internal spurs absent. No trochantal spurs. Length of tarsus I, 0.87; metatarsus, 0.54. Length of tarsus IV, 0.75; metatarsus, 0.56. Tarsus IV tapers a little more abruptly than in the male.

Spiracular plate.—Suboval, greatest diameter 0.44. Goblets numerous and small.

Genital aperture.—Situated between coxae III.

Anal groove.—As in the male.

NYMPH. *Capitulum.*—Length, 0.35; width of basis, 0.25. Basis much as in the female. Cornua directed posterolaterally and widely separated; posterior margin of basis between them straight or slightly convex. Palpi similar to those of the female; combined length of segments 2 and 3 about 0.22. Ventrally, basis as in the female but no transverse sutural line. Hypostome as long as the palpi; dentition as in the female. Length of toothed portion about 0.19.

Scutum.—Length 0.57 to 0.59; width 0.52 to 0.57. Shape as figured. Scapulae very short and blunt. Lateral carinae absent. Cervical grooves as in the female. Hairs few and scattered.

Legs.—Similar to those of the female.

Spiracular plate.—Subelliptical, greatest diameter about 0.18. Goblets fewer and larger than in the female.

LARVA. *Capitulum.*—Length, 0.16; width of basis 0.15. Basis broad and narrow, rounded posterolaterally, posterior margin straight. The palpi resemble those of the nymph; combined length of segments 2 and 3 about 0.12. Ventrally, the basis is elongate, lateral margins convergent, posterior margin truncate. Auriculae as mild elongate lateral saliences. Hypostome as long as the palpi; principal dentition 2/2.

Scutum. Shape as figured, cervical grooves distinct, shallow, divergent and reaching the posterolateral margins. Scapulae and lateral carinae absent.

Coxae.—Short triangular external spurs on all coxae. No internal spurs.

Little information is available as to the hosts of *I. downsi* n. sp., but the finding of a larva on a bat taken in a cave, and the presence of adults and nymphs on the walls of the same cave suggest that it may be a bat tick. If so, *I. downsi* is the first bat tick of this genus to be recorded from the New World. Dr. Aitken informed me that Dr. Downs and other members of the party who visited the cave saw at least four species of bats, including *Anoura g. geoffroyi* on which the larva was found. Oil birds, *Steatornis caripensis*, were nesting in the cave and a large rat was also seen, but whether any of these serve as hosts is unknown.

The new species, named for the collector, Dr. W. G. Downs, Director of the Trinidad Regional Virus Laboratory, is readily distinguished from the few known bat-infesting species of *Ixodes* (reviewed by Arthur, 1956) and all New World species of the genus by characters of the capitulum, scutum, and legs. It bears little resemblance to *Ixodes luciae* Senevet, 1940 (= *I. loricatus vogelsangi* Santo Dias, 1954, new synonymy), the only other species known from Trinidad. Adults of the latter, a widely distributed Latin American species but here first reported from Trinidad, infest opossums (*Didelphis* spp.) primarily; the immature stages infest various species of rats as evidenced by several collections received from Dr. Aitken. The only species of *Ixodes* that have been recorded from nearby Venezuela are

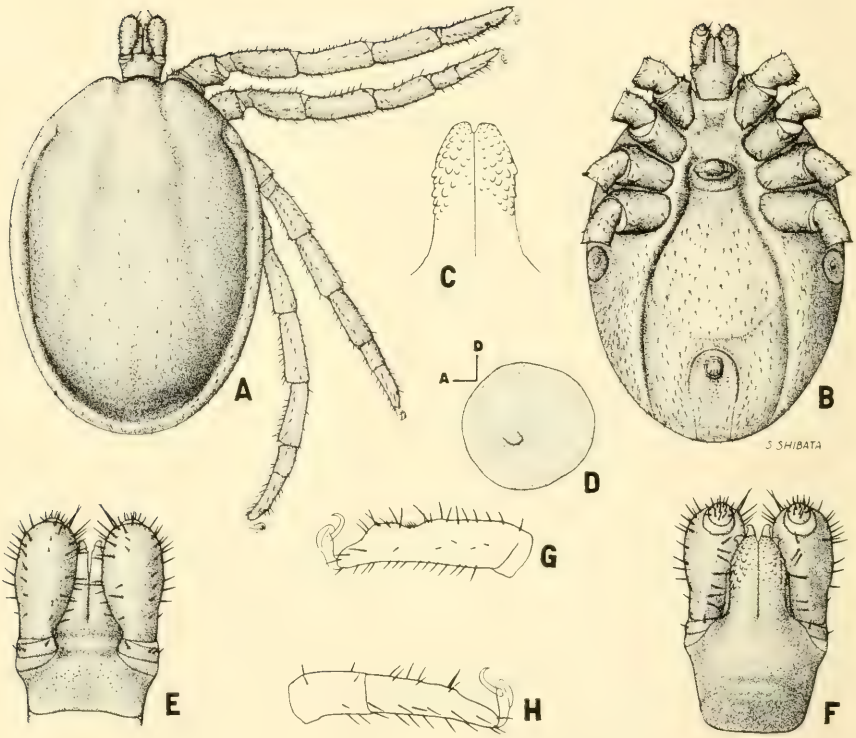

Fig. 1. *Ixodes downsi* n.sp. Male. A, dorsum; B, venter; C, hypostome; D, spiracular plate (A = anterior; D = dorsal); E, capitulum, dorsal; F, capitulum, ventral; G, tarsus I; H, tarsus IV.

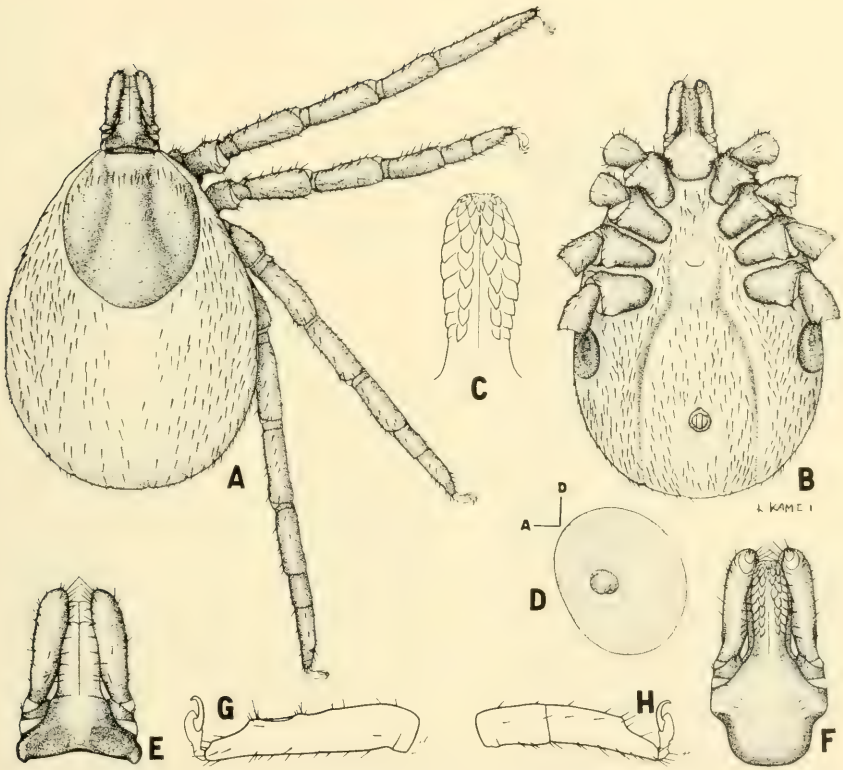

Fig. 2. *Ixodes downsi* n.sp. Female. A, dorsum; B, venter; C, hypostome; D, spiracular plate (A = anterior; D = dorsal); E, capitulum, dorsal; F, capitulum, ventral; G, tarsus I; H, tarsus IV.

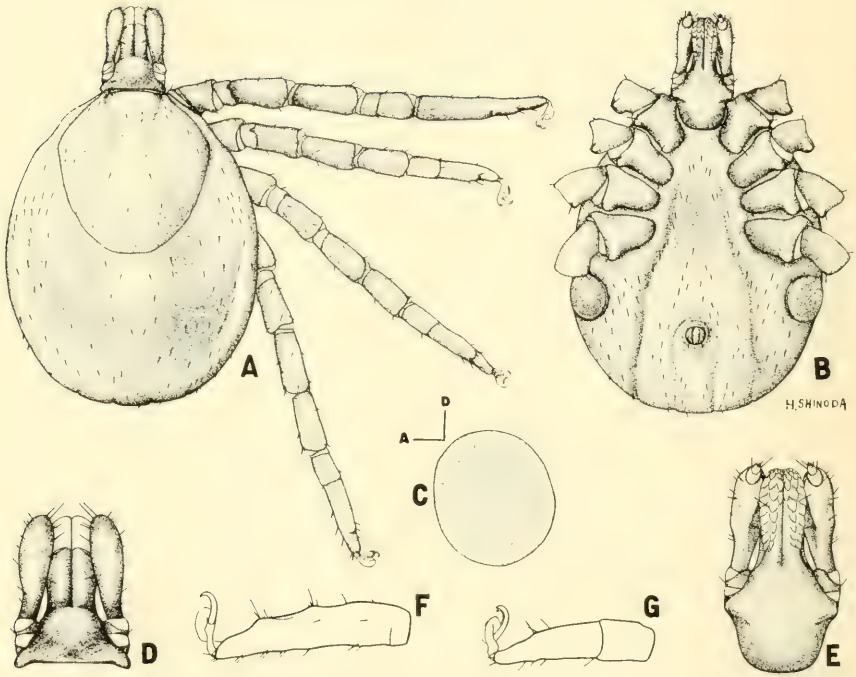

Fig. 3. *Ixodes downsi* n.sp. Nymph. A, dorsum; B, venter; C, spiracular plate (A = anterior; D = dorsal); D, capitulum, dorsal; E, capitulum, ventral; F, tarsus I; G, tarsus IV.

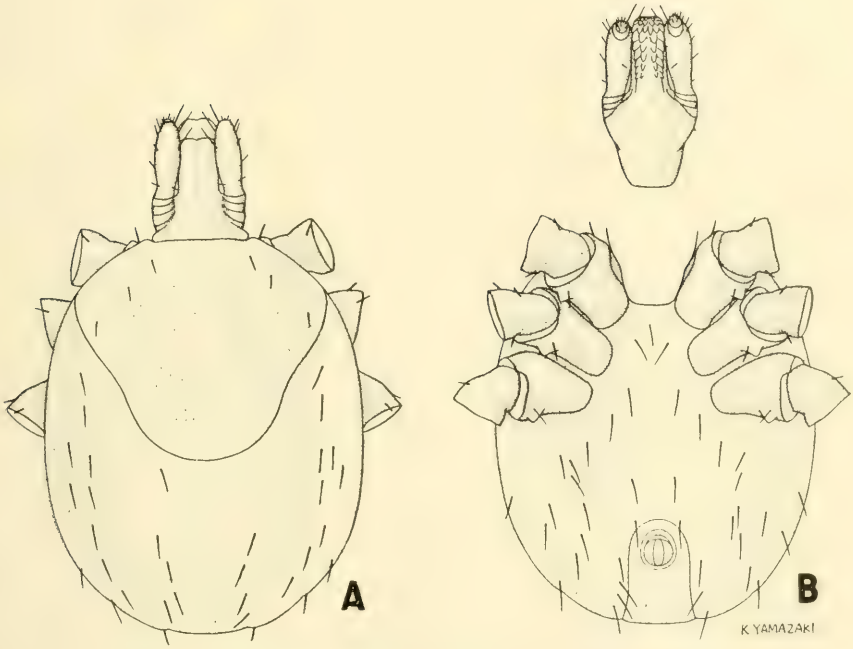

Fig. 4. *Ixodes downsi* n.sp. Larva. A, dorsum; B, venter.

I. loricatus Neumann, 1899, whose adults occur almost exclusively on *Didelphis* (Cooley and Kohls, 1945) and *I. venezuelensis* Kohls, 1953, known from a few murid hosts and from an opossum, *Monodelphis b. brevicaudata* (Vogelsang and Santos Dias, 1953). None of these have been recorded from bats nor have they been found in caves.

Summary

Ixodes downsi n. sp. is described from a male (holotype), female, and three nymphs found crawling on the wall of Aripo Cave, Trinidad, British West Indies, and from a larva off a bat, *Anoura g. geoffroyi*, taken in the same cave. The specimens are deposited in the Rocky Mountain Laboratory, Hamilton, Montana. *I. loricatus vogelsangi* Santos Dias is reduced to a synonym of *I. luciae* Senevet, the only other species of the genus known from Trinidad.

Acknowledgments

It is a pleasure to express appreciation to Major Hugh L. Keegan, 406th Medical General Laboratory, for the accompanying illustrations prepared under his direction by artists Saburo Shibata, Kinuyo Kamei, Hideko Shinoda, and Kakuzo Yamazaki assigned to the Taxonomic Section, Department of Entomology, and to Colonel Joe M. Blumberg, Commanding Officer of the Laboratory, for his cooperation.

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THE SNAKE MITE PARASITES OF THE FAMILY IXODORHYNCHIDAE (MESOSTIGMATA), WITH DESCRIPTION OF A NEW SPECIES, IXODORHYNCHUS GORDONI[1]

TED TIBBETTS AND R. W. STRANDTMANN, *Texas Technological College, Lubbock*

Ewing (1922) described and figured an ectoparasitic mite of snakes which was so peculiar morphologically that he created a new subfamily, Ixodorhynchinae, for it. As the name implies, the mite had certain features characteristic of the ixodids (ticks). Specifically, these are harpoon-shaped corniculi, presumably used as holdfast organs. Ewing considered the mite closely related to Dermanyssidae and placed the new subfamily in that family. Later Fonseca (1934) found a related species he thought differed sufficiently from Ewing's (*Ixodorhynchus*) to warrant separate generic status and proposed the name *Ixobioides*, again indicating the ticklike holdfast organ. Fonseca however recognized the great dissimilarity between these mites and the dermanyssids and consequently raised them to separate family status, Ixodorhynchidae. The authority for the family name, however, remains "Ewing," as according to Article 4 (35) of the International Rules of Zoological Nomenclature, names of the Family Group Categories, despite the form of the ending, are coordinate with each other. The family was characterized as follows: Chela with only one digit, which in the female is clearly toothed; corniculi of the female serving as holdfast organs.

In 1933 Ewing found two more ectoparasitic mesostigmatic mites on snakes and created the genus *Hemilaelaps* for their reception. These mites had distinctly shearlike chelae but otherwise were similar in facies to *Ixodorhynchus*. The genus however, was kept in the family Dermanyssidae by subsequent authors.

In 1947 Radford described another mite of this complex and without comment on Ewing's or Fonseca's species, created the genus *Ophidilaelaps* for it. Radford was apparently the first to note that *Laelaps piger* Berlese (1918), also an ectoparasite of snakes, was of this same complex and accordingly moved it to his new genus, *Ophidilaelaps*. Although almost identical with *Hemilaelaps* Ewing, *Ophidilaelaps* was placed by catalogers in the family Laelaptidae. Subsequently, two more species were added to *Ophidilaelaps* by Tibbetts (1954).

A study of all the species described thus far in this complex reveals several characters in common. The corniculi are long and apically barbed, although the barb may be very small; the epipharynx is long and very slender; the ventral shields are poorly sclerotized; at least coxae II, generally coxae I and II, and sometimes coxae I, II, and III,

[1]This investigation was supported, in part by research grant E-616(C3) from the National Institute of Allergy and Infectious Diseases of the National Institutes of Health, Public Health Service.

have the ventral seta transformed into a spur; and the male (where known) has a divided ventral plate. *Ixodorhynchus* and *Ixobioides* differ from *Hemilaelaps* and *Ophidilaelaps* only on the chela; the former have only one digit, the latter, two.

Ixobioides Fonseca, 1934 is a synonym of *Ixodorhynchus* Ewing, 1922. Dr. Fonseca was aware of Ewing's genus, in fact compared his own with it, but a misinterpretation of Ewing's brief description and incomplete illustration caused Fonseca to believe his mite showed real differences. Actually there are no real differences and the two names have long been considered synonymous (*See* Baker and Wharton, 1952: 60).

Hemilaelaps Ewing, 1933 was considered invalid by Turk (1945: 141) because the name had been used, in error, by Hull, 1918 for another group of mites. As Dr. Turk clearly stated that Hull had intended to write *Haemolaelaps* but misspelled it *Hemilaelaps*, we consider this an erroneous subsequent spelling which according to Article 19(112) of the International Rules of Zoological Nomenclature has no separate status in nomenclature. Therefore, *Hemilaelaps* Ewing, 1933, is valid and *Ellsworthia* Turk, 1945, which had been proposed as a replacement name, is a synonym.

Radford (1947: 237) did not distinguish his *Ophidilaelaps* from *Hemilaelaps* Ewing although the two are very similar indeed. Actually there are no differences of generic value and we consider *Ophidilaelaps* Radford a synonym of *Hemilaelaps* Ewing. Up to this point, then, we may speak of two genera; *Ixodorhynchus* Ewing in which the female chela is unidigitate, and *Hemilaelaps* Ewing in which the female chela is bidigitate. But the discovery of the new species described below by Tibbetts indicates that the above difference may not be so real. This new species has the immovable arm of the chela so small that it is a toss-up whether to put it with *Ixodorhynchus* or with *Hemilaelaps*. It would seem superfluous and somewhat foolish to create a third genus based on an intermediate size of the immovable finger of the chela and yet that would have to be the case because other characters, such as size and shape of ventral plates, chaetotaxy, etc., vary just as subtly.

We therefore propose that all the species are congeneric, and relegate all the generic names so far proposed to the synonymy of *Ixodorhynchus*.

Genus **Ixodorhynchus** Ewing, 1922:5

Type.—*Ixodorhynchus liponyssoides* Ewing, 1922:9 (Monotypic). *Synonyms*—*Hemilaelaps* Ewing, 1933:7 **(New synonymy).**

Type.—*Hemilaelaps americanus* Ewing, 1933:8 (Original designation). *Ixobioides* Fonseca, 1934:512.

Type.—*Ixobioides butantanensis* Fonseca, 1934 (Monotypic). (*Ellsworthia* Turk, 1945. Proposed by Turk as a new name for *Hemilaelaps* Ewing). *Ophidilaelaps* Radford, 1947:237 **(New synonymy).**

Type.—*Ophidilaelaps imphalensis* Radford, 1947:238. (By original designation).

Description of the genus.—Chelicera with one or two digits; when one is present it is the movable digit, which is provided with recurved hooks. Corniculi long and apically barbed, although the barb may be very small; epipharynx long and slender; ventral shields poorly sclerotized. Coxae I and II, or II, or I, II, and III have the ventral seta transformed into a spur. Male, when known, has a divided ventral plate. Dorsal shield entire, partially divided, or completely divided; dorsal side of body partially or completely covered with dorsal plate. Legs short, stout, spined. The sternal plate may bear one, two, or three pairs of setae, genital plate with one pair of setae although occasionally it bears two pairs and sometimes none, the genital setae having moved off the plate.

The name, description, and illustrations of the new species given below were prepared entirely by Ted Tibbetts, and the species is to be credited to him.

Ixodorhynchus gordoni Tibbetts, n. sp.

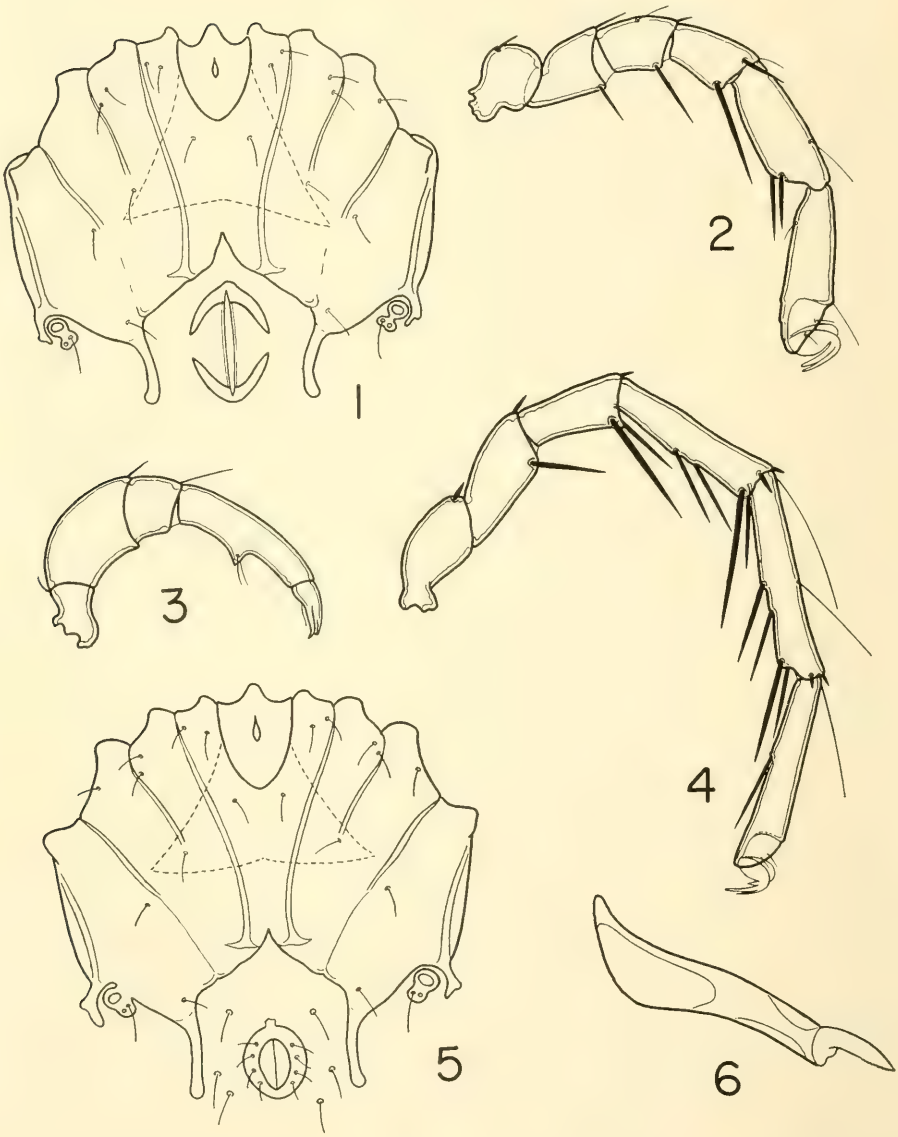
Female (Fig. 1).—Body length, excluding gnathosoma, 744 μ, and body width 628 μ.

Venter.—The antero-lateral angles of the sternal plate rounded, and not projecting between coxae I and II; anterior margin convex; lateral margin straight, extending laterally at a slight angle from the anterior to posterior end; posterior margin slightly concave. The first pair of sternal setae are located on the sternal plate; second pair of setae even with coxal spur on coxae II; third pair of setae level with middle of coxae III; fourth pair of setae even with posterior margin of coxae IV. Genito-ventral plate flask-shaped, genital setae not on genito-ventral plate but lateral to it. Anal plate ovoid, 139μ wide and 163μ long; anal opening slightly posterior to the center of anal plate. The paired anal setae slightly anterior to the anal opening; unpaired seta at the posterior end of anal plate. Posterior to the genito-ventral plate and anterior to the anal plate in the soft integument of the opisthosoma are three pairs of setae. In the area on each side of the anal plate are four pairs of setae and posterior to the anal plate is one pair of short setae. Peritremes extending from the middle of coxae IV to the middle of coxae II. Metapodal and peritremal plates fused.

Dorsum (Fig. 2).—The dorsal plate is entire with 34 pairs of setae. On the dorsal plate near the anterior-lateral margin is one pair of short setae and on the posterior lateral margin two pairs of short setae. A heavy sclerotized area is present on the posterior margin of the dorsal plate.

Legs.—Legs short and stout. All setae on legs spinelike. Femur and genu have two or three unusually long, stout, dorsal setae. Coxae I and II are each provided with a stout rounded spur and a seta. Spur on coxae I 13μ wide and 15μ long; spur on coxae II 11μ wide and 9μ long. Coxae III each with two setae and coxae IV each with a simple seta. Chaetotaxy of ventral side of legs as figured. Claws well developed.

Gnathosoma (Fig. 3).—Palps 5-segmented, 200μ long from base of fused coxae to tip; hypostome extends to the posterior margin of palp tibia. Three pairs of setae on hypostome as figured. Deutosternal teeth 11 in number, arranged consecutively along deutosternum.



Ixodorhynchus gordoni, n. sp., female: Fig. 1, venter; fig. 2, dorsum; fig. 3, gnathosoma; fig. 4, chela; fig. 5, tritosternum; fig. 6, chelicera.

Tritosternum (Fig. 5).—Tritosternum with two lacinae densely pilose, 122μ long. The lacinae rising separately from the basal segment. Chelicerae chelate (Fig. 4); movable finger has three teeth and the immovable finger greatly reduced. Chelicerae (Fig. 6) 137μ long and 30μ wide.

Male.—Unknown; Nymphs unknown.

Host.—*Natrix tigrina lateralis* (Berthold). (Snake).

Location.—Seoul, Korea, May 15, 1953.

Material.—Four female specimens. The holotype female and one paratype female deposited in the U. S. National Museum. One paratype female deposited in the collection of Dr. R. W. Strandtmann, Texas Technological College, and one paratype retained in the author's collection.

Remarks—The four specimens were found near the head, under the lateral scales of the host. This mite differs from other *Ixodorhynchus* in that the genital setae are not located on the genito-ventral plate, and the immovable chela is greatly reduced but not absent. Also the sternal plate is much more drastically reduced than in any other species. One of the paratype females contained a hexapod larva measuring 380μ by 265μ.

This mite has been named after Mr. W. E. Gordon of Moab, Utah, who has accompanied the senior author on many collecting trips.

KEY TO THE FEMALES OF THE SPECIES IN THE FAMILY IXODORHYNCHIDAE

1. Sternal plate with 3 pairs of setae 2
   Sternal plate with 1 or 2 pairs of setae 5
2. Coxae I and II with heavy spur 3
   Coxa II only, with a heavy spur ..... *butantanesis* (Fonseca)
3. Genito-ventral plate with 1 pair of setae 4
   Genito ventral plate with 2 pairs of setae; immovable chela with a single tooth ..... *distinctus* (Ewing)
4. Chela with only 1 arm ..... *liponyssoides* Ewing
   Chela with 2 arms, shearlike; immovable arm with 2 teeth ..... *americanus* (Ewing)
5. Sternal plate with 2 pairs of setae 6
   Sternal plate with 1 pair of setae 7
6. Dorsal plate entire ..... *imphalensis* (Radford)
   Dorsal plate partially divided ..... *piger* (Berlese)
7. Coxa I with a heavy spur and a spinelike seta ..... *tanneri* (Tibbetts)
   Coxa I with a heavy spur and normal setae 8
8. Genito-ventral plate with genital setae ..... *farrieri* (Tibbetts)
   Genito-ventral plate without genital setae ..... *gordoni* Tibbetts, n. sp.

Biology and Distribution.—So far as is now known, these mites are found in association with snakes only. They are never abundant, although Tibbetts (unpublished observation) found about a dozen specimens on a snake in Korea. With one exception, *piger*, all species have been found under the lateral or ventral scales of snakes on or near the head region. The species *liponyssoides* was reported as taken "from the eye of a snake" but presumably that meant from the scales

around the eye. The exception above noted (*piger*), was found in the hole or den of a snake along with large numbers of *Ophionyssus natricis*. Unlike *O. natricis*, the Ixodorhynchids are rare on captive snakes. All species reported to date have been taken from wild reptiles.

Although not common, they are widely distributed, having been reported from every major continent except Australia. From Europe is *piger*, collected in Florence, Italy; *butantensis* was found in Brazil, in the States of Sao Paulo, Matto Grosso, Goyas, and Minas Geraes; *imphalensis* comes from Manipur State in India; the United States has three records, *liponyssoides* from Iowa, *americanus* from the southern tip of Texas, and *distinctus* from Kentucky; and three species, *farrieri*, *tanneri*, and *gordoni*, are reported from Korea.

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CORRECTION

Wheeler, G. C., and Wheeler, Jeanette. The larva of Simopelta (Hymenoptera: Formicidae). Volume 59, No. 4, pp. 191-194. October, 1957.

In the second paragraph, p. 191, lines 4 to 9 should read as follows: . . . Wirth has written us that "the complete series of abdominal spiracles and the lack of a posterior differentiated pair of spiracles indicate that they are not dipterous. I know of no Diptera higher than the Fungivoridae-Itonididae series which have a complete series of abdominal spiracles. Traces of the usual pair of apical spiracles are practically always to be found in the higher Diptera."[1]

A NEW SPECIES OF THE GENUS PTEROMICRA ASSOCIATED WITH SNAILS

(DIPTERA, SCIOMYZIDAE)

GEORGE C. STEYSKAL, *Grosse Ile, Michigan*

Since the publication of my revision of *Pteromicra* (Steyskal, 1954) and later notes (Steyskal, 1956), the new species described below has come to hand as well as a few bits of data on other species of *Pteromicra*.

Pteromicra perissa Steyskal, new species

(FIGURES 1-3)

Male.—Length of wing, 3.4 mm.

Head and antennae brownish, cheeks and palpi yellowish. Arista brownish with short brownish hairs. Fronto-orbital bristles two, the anterior one slightly smaller than the posterior.

Thorax brownish, most areas apparently slightly grayish pruinose; pteropleura with three bristly hairs.

Legs with coxae whitish, fore coxae with two exterior bristles; fore femora wholly blackish, lacking pecten, but with many coarse bristly hairs; middle and hind femora yellowish basally, brown apically, the hind pair with one strong dorsal bristle at apical third; fore tibiae blackish, others dark brown to blackish; fore tarsi with first and most of second segment whitish, third and fourth segments blackish, fifth segment whitish; middle and hind tarsi whitish basally, brownish apically.

Wings uniformly pale brownish, with brown veins. Halteres and squamae whitish.

Abdomen brownish, andrium yellowish brown. Terminalia as figured; no spiracles discernible; sixth and seventh sternites moderately narrow; sixth tergite represented by a very slender sclerotized strip; posterior surstylus hook-shaped, directed posteriorly at base and turning meso-anterad, clothed with many strong posteriorly-directed hairs; anterior surstylus well developed, apically acute, with notch and strong tooth on posterior margin.

Holotype.—Male, Buffalo Peaks Area, Chaffee and Parks Counties, Colorado, summer, 1955, associated with land snails, predominantly *Pupilla* (Richard Pillmore), in University of Colorado Museum. The single specimen was removed from alcohol and the terminalia macerated in NaOH; color and pruinosity characters were therefore difficult to ascertain surely.

Remarks.—This species belongs in the group lacking fore femoral pecten, including *Pteromicra anopla* and *P. inermis*, from which species it may be distinguished by wholly blackish fore femora, basally pale fore tarsi, yellowish palpi, and distinctive terminalia. According to Clifford Berg's summary of the snail-feeding habits of the Sciomyzidae (Berg, 1953), this is the first time a fly of the family has been associated with snails of the genus *Pupilla*.

Pteromicra pectorosa (Hendel)

A third American specimen, a male from Mecosta County, Michigan, May 15, 1951 (R. R. Dreisbach), has been examined recently. The species is therefore apparently widespread but rare in North America,

being known also from Churchill, Manitoba, and the extreme northwestern corner of California.

Pteromicra similis Steyskal

In the specimens examined when drawing up the description of *P. similis*, no sixth tergite could be discerned; however, a specimen from Midland, Michigan, has a narrow but distinct sixth tergite. Also in disagreement with my description, the eyes of specimens collected by myself and Stuart Neff on Ile Perrot, Quebec, August 23, 1956, were plain olive-green, although the specimens otherwise were typical.

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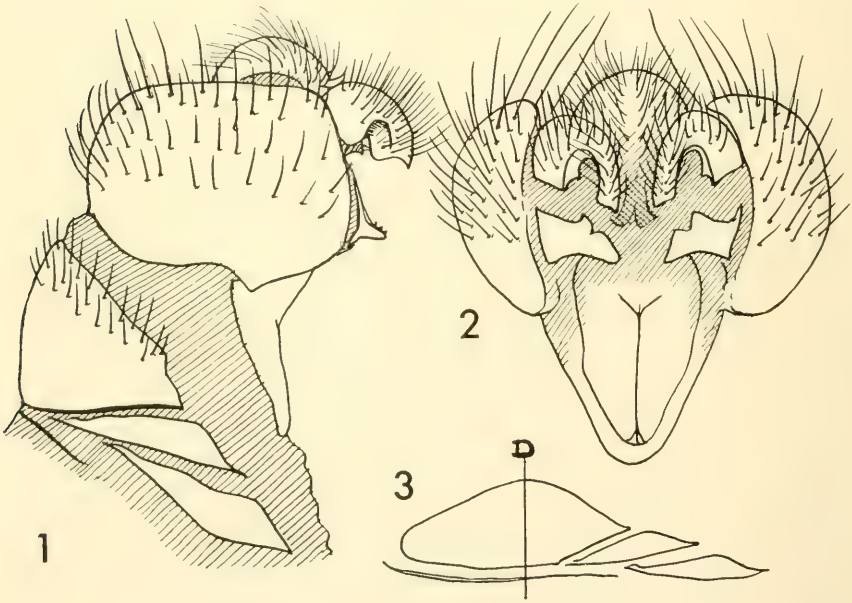

Pteromicra perissa, new species: Fig. 1, sinistral profile of male terminalia; fig. 2, ventral view of same; fig. 3, diagram of protandrium as if split along mid-ventral line and laid flat, D—mid-dorsal line.

A NEW BRUCHOPHAGUS FROM A LILIACEOUS PLANT WITH A HOST PLANT LIST FOR THE GENUS

(HYMENOPTERA, EURYTOMIDAE)

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The genus *Bruchophagus* Ashmead was originally described without included species (1888, Ent. Amer. 4 : 42). Six years later Ashmead (1894, Trans. Amer. Ent. Soc. 21 : 328) referred three species to it. Two of these, *borealis* Ashmead and *mexicanus* Ashmead, were said to have been bred from *Bruchus* and the third, *funebris* (Howard), from the clover-seed midge. Shortly thereafter Hopkins (1896, U. S. Dept. Agr., Div. Ent. Bul. 6(n.s.), p. 73) studied *funebris* carefully and showed that it was not a parasite of the clover-seed midge, as stated by Howard when he described it, but developed by feeding in the clover seeds themselves.

Ashmead was unwilling to accept the judgment of either Howard or Hopkins about the host relationships of *funebris*. His final remarks on the subject (1904, Mem. Carnegie Mus. 1 : 260) were that he thought "that both Drs. Howard and Hopkins are wrong and that *Bruchophagus funebris* is a parasite upon some *Bruchus*, or the larva of a small rhynchophorus beetle living in the clover seed." The same year Titus (1904, U. S. Dept. Agr., Div. Ent. Bul. 44, pp. 77-80) published his observations on the life history and habits of *funebris*, and these left no doubt that it was a phytophagous species. He concluded that "the clover-seed chalcis-fly, if ever a coleopterous parasite, has changed its diet." Since that time no one has seriously questioned the fact that this species is phytophagous, and it has been reared from the seeds of a large number of different leguminous plants.

During the 53 years since 1904, additional species of *Bruchophagus* have been described from the seeds of leguminous plants, so that now there are 15 species which are known to develop in leguminous seeds. Also, rearings have shown that *B. mexicanus*, thought by Ashmead to be parasitic on species of *Bruchus*, actually develops in the seeds of *Astragalus*, another legume. The generic name *Bruchophagus* (despite its unfortunate derivation) has thus come to be associated by entomologists with the phytophagous habit in the seeds of legumes.

In 1952, however, Nikolskaja (Fauna U. S. S. R. 44, p. 174) described a species of *Bruchophagus* which infests the seeds of a *Primula*, in the Primulaceae. The present paper describes a species from the seeds of *Aloe*, in the Liliaceae, and further extends the range of plant families known to be attacked by members of the genus *Bruchophagus*. A host-plant list for the species of *Bruchophagus* is given at the end of this paper.

Bruchophagus aloineae, new species

Female.—Length 1.2-2.0 mm. Head and body black, anterior face of pronotum with a white spot on either side; antennae black; wings hyaline with tan or yellow venation; legs black or very dark brown with inner surface of fore tibia,

apices of all femora, bases and apices of tibiae, and basal 4 segments of each tarsus tan. Setae of head, body, and appendages silvery, inconspicuous.

Head, fig. 1, with a very vaguely defined transverse depression extending across frons just dorsal to level of ventral margins of compound eyes, area below this depression with strong striae converging toward mouth opening, dorsad of this depression the surface area of fronto-vertex with umbilicate punctation; malar furrow wanting; width of malar space two-thirds as great as height of compound eye; length of ocellar line one-third as great as postocellar line; antenna, fig. 2, with scape three times as long as pedicel, first funicle segment one-fourth longer than pedicel, second to fifth funicle segments equal in length and each as long as pedicel, club three and one-half times as long as fifth funicle segment.

Dorsal surface of pronotum, mesoscutum, and mesoscutellum with umbilicate punctation made up of well-marked, closely set, shallow pits, interstices between punctures narrow—always much less than width of punctures themselves—and almost or quite smooth; anterior face of fore coxa smooth, a broad groove extending from inner apical angle to outer basal angle; depression on anterior face of mesepisternum, into which the anterior coxa fits when at rest, with its surface closely shagreened, lateral margin carinate; prepectus relatively narrow, usually with a large, triangular pit anteriorly, this pit occasionally divided by a septum; tegula inflated, its dorsal surface very obscurely sculptured; submarginal vein of forewing five times as long as marginal vein; stigmal, postmarginal, and marginal veins equal in length; dorsal area of mesepimeron posterior to femoral furrow with numerous, closely set, longitudinal ridges, these sometimes rather irregular, but usually almost or quite parallel; outer, dorsal surface of hind coxa shagreened.

Propodeum with its surface flat and lying at a 90° angle with longitudinal axis of thorax; median area of propodeum uniformly shagreened, laterally and dorsally coarsely rugulose. Petiole as broad as long. Gaster one and one-fourth times as long as thorax; basal four gastral tergites subequal in length dorsally when gaster is in normal position; fifth gastral tergite usually completely retracted beneath fourth, sixth gastral tergite half as long as third; gastral tergites one to four smooth and asetose, fifth setose ventrally, sixth and epipygium densely setose; ovipositor sheaths directed obliquely dorsad, their apices normally exserted for a distance equal to length of sixth tergite.

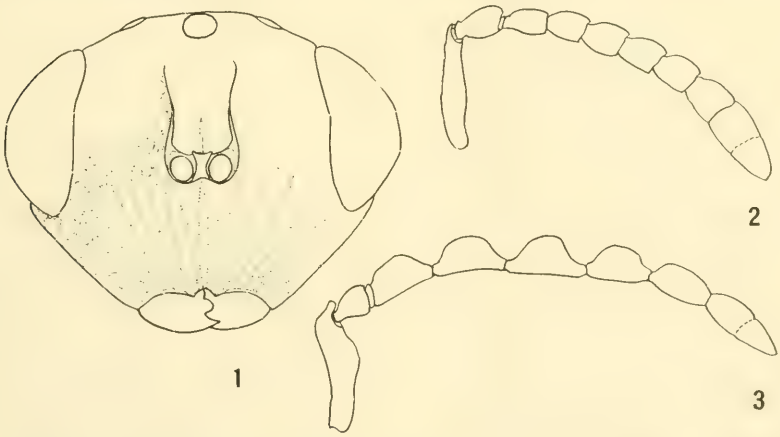
Male.—Length 1.1-2.0 mm. Apical two-thirds of fore femur, entire fore tibia, and apical third of mid femur tan. Antenna, fig. 3, with scape enlarged and three and one-half times as long as pedicel, first and second funicle segments equal in length and each twice as long as pedicel, third and fourth funicle segments equal in length and each half as long as scape, fifth segment seven-eighths as long as fourth, club three-fourths as long as scape. Petiole three times as long as wide. Gaster one-half to two-thirds as long as thorax.

Type locality.—Port Elizabeth, South Africa.

Types.—U. S. N. M. No. 63412.

Described from 21 female and 18 male specimens, all intercepted in quarantine at Washington, D. C. The specimens were taken from sealed packages of seeds being shipped into the United States for propagation purposes; the dates given are those of the interceptions. Female holotype, male allotype, and 1 male paratype, Port Elizabeth,

S. Africa, Oct. 24, 1934, with seeds of *Aloe ferox*, B. P. Q. No. 030955; 8 female and 7 male paratypes, same data, but with seeds of *Aloe lineata*, B. P. Q. No. 030956; 2 female and 1 male paratypes, same data, but with seeds of *Aloe africana*, B. P. Q. No. 030953; 1 female and 2 male paratypes, Kimberley, S. Africa, Nov. 27, 1934, with seeds of *Aloe globuligemma*, B. P. Q. No. 032536; 1 female paratype, S. Africa, Jan. 10, 1936, reared from seeds of *Aloe* (*Haworthia*) *ferox*, E. Q. Washington No. A33710; 1 female paratype, S. Africa, June 4, 1935, with seeds of *Aloe globuligemma*, B. P. Q. Washington No. 036379; 4 female and 1 male paratypes, Germany, Nov. 6, 1934, in *Aloe* sp. seeds, B. P. Q. No. A28173; 3 female paratypes, Germany, Oct. 8, 1934, with seeds of *Aloe variegata*, P. Q. No. A27779; 3 male paratypes, Potsdam, Germany, May 8, 1933, with seeds of *Aloe variegata*, B. P. Q. No. A22270.



Bruchophagus aloineae, n. sp.: Fig. 1, Anterior aspect of head of female; fig. 2, antenna of female; fig. 3, antenna of male.

In addition there are more or less fragmentary specimens of this species, not included in the type series, in the U. S. N. M. collection from the following localities and hosts: Port Elizabeth, S. Africa, seeds of *Aloe striata*, *Aloe* (*Haworthia*) *ferox*, *Aloe africana*, *Aloe microstigma*, and *Aloe lineata*; Ethiopia, seeds of *Aloe* sp.; Germany, seeds of *Aloe variegata* and *Aloe* sp.

Bruchophagus aloineae differs from *B. gibbus* (Boheman) in having the dorsal pronotal punctures uniformly close together, with narrow, unsculptured interstices; in *gibbus* these punctures are rather haphazardly arranged, with some of the interstices as wide as the punctures themselves, and the surfaces of the interstices are shagreened. *B. aloineae* differs from *B. mexicanus* Ashmead in possessing strong striae on the lower face; this area is umbilicately punctate in *mexicanus*. The black antennal scape and mostly black anterior and mid legs of the female of *aloineae* distinguish it from *B. borealis*

Ashmead, as the antennal scape and two anterior pairs of legs in *borealis* are almost entirely yellow.

Host-plant list for Bruchophagus

The following list has been compiled from data associated with identified specimens of *Bruchophagus* in the collection of the U. S. National Museum and from the literature reference files maintained there by the Insect Identification and Parasite Introduction Laboratories, U. S. Department of Agriculture. The plant names were kindly checked by Dr. Velva E. Rudd, Division of Botany, U. S. National Museum.

LEGUMINOSAE	Species of Bruchophagus
Astragalus macronyx	*macronycis* Fedoseeva
Astragalus mollissimus, loco weed	*mexicanus* Ashmead
Astragalus sp.	*gibbus* (Boheman)
	astragali Fedoseeva[1]
Cajanus cajan, pigeon pea	*mellipes* Gahan
Caragana arborescens, pea tree	*caraganae* (Nikolskaja)
Caragana frutescens	*caraganae* (Nikolskaja)
Caragana pygmaea	*caraganae* (Nikolskaja)
Colutea arborescens, bladder senna	*coluteae* (Bouček)
Colutea media	*coluteae* Fedoseeva[2]
Glycyrrhiza glabra, licorice	*glycyrrhizae* Nikolskaja
Hedysarum sibiricum	*hedysari* Fedoseeva
Indigofera sp., indigo	*indigoferae* (Risbec)
Lespedeza sp., bush clover	*gibbus* (Boheman)
Lotus corniculatus, birds-foot trefoil	*gibbus* (Boheman)
	kolobovae Fedoseeva
Lotus decumbens	*gibbus* (Boheman)
Medicago arabica, spotted bur clover	*gibbus* (Boheman)
Medicago falcata	*gibbus* (Boheman)
Medicago hispida, toothed bur clover	*gibbus* (Boheman)
Medicago ruthemia	*gibbus* (Boheman)
Medicago sativa, alfalfa	*gibbus* (Boheman)
	roddi Gussakovsky
Medicago tornata	*gibbus* (Boheman)
Medicago tuberculata	*gibbus* (Boheman)
Medicago tunetana	*gibbus* (Boheman)
Melilotus sp., sweetclover	*gibbus* (Boheman)
Onobrychis caputgalli	*onobrychidis* (Nikolskaja)
Onobrychis viciaefolia (= *sativa*), Sainfoin	*onobrychidis* (Nikolskaja)
Ononis sp., rest harrow	*ononis* (Mayr)
Oxytropis lambertii, loco weed	*gibbus* (Boheman)

[1]I am indebted to Dr. O. Peck, Canadian Department of Agriculture, for the reference to the original description of this species—Fedoseeva, 1954, Vestnik, Moscow Univ., 9, No. 5, p. 115.

[2]This species is a homonym, and probably also a synonym, of *B. coluteae* (Bouček).

Sesbania sesban	*mellipes* Gahan
Sesbania grandiflora	*mellipes* Gahan
Smirnovia turkestana	*smirnoviae* Nikolskaja
Sophora japonica, Japanese pagoda tree	*sophorae* Crosby
Trifolium incarnatum, crimson clover	*gibbus* (Boheman)
Trifolium pratense, red clover	*gibbus* (Boheman)
Trigonella sp.	*gibbus* (Boheman)
PRIMULACEAE	
Primula sp., primrose	*mutabilis* Nikolskaja
LILIACEAE	
Aloe africana	*aloineae* Burks
Aloe ferox	*aloineae* Burks
Aloe globuligemma	*aloineae* Burks
Aloe lineata	*aloineae* Burks
Aloe microstigma	*aloineae* Burks
Aloe striata	*aloineae* Burks
Aloe variegata	*aloineae* Burks

A total of 32 species have been referred to the genus *Bruchophagus.* In addition to those listed above as phytophagous, the following species have been reared from cynipid galls: *B. cynipseus* (Boheman), *jaceae* (Mayr), *phanacidis* (Mayr), *setigerus* (Mayr), and *timaspidis* (Mayr). There are six species of unknown habits: *B. cylindricus* (Thomson), *inconspicuus* Girault, *maurus* (Boheman), *niger* Girault, *noctua* Girault, and *sculpta* (Ashmead). Three others still are said to parasitize Bruchidae: *B. borealis* Ashmead, *bruchocida* (Risbec), and *sayeli* (Risbec).

Bruchophagus sativae Ashmead, Tschorbadjiev (1936, Mitt. Bulgar. Ent. Ges. 9: 169) evidently is a *nomen nudum.* Although this author credits the specific name to Ashmead, there is no record that Ashmead described such a species. If *sativae* were taken to have been validated by the very meager information given by Tschorbadjiev, the name should be attributed to him.

Eurytoma acaciae Cameron (1910, The Ent. 43: 114) [not *E. acaciae* Girault, 1914 nor *E. acaciae* Risbec, 1951], reared from the seeds of *Acacia decurrens* in New Zealand, possibly is a *Bruchophagus.* I have been unable to locate the type.

A NOTE ON TWO CHRYSOMELID BEETLES
(COLEOPTERA)

A species of chrysomelid beetle, *Ophraea arizonica* Fall, hitherto not represented in the collection of the United States National Museum, has recently been added in the shape of 25 specimens collected by Jack M. Kaiser on the leaves of *Beloperone* sp. at Peña Blanca, Arizona (near Tucson). Fall (Trans. Amer. Ent. Soc., 36, 1910, p. 147) described this apparently rare beetle from one specimen sent him by F. H. Snow from the Santa Rita Mountains, Arizona.

D. M. Weisman has recently collected a new species of *Disonycha* in Harnett County, North Carolina. The host plant is unknown as the beetle was taken by sweeping.

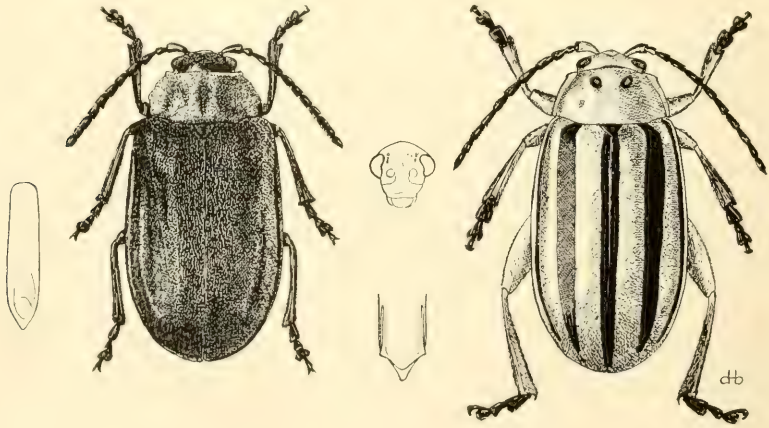
Disonycha weismani n. sp.

About 7.5 mm. in length, oblong oval, feebly shining, alutaceous, very finely and indistinctly punctate, pale yellow with dark antennae and tarsal joints and two small spots anteriorly on the prothorax and moderately wide dark sutural, median and lateral vittae not joined at the apex of the elytra.

Head with interocular space more than half its width, with occiput having a few punctures besides the large fovea near eye, the interantennal area wide and bulging forward in a broadly rounded carina; pale with a very narrow darkening over occiput at edge of prothorax. Antennae with the two basal joints pale edged, remainder dark. Prothorax approximately twice as wide as long with rounded sides, not very convex; faintly shining, alutaceous, very finely punctate; pale yellow with two small spots anteriorly. Scutellum dark. Elytra alutaceous, faintly punctate and somewhat shiny; pale yellow with moderately wide sutural, median and lateral vittae, none joined at the apex. Body beneath entirely pale. Legs pale with the tarsal joints dark. Length 7.7 mm.; width 3.6 mm.

Type.—Male, U.S.N.M. Type No. 63507, collected by Donald M. Weisman, in sweeping at Spout Springs, Harnett Co., North Carolina, on Aug. 30, 1952.

Remarks.—This species has the same coloration as *D. caroliniana* (Fab.) and *D. latifrons* Schaeffer, but differs from either in the head the aedeagus, which is unlike that of any other *Disonycha*.—DORIS H. BLAKE.



Ophraea arizonica Fall Disonycha weismani n.sp.

ON SOME MICROTINE-INFESTING POLYPLAX
(ANOPLURA)

By JOHN E. SCANLON[1] and PHYLLIS T. JOHNSON[2]

For some years the relationship of *Polyplax borealis* Ferris, 1933, (from *Clethrionomys rufocanus*, Finmark, Norway) to *P. alaskensis* Ewing, 1927, (from *Microtus* sp., Alaska) has been in doubt. The original description of *P. alaskensis* contains no figures and is vague in many details. Ferris noted in his original description of *borealis* that this name might prove to be synonymous with *alaskensis* Ewing, since he had not seen specimens of *alaskensis* and could not be sure of his interpretation of the latter. Ewing (1935) synonymized *borealis* Ferris under *alaskensis* Ewing, without seeing specimens of *borealis*. Quay (1949) published a redescription and figures of *alaskensis* from *Microtus operarius*, Seward Peninsula, Alaska, but did not mention *borealis*. Finally, in 1951, Brinck published a note asserting that *borealis* is a valid name, basing his conclusions on a comparison of Quay's drawings and description of *alaskensis* and Ferris' original description and figures of *borealis*.

A re-examination of *P. alaskensis* holotype proves Brinck to be correct, and further shows that *Polyplax abscisa* Fahrenholz, 1938, (from California off "*Arvicola*," which according to Ferris (1951) probably means *Microtus*), is a synonym of *P. alaskensis* **(new synonymy)**. Dr. G. F. Ferris of Stanford University has kindly compared specimens of *borealis* from Alaska and Labrador with his paratype male of *borealis* and also has compared the holotype of *alaskensis* with *borealis* and California "*abscisa*," coming to the same conclusion. Specimens of *Polyplax* from California *Microtus* agree with Fahrenholz's original description and figures of *abscisa* as well as with holotypic *alaskensis*. A figure of *alaskensis* holotype is included in this paper (fig. 3).

P. alaskensis is easily separated from *borealis* in the male by the shape of the pseudopenis (fig. 8), which is strongly curved apically and relatively much narrower than it is in *borealis* (fig. 7). Both sexes of *borealis* have an arcuate first abdominal sternum (figs. 9, 10), and the third abdominal sternite is triangulate, more than half as high (in the longitudinal axis of the body) as it is broad (in the transverse axis of the body). *P. alaskensis* (fig. 11) may have the first sternite weakly arcuate, but usually not approaching the condition found in *borealis* and the third sternite is less than half as high as broad and not markedly triangulate. There are small discrepancies between Quay's redescription of *alaskensis* and the actual form of the holotype, although the lone specimen from his series we examined agrees well with the holotype. This single male, from *Microtus*

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[2]Entomology Research Division, Agricultural Research Service, U. S. Department of Agriculture.

operarius, does not have the first sternite as strongly arcuate as he draws and describes it. He also states that the first sternite of the female is broader than the second and concave posteriorly, but his figure does not show this to be the case. The thoracic sternal plate in *alaskensis* is normally quite broad anteriorly and with the sides angled and subsequently slightly concave to the apex, as in figure 6, whereas *borealis* has the sides almost evenly convex to the apex (figs. 4, 5). In other respects *alaskensis* and *borealis* are very similar morphologically. Brinck (1951) mentions that in *borealis* the paratergal plates (fig. 2) are not as markedly toothed as in *alaskensis,* but this character is quite variable.

Both sexes of *alaskensis* and *borealis* may be separated from the very similar *P. spinulosa* (Burmeister) by the shape of the paratergites 3-5. In *alaskensis* and *borealis* both dorsal and ventral apical lobes are acute, while in *spinulosa* the ventral apical lobes of these paratergites are rounded. Ewing (1935) used this character to separate *alaskensis* from *spinulosa.*

Since Ferris' (1951) publication "The Sucking Lice" will be the standard reference on Anoplura for many years to come, we append here a revision of couplets 21 and 22, page 205, of the key to *Polyplax* species. It should be noted that as Ferris' key now reads, *borealis* will key to *alaskensis* and *alaskensis* will key to *abscisa.*

21(20) First abdominal sternite strongly arcuate and with its lateral angles somewhat prolonged; third abdominal sternite more than half as high (in longitudinal axis of body) as broad (in transverse axis ofbody); occurring on *Clethrionomys* and *Phenacomys* ..... **BOREALIS**

First abdominal sternite in both sexes not thus, its posterior margin almost straight and the lateral angles not produced; third abdominal sternite considerably less than half as high as broad 22

22(21) In both sexes, paratergal plates 3–5 with only the dorsal apical angle produced into a point; dorsal lobe of the pseudopenis very short, scarcely one-fourth the length of the ventral lobe; parameres well developed, extending forward between the posterior arms of the basal plate; occurring especially on species of *Rattus* throughout the world ..... **SPINULOSA**

In both sexes, paratergal plates 3–5 with both apical angles produced into points; parameres quite weakly developed and extending forward only slightly past the apex of the arms of the basal plate; normally occurring on species of *Microtus* ..... **ALASKENSIS**

The normal hosts of *Polyplax alaskensis* are members of the genus *Microtus.* Specimens have been examined as follows: Alaska (Golovin, Takotna and the Seward Peninsula, and the holotype) from *Microtus* sp. and *M. operarius*; Oregon from *M. montanus*; California from *M. californicus sanctidiegi*; Virginia, Pennsylvania, Delaware, New York, Massachusetts and Maine from *Microtus pennsylvanicus*; Massachusetts from *M. breweri* (this species of *Microtus* is found only on Muskeget Isl.); Canada, "from an island in the St. Lawrence

River'' from *M. pennsylvanicus* and at Toronto, Ontario from ''meadow mouse.'' Ferris (1951) also reported *alaskensis* (as *abscisa*) from Nevada. Scanlon (1954) reported *alaskensis* (as *abscisa*) from *Microtus montebelli*, Mt. Fuji, Japan. A re-examination of some of Sasa's material from *Microtus montebelli*, Mt. Fuji, reported as *Polyplax spinulosa* (Burmeister) (Sasa, 1950) establishes that these specimens are *alaskensis*, not *spinulosa*. One female with the sides of the thoracic sternal plate somewhat less angled than is usually the case, from a species of *Synaptomys* (bog lemming, tribe Lemmini), Norway House, Northwest Territories, Canada, is also here referred to *alaskensis*.[3]

P. borealis has as its normal hosts species of *Clethrionomys* and *Phenacomys*. Its distribution is circumpolar, as is probably true of *alaskensis*, but *borealis* is more northern, although there is some overlapping. Specimens of *borealis* have been examined as follows: Alaska (Ladd Air Force Base) from *Clethrionomys rutilus dawsoni*; Canada, Northwest Territories, S. W. Keewatin from *Phenacomys* sp. and *Clethrionomys* sp., and Quebec and Labrador from *Clethrionomys* sp. Specimens from *Clethrionomys rufocanus* (the type host) from Korea, were reported as *alaskensis* by Scanlon (1955). The latter specimens and a Korean series from ''*Apodemus speciosus*'' differ slightly from the North American specimens in that the sternal plate of the thorax is somewhat broader anteriorly, but this series still fits well within the limits of *borealis*. ''*Apodemus speciosus*'' is probably a *lapsus* for a species of *Clethrionomys*.

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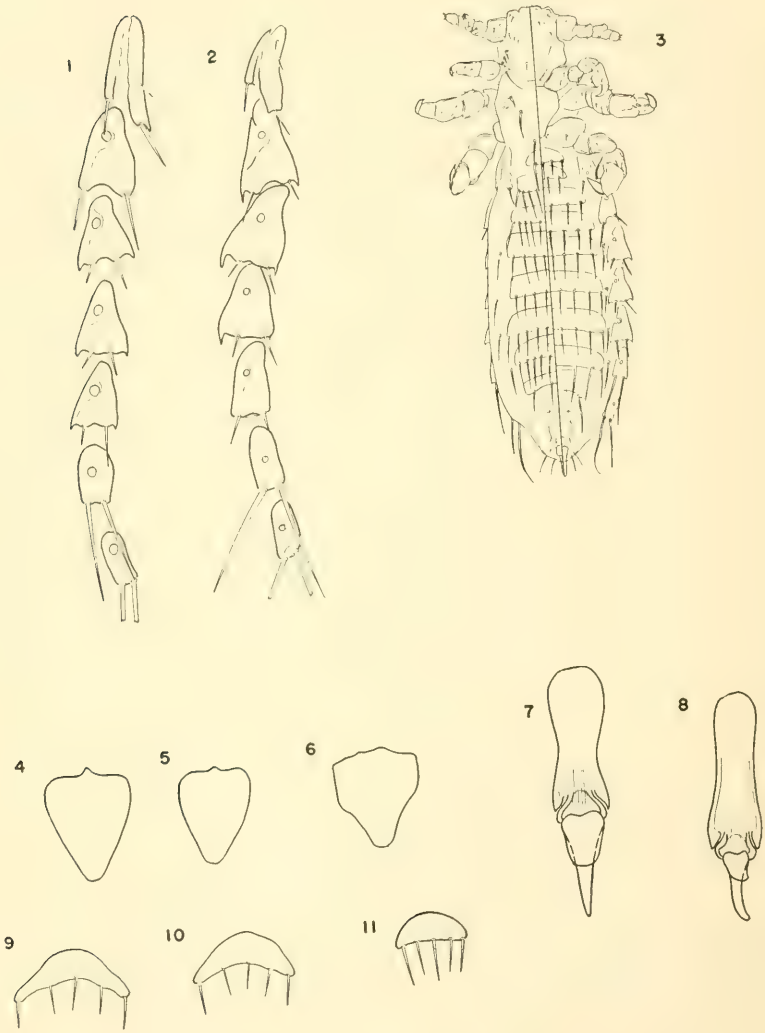

Fig. 1, *Polyplax alaskensis Ewing*, 1927: paratergal plates, holotype; fig. 2, *P. borealis* Ferris, 1933: paratergal plates, male (Ladd Air Force Base, Alaska); fig. 3, *P. alaskensis*: holotype; fig. 4, *P. borealis*: thoracic sternal plate, male (Ladd AFB); fig. 5, *P. borealis*: thoracic sternal plate, male (Lake Marymac, Quebec); fig. 6, *P. alaskensis*: thoracic sternal plate, holotype; fig. 7, *P. borealis*: aedagus (Lake Marymac); fig. 8, *P. alaskensis*: *aedeagus*, holotype; fig. 9, *P. borealis*: first abdominal sternite, male (Ladd AFB); fig. 10, *P. borealis*: first abdominal sternite, male (Lake Marymac); fig. 11, *P. alaskensis*: first abdominal sternite, holotype.

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OBSERVATIONS ON THE BIOLOGY AND LIFE HISTORY OF THE BROWN COCKROACH PERIPLANETA BRUNNEA BURMEISTER

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The brown cockroach, *Periplaneta brunnea* Burmeister, is a common species in the southern and southeastern United States, from the Carolinas to Florida and west to Texas. It has been found indoors as far north as Philadelphia and was collected by the writer in Columbus, Ohio. In some areas of the south it is more common than the American cockroach which it closely resembles.

This insect, typical of all roaches, is an obnoxious household pest. It has been collected in such places as army camps, outbuildings, city dumps, grocery stores, at lights, under bark, and in sewers.

Little is known about the biology of *P. brunnea* because only in recent years have entomologists become generally aware of the distinction between this species and the other three species of *Periplaneta* found in the United States. *P. brunnea* very closely resembles the American cockroach *Periplaneta americana* Linn., and there are some marked similarities and differences in biology.

The determination of *P. brunnea* was made through the courtesy of Dr. P. W. Oman and Dr. A. B. Gurney, of the Insect Identification and Parasite Introduction Laboratories, Entomology Research Division, United States Department of Agriculture. The writer is indebted to Dr. Ross Hutchins, of the Department of Zoology and Entomology, Mississippi State College, for the use of the controlled temperature equipment.

METHODS

Cultures of *P. brunnea* were started with adults and nymphs collected in March 1952, from the basement of the biology greenhouse on the campus of the Ohio State University. These cultures were transported by automobile to Mississippi State College where biological studies of *P. brunnea* were made from 1954 through 1956.

The cockroaches were reared in 1-gallon battery jars, the tops of which were covered with cheese cloth held in place by a rubber band.

Water was supplied by using a glass vial 1-inch in diameter and 2½ inches long. This vial was filled with water, plugged with cotton, and placed in a horizontal position on the floor of the jar. The cockroaches were fed a diet of commercial dog food, Purina Kibbled Meal, supplemented by wheat germ.

The life history studies were made at approximately 75° F., using controlled temperature cabinets. Examinations were made once daily at the same time each day, consequently, the durations given for stages and other periods are accurate to one calendar day.

Observations

The period between extrusion and deposition of the egg capsule by *P. brunnea* ranged from 20 to 24 hours, with an average time of 21 hours. The ootheca was glued to the substrate, generally near a food supply. When first deposited the egg capsule was light brown in color, changing within a few hours to dark brown. One hundred oothecae were removed from the cultures and measured; they varied in length from 1.2 to 1.6 mm. The number of eggs contained in an ootheca were found to range from 21 to 28, with an average of 24.

In ovipositing, the female roach secreted from her mouthparts a frothy white substance which she smeared over the spot on which she was going to deposit the egg capsule. Some females spent from 30 to 40 minutes preparing this frothy bed. The egg capsule was then deposited in the froth and covered with additional froth secreted by the female. Some cockroaches were observed spending as much as 2 hours coating the egg capsule after it was deposited. This substance hardened to become a very strong cementing material. It was so strong that it was difficult to pry the capsule loose without causing it to rupture. For several hours after a capsule was deposited the female rested with her body over the capsule and drove away any other roaches which approached.

Ten egg capsules were removed from the cultures just as they were deposited. These were placed singly in 1-pint jars in a controlled temperature cabinet, and incubated at approximately 75°F. Nymphal cockroaches emerged from 8 of the capsules, the developmental period in the capsule ranging from 61 to 63 days.

On October 23, 1955, 25 newly emerged nymphs of *P. brunnea* were placed together in a quart battery jar provisioned with food and water. These roaches were kept in a controlled temperature cabinet at 75°F. Daily examinations were made to determine the progress of development. The number of nymphal instars was not ascertained because the cockroaches consumed the cast exuviae. The first adult male completed development in 263 days, and the first female in 268 days. All of the nymphs had completed development by 277 days. Pope (1951) found that the nymphal period of *P. brunnea* varied from 110 to 327 days and that all stages were greatly influenced by temperature.

The newly emerged first-instar nymph of *P. brunnea* is dark brown in color, with yellowish legs and mouth parts. The first 8 and last 4 antennal segments are white, the median antennal segments are brown. A median translucent area allows light to pass completely through the mesothorax. Faint cream-colored spots occur on the dorso-lateral margins of the first and second abdominal segments. The body is 8 to 10 mm. in length. The first instar ranged from 16 to 21 days in length, with an average of 17 days.

The nymphal instars between the first and last instars generally resembled the last. During development there was an increase in size, and the appearance of larger and more distinct cream-colored spots on the dorso-lateral margins of the abdomen.

The last nymphal instar, just prior to completing development, was chestnut to dark-brown in color and 25 to 30 mm. in length. Distinct cream-colored spots occurred on the dorso-lateral margins of the second to sixth abdominal segments. The thorax was chestnut colored with posterior dark brown margins. The first 29 to 30 segments of the antenna were chestnut-colored, distal segments darker.

Copulation occurred within a few hours after the female of *P. brunnea* completed development. Egg deposition started in from 16 to 20 days after the adult female emerged and continued throughout life. A female was capable of forming and dropping an oothecae at 5- to 6-day intervals, but the time period between capsules was highly variable. Pope (1951) found that the maximum number of ovipositions was 30 but usually less. The maximum longevity of an adult roaches life was not determined, but some were kept for 20 months and were still living and reproducing. The adults of *P. brunnea* usually shunned light and were nocturnal in habit. They were capable of flight, which is generally of a gliding type. Cannabalism was common in captivity. Cockroaches that had been injured or weakened in some way are often eaten by others. Egg capsules after being deposited and left by the mother were often found and consumed by other cockroaches.

Discussion

The brown cockroach *P. brunnea* and the American cockroach *P. americana* are often confused because they frequent similar habitats and are very much alike in appearance. Both species as adults are reddish-brown in color and have yellowish markings on the pronotum. They can be readily distinguished by using the following information (Table 1):

a. The egg capsule of *P. brunnea* is nearly 50 per cent longer than the American cockroach. It is less rounded laterally and much darker in color. The brown roach glues the egg capsule more securely when it is deposited. Lawson (1951) in studying the egg capsule of *P. brunnea* found 22 to 28 eggs with an average of 24. The American roach has 16 eggs per ootheca.

b. The first stage nymph of *P. brunnea* has white antennae tips

and a translucent area through the mesothorax. The first stage nymph of *P. americana* has entirely dark antennae. The intermediate and last nymphal instars of the brown roach have cream-colored spots on the dorso-lateral margins of the second and sixth abdominal segments. The intermediate and last nymphal instar of the American roach have entirely brown abdomens.

e. Pratt (1955) states that adult brown and American cockroaches can be separated in both sexes by the shape of the cercus, a jointed appendage on each side of the tip of the abdomen. The cercus of the brown cockroach is stout, more evenly spindle-shaped, with the last segment somewhat triangular and less than twice as long as its basal width. The cercus of the American cockroach is stout basally and tapers markedly toward the tip, and the last segment is more or less parallel-sided and two or more times as long as its basal width.

Summary

The brown cockroach, *P. brunnea*, is a common noxious household pest in the southern United States, and closely resembles the American cockroach. The ootheca of *P. brunnea* contains an average of 24 eggs, and is deposited in frothy material secreted from the female's mouth parts. At 75°F. there is an egg-to-egg cycle of 339 to 351 days. Nymphs hatch from the ootheca 61 to 63 days after oviposition. The first male to complete development required 263 days and the first female, 268 days. Egg deposition starts 15 to 20 days after the females become adults.

Table 1. A comparison of the various life stages of *Periplaneta americana* Linn. and *Periplaneta brunnea* Burm.

Species	Avg. no. eggs per capsule	Incubation period (days)	Nymphal period (days)	Adult forms First ootheca (days)	Total egg-to-egg cycle (days)
P. brunnea	24	62-63	263-277	15-20	340-360
*P. americana**	16	42-63	98-200	10	150 .....

*Data taken from Piquett & Fales (1952).

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A NOTE ON THE OVIPOSITION BEHAVIOR OF SABETHES (SABETHOIDES) CHLOROPTERUS HUMBOLDT[1]

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The author has maintained a laboratory colony of the mosquito *Sabethes* (*Sabethoides*) *chloropterus* Humboldt for nearly 2 years and a paper discussing in detail the bionomics of this species under laboratory conditions is now in preparation. However, considering that published information on the egg-laying activities of members of the tribe Sabethini is very scant and in view of the unique oviposition behavior observed by the author in *S. chloropterus*, it was deemed of interest to publish these observations as the subject of a separate note.

Galindo, Carpenter, and Trapido (1951) found that *S. chloropterus* a forest mosquito, breeds primarily in a specialized type of tree-hole which possesses a large inner cavity and a relatively small opening and holds water continuously even during the dry season months. In attempting to simulate natural conditions in the laboratory colony, the author used as a receptacle for oviposition a well-ripened bamboo internode. The open top was fitted with a cover and a 1-inch hole drilled in the side near the top to give access to the central cavity, which was half-filled with water. Using this type of artificial tree-hole, large numbers of eggs have been obtained, making it possible to maintain a thriving colony. Statistical data on the number of eggs laid per female, time of oviposition, length of time spent in the egg stage, etc., will be presented in the bionomics paper in preparation. The present note will deal exclusively with a description of the manner in which the eggs are deposited.

The female, when ready to lay, approaches the bamboo in the characteristic slow flight peculiar to the genus and usually flies around it two or three times probing here and there until the entrance hole is found. Once this is accomplished, the female hovers outside and in front of the opening at a distance from it which varies from a few millimeters to as much as 5 centimeters, with the fore and hind tarsi almost locked together above the thorax and the mid-legs extended downward and outward. After hovering for a variable length of time, and while still in flight, the mosquito suddenly jerks the head and thorax back and thrusts the abdomen forward, forcibly ejecting at the same time 1 or 2 eggs which shoot through the entrance hole and into the water in the cavity. Almost in the same movement the female darts back rapidly a few centimeters and then resumes normal flight. The entire process takes place with incredible speed and is completed in but fractions of a second. A female which has just laid many come back immediately and go through the same motions for as many as

[1]This investigation was supported by the Research and Development Division, Office of the Surgeon General, Department of the Army, under Contract No. DA-49-007-MD-655.

18 consecutive times, or it may alight on the bamboo or some other surface nearby, only to resume egg-laying after a few minutes rest.

A number of experiments were performed in order to determine the force with which the eggs are ejected and the accuracy displayed by the female in shooting the eggs through the entrance and into the bamboo. In one set of experiments, a black leather disk smeared with castor oil was hung inside the bamboo directly in back of the entrance hole and at distances of 2, 4 and 6 centimeters from the outer surface of the container. At 2 centimeters, out of 25 eggs released by the female 24 were caught on the disk; at 4 centimeters, out of 40 eggs shot into the bamboo 18 were trapped in the castor oil, and at a distance of 6 centimeters 4 out of 28 eggs were trapped. From these experiments we may conclude that eggs are released with such force that they travel in a straight horizontal line from a minimum of 2½ cms. to a possible maximum of 10 cms. In a second series of experiments, bamboo internodes with smaller entrance holes having diameters of 10/16, 8/16, 6/16 and 4/16 inch, respectively, were tried as oviposition receptacles. It was found in these experiments that eggs are shot with unerring precision even through the smallest aperture tried, but here oviposition is somewhat inhibited perhaps due to failure of some females to detect the opening.

The process described above may possibly explain how oviposition takes place in the many sabethine species which possess eggs of the same type as *S. chloropterus* and whose immature stages are found in uncut bamboo internodes with small holes in the side drilled by boring insects. Examples of these species occuring in Panama are: *S. undosus*, *S. aurescens*, *S. intermedius*, *S. fabricii*, *Wyeomyia codiocampa*, and *W. hosautos*.

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Short scientific articles, not illustrated, two double-spaced typewritten pages or less in length, are welcome and will usually receive prompt publication. References to literature should be included in the text.

THE NORTH AND CENTRAL AMERICAN SPECIES OF PROPRISTOCERA

(HYMENOPTERA: BETHYLIDAE)

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The genus *Propristocera* was described by Kieffer (1905, *In* André, Species des Hyménoptères d'Europe, p. 247) to include 2 species from the Oriental region which differed from *Pseudisobrachium* in having glabrous eyes and simple, edentate mandibles. Later (1914, Das Tierreich, 41: 484-488) Kieffer expanded his concept of the genus to include certain other species which he had previously included in *Pristocera* and in *Pseudisobrachium;* these species possessed essentially "normal" 3- to 5-toothed mandibles. As thus defined, the genus included 9 known species, 3 Oriental, 2 Ethiopian (Seychelles), 1 Australian, and 3 Neotropical (including one Mexican). To the best of my knowledge, the genus has received no attention since 1914, and no Nearctic species have ever been assigned to it.

I have not seen specimens of the type species of *Propristocera, P. interrupta* Kieffer from Ceylon, or for that matter of any of the other species which Kieffer included in the genus. But there are several North and Central American species, all undescribed, which key to this genus in Kieffer's generic keys and agree well with his generic diagnosis of 1914. These species cannot be placed in any other genus, and for the present, at least, I see no reason for not assigning them to *Propristocera.* One of the species occurs in eastern United States and three others in Mexico and Central America.

Propristocera is a particularly interesting group because in many ways it links the other genera of Pristocerini. The resemblance to *Pseudisobrachium* is strong, but the eyes are weakly or not at all hairy and the genitalia are very different. The antennae, eyes, and genitalia are similar to *Pristocera,* and some species approach this genus in venation, but the claws are simple or have but a single weak tooth (as in *Pseudisobrachium*) and the structure of the clypeus is different. The complex aedoeagus of some species suggests *Dissomphalus,* and in fact the genitalia of one species, *tridentata,* are nearly identical with those of certain species of *Dissomphalus,* and the clypeus also resembles this genus. In fact *tridentata* (which I assign to *Propristocera* with somewhat more doubt than the other species) is virtually a *Dissomphalus* without the tergal pits and the transverse propodeal carina. In another species, *laevigata,* the spiracles of the first and second abdominal tergites are enlarged, suggesting the condition in *Dissomphalus,* with which the species otherwise has little in common. All in all, *Propristocera* is a nearly perfect mixture of the characters of these three genera.

This fact, combined with the fact that the species are very distinct and separable by many more characters than is usual in the Bethylidae, suggsts that the genus may be primitive and somewhat ancestral to the other Pristocerini. This seems to be supported by geographic

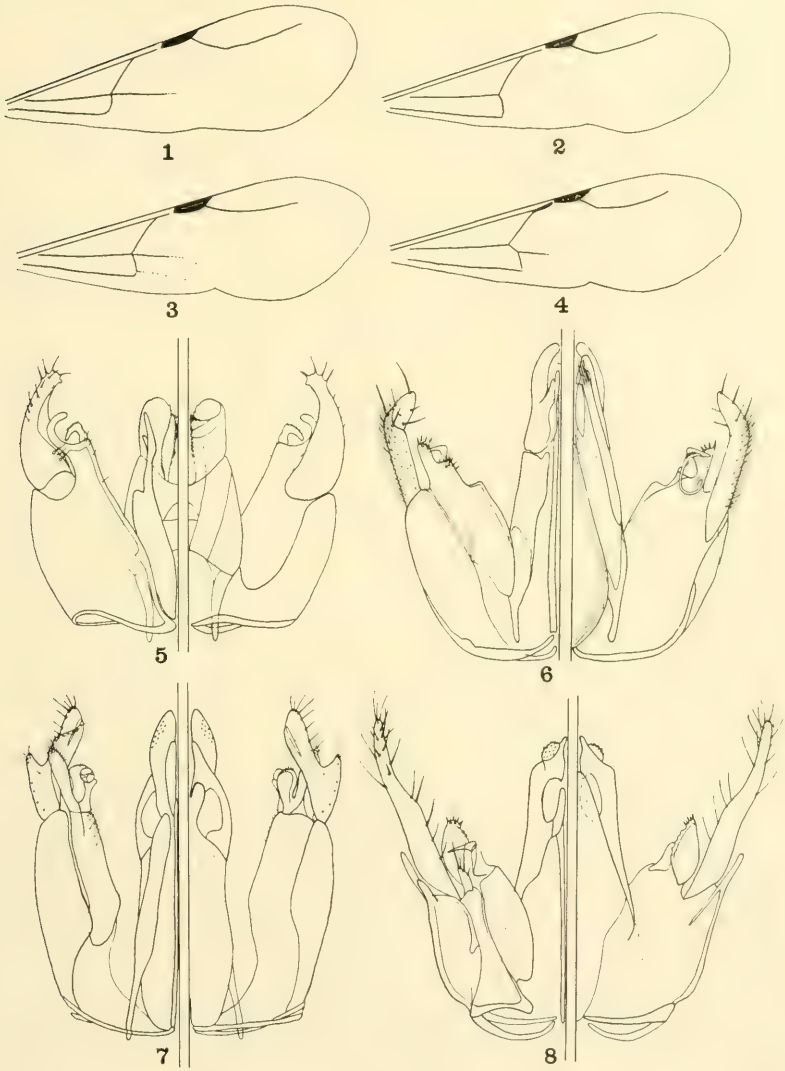
evidence, for the known species are widely and discontinuously scattered throughout the warmer parts of the globe. I would hesitate to say that *Propristocera* is more primitive than *Pristocera*, which is the most tiphiid-like of all the Bethylidae, but certainly it provides a likely ancestral stock for the more specialized genera *Dissomphalus* and *Pseudisobrachium*, tying these genera to a *Pristocera*-like bethylid prototype.

Unfortunately the females of *Propristocera* are completely unknown, and nothing whatever is known about the ethology of the genus. The only specimen I have ever collected was taken inside a window of my home. Other specimens have been taken at light (as the males of *Pseudisobrachium* and *Dissomphalus* commonly are). The type series of *angustata* was taken on *Ipomoea tiliacea* (a morning glory). Presumably the females are apterous and hypogaeic like other Pristocerini.

Generic characters (males)—Mandibles with from three to five teeth, in certain exotic species with a single apical tooth. Clypeus strongly developed, the apex rounded or subtruncate, sometimes weakly notched, sometimes dentate, but never with a strong median truncate lobe as in *Pseudisobrachium*. Antennae long, the outer antennal segments (9–11) at least 1.5 times as long as thick; segments of flagellum separated by constrictions and clothed with dense erect pubescence. Eyes bare or with very minute hairs (but in *tridentata* somewhat more evidently hairy). Ocelli of moderate size, forming an acute angle in front. Occipital carina distinct for its entire length, including dorsally. Mesonotum with well developed parapsidal furrows and notauli. Propodeum rather short, with well developed lateral carinae, with or without a median carina, and without a transverse carina bordering the declivity. None of the femora notably incrassate; claws simple or with a very weak tooth. Fore wing with the radial vein very long, much more than twice the length of the stigma; discoidal vein absent or present, the discoidal cell absent or incompletely formed (said to be complete in *oriplana*). Abdomen sessile or petiolate; second tergite without setigerous pits as in *Dissomphalus*, but the spiracles of the first two tergites somewhat enlarged in *laevigata*. Subgenital plate simple, truncate apically. Genitalia with the lateral elements rather widely separated from the complex aedoeagus; parameres of variable form but never deeply divided into two separate appendages; basis volsellaris without a plate along the mesal margin which bears radiating grooves; aedoeagus not strongly depressed, consisting of several closely consolidated elements.

Key to North and Central American Species

1. Basal vein ending almost in the distal end of the subcosta, close to the stigma; discoidal cell complete; length 5–6 mm ..... *oriplana* (Kieffer)
   Basal vein ending basad of the stigma by at least one third its length; discoidal cell incomplete or absent; length under 4 mm. 2
2. Clypeus tridentate apically; mandibles with four teeth; aedoeagus relatively short and broad, with well-developed ventral rami, fig. 5 ..... *tridentata*, new species
   Clypeus simple or with a weak median tooth; mandibles with five teeth; aedoeagus relatively more elongate and without distinct ventral rami 3



Figs. 1–4, fore wing of various species of *Propristocera;* fig. 1, *P. tridentata,* n. sp.; fig. 2, *P. polita,* n. sp.; fig. 3, *P. angustata,* n. sp.; fig. 4, *P. laevigata,* n. sp. Figs. 5–8, male genitalia, ventral aspect on left side, dorsal on right; fig. 5, *P. tridentata,* n. sp.; fig. 6, *P. polita,* n. sp.; fig. 7, *P. angustata,* n. sp.; fig. 8, *P. laevigata* n. sp.

3. Abdomen petiolate; spiracles of the first two abdominal segments enlarged; transverse median vein strongly oblique, the discoidal vein arising well down on it, fig. 4; parameres of genitalia very long and slender, fig. 8 ..... *laevigata*, new species

   Abdomen subsessile; spiracles of the first two abdominal segments not enlarged; discoidal vein either absent or interstitial or nearly so with the media 4

4. Front moderately shining, alutaceous; discoidal vein strong, fig. 3; genitalia with the parameres short, with a lateral process, fig. 7 ..... *angustata*, new species

   Front strongly shining, very weakly alutaceous; discoidal vein completely absent, fig. 2; parameres rather long, their apices deflected mesad, fig. 6 ..... *polita*, new species

Propristocera tridentata, new species
(Figs. 1, 5)

Holotype: ♂, Cordoba, Mexico, 21 May (A. Fenyes) [U. S. Natl. Mus.].

This minute but remarkable species has a tridentate clypeus as in many *Dissomphalus*, but the propodeum lacks a transverse carina and the second abdominal tergite is simple. The genitalia are very *Dissomphalus*-like, and remarkably similar to those of *D. barberi* Evans. The antennae agree with *Propristocera*, but the eyes are slightly hairy, so the species is assigned here somewhat tentatively. Perhaps it represents a stock of the genus from which *Dissomphalus* evolved.

Description.—Length about 2 mm. Body rich brown; legs wholly straw-yellow, the coxae somewhat suffused with brown; mandibles and clypeus mostly light brown; scape and pedicel straw-yellow, the remainder of the antenna medium brown. Wings hyaline, clothed with light brown hairs; veins and stigma brown. Head and thorax with numerous light brown hairs; eyes weakly hairy.

Mandibles with a strong apical tooth plus three smaller teeth in a row. Clypeus large, well developed in front of the antennal bases; apex with three small teeth, the median tooth a continuation of the strong median carina. Antennae slender but not exceptionally long; flagellum with dense erect setae which are half or more as long as the width of the flagellum, and with distinct constrictions between the segments; antennal segments 9–11 each about 1.8 times as long as thick. Middle interocular line .5 times the transfacial line, 1.15 times the eye-height; ocello-ocular line 2.5 times the postocellar line. Front, vertex, and temples weakly shining, alutaceous; punctures sparse and weak.

Pronotum smooth and rather flat. Mesonotum moderately shining, alutaceous, weakly punctate; parapsidal furrows weak but complete; notauli strong on the anterior two-thirds, absent behind. Propodeum with strong median and lateral carinae, more or less smooth and shining above, but with some reticulations arising from the median carina; spiracles large, circular, opening latero-dorsally. Fore wing, fig. 1, with the transverse median vein erect, nearly straight; discoidal vein unusually long, actually longer than the basal, interstitial with the media.

Abdomen short, smooth and shining, subsessile. Subgenital plate weakly arcuately emarginate apically. Genitalia, fig. 5, very broad and relatively short; parameres short, curved, apically with small knobs and strong setae; volsellae

with the digitus slender, curved, the cuspis short, serrate above; aedoeagus complex, with well-developed ventral rami, the dorsal body terminating in two large, complex lobes.

Propristocera laevigata, new species

(FIGS. 4, 8)

Holotype: ♂, Cordoba, Mexico, 21 May (A. Fenyes). *Paratype:* 1 ♂, same data but 13 May 1908 [both U. S. Natl. Mus.].

This is an elongate, pale, highly polished species which is immediately separable from all other species of *Propristocera* by the petiolate abdomen, the enlarged spiracles of the first two abdominal segments, the unusual venation, and the highly distinctive genitalia.

Description.—Length about 3.5 mm. Entire body light chestnut-brown, the ocellar triangle and abdominal petiole suffused with darker; legs entirely pale straw-yellow; mandibles straw-yellow, the apices rufous; antennae with the two basal segments straw-yellow, the remainder light brown. Wings faintly clouded; veins and stigma brown. Body sparsely clothed with pale setae; eyes with only very minute hairs.

Mandibles with five sharp teeth in an oblique series. Clypeus large, rounded in front and with a very small median notch; median line with a strong, sharp elevation. Antennae of moderate length, the flagellum clothed with pale, erect setae which are about half as long as the width of the flagellum, the setae on the under side of the last three segments shorter and more dense; antennal segments 9-11 each about 1.5 times as long as thick. Middle interocular line .58 times the transfacial line, 1.35 times the eye height; eyes bulging; ocello-ocular line 3.5 times the postocellar line. Front, vertex, and temples strongly shining, non-alutaceous, the punctures sparse, shallow, and small.

Pronotum short, sloping evenly, smooth and shining. Mesonotum strongly polished, the punctures inconspicuous; parapsidal furrows present except on the anterior fifth; notauli complete but weakened both anteriorly and posteriorly. Lateral foveae of the scutellum large, deep, sharply defined; metanotum also with a series of foveae on each side. Propodeum with a median impression and with lateral carinae, the upper surface smooth and polished except for some sculpturing anteriorly; spiracles circular and opening laterally. Fore wing with the transverse median vein strongly sloping, the discoidal vein distinct, about as long as the transverse median vein, arising well down on the latter, fig. 4.

Abdomen with a relatively long petiole which is strongly sculptured and hirsute. Spiracles of the first two segments large, round. Genitalia, fig. 8, with the parameres very long and slender, and with two additional short processes arising near their base; basis volsellaris with a plate along its mesal margin which may be homologous with a similar plate bearing radiating grooves in *Pseudisobrachium;* aedoeagus complex and with two small, pincushion-like pads near the apex.

Variation.—The single topotypic paratype is very similar to the type in all details. The top of the head is somewhat more extensively infuscated.

Propristocera polita, new species
(FIGS. 2, 6)

Holotype: ♂, Columbia, South Carolina, 16 Aug. 1951 (L. & G. Townes) [Coll. H. K. Townes] *Paratypes*: 1 ♂, Greenville, S. C., 31 Aug. 1952 (L. & G. Townes) [Coll. H. K. Townes]; 1 ♂, Dunn Loring, Va., 11 Sept. 1948 (K. V. Krombein) [Coll. K. V. Krombein]; 1 ♂, Butler, N. J., Summer 1955 (R. Dorland; taken from light globe in house) [U. S. Natl. Mus.]; 1 ♂, Ithaca, N. Y., 14 Sept. 1956 (H. E. Evans; taken inside window of house) [Cornell Univ.].

This highly distinctive species appears to be widely distributed in eastern United States, although its closest relative, *angustata*, occurs in Costa Rica. In common with *angustata*, the antennae are extremely long and the pronotum is crossed by a carina followed by a depression. In common with *laevigata*, the front is very highly polished. Unique characters include the complete lack of a discoidal vein, the strongly sculptured propodeum, and the unusual genitalia.

Description.—Length about 3.5 mm. Head black, thorax dark brownish-fuscous, abdomen medium brown; coxae brown, femora light brown, remainder of legs straw-colored; mandibles yellowish, rufous at the apex; scape and pedicel straw-yellow, the flagellum gradually darkened to brown at the apex. Wings hyaline, the setae light brown, the veins pale brown, the stigma medium brown. Head and thorax clothed with rather short golden-brown setae; eyes with only very minute, scarcely noticeable setae.

Mandibles terminating in five strong, sharp teeth in a row. Clypeus with a strong median carina which in profile is strongly arched; margin of clypeus with a weak median tooth. Antennae very long and slender; flagellum with dense erect setae which are over half as long as the width of the flagellum; antennal segments 9-11 each about three times as long as thick. Middle interocular line .53 times the trifacial line, 1.05 times the eye-height; ocello-ocular line 2.9 times the postocellar line; occipital carina strongly raised, the groove in front of it somewhat foveolate. Front strongly polished, only very weakly alutaceous, the punctures small and widely separated; center of the front with a longitudinal impression.

Pronotum crossed anteriorly by a somewhat irregular carina behind which is a foveolate groove; posterior margin of pronotum strongly depressed. Mesonotum shining, weakly alutaceous, the punctures small and widely separated; parapsidal furrows strong on the posterior three-fourths, absent in front; notauli very strong on the posterior three-fourths, tapering off to thin lines in front. Pits on the sides of the scutellum rather shallow. Propodeum wholly covered with reticulate ridges, the dorsal surface depressed medially and with a median carina and several other carinae on each side of it, also with lateral carinae, but these carinae not set off strongly from the sculpturing; spiracles slit-like, opening dorsally. Fore wing with a transverse median vein slightly arched, the discoidal vein completely absent, fig. 2.

Abdomen subsessile. Subgenital plate broadly truncate apically. Genitalia with the parameres slender, the apical third deflected mesad; volsellae with a group of spines at the base and another at the apex of the digitus; cuspis complex; aedoeagus complex, as figured, fig. 6.

Variation.—The four paratypes vary in size from 2 to 3.2 mm. All but the specimen from Ithaca, N. Y., agree closely with the type in coloration; in the Ithaca specimen the entire body is black, the antennae are entirely dark brown, and the legs vary from dark brown at the coxae to light brown at the tarsi; in this specimen the wing veins are brown and the stigma dark brown. The paratypes agree well with the type in head characters, but in the Ithaca specimen the transverse carina on the pronotum is largely obscured by the heavy sculpturing. In the specimen from Butler, N. J., the pronotum and mesonotum are unusually smooth and polished, and even the propodeum has small latero-dorsal areas devoid of sculpturing.

Propristocera angustata, new species
(FIGS. 3, 7)

Holotype: ♂, San Pedro de Montes de Oca, Costa Rica, 3 Feb. 1935, on *Ipomoea tiliacea* (C. H. Ballou). *Paratypes*: 4 ♂♂, same data as type [all U. S. Natl. Mus.; one paratype retained at Cornell Univ.].

This species seems to stand fairly close to *Pristocera*. The antennae are very long, the discoidal vein is strong, and the genitalia are not very different from those of *Pristocera*.

Description.—Length about 3.2 mm. Thorax and abdomen medium brown, the head dark brownish-fuscous; legs entirely straw-yellow, including the coxae; mandibles light brown, darker apically; scape and pedicel straw-yellow, the remainder of the antenna gradually more infuscated, the apical segments dark brown. Wings nearly hyaline, with dark setae, the veins medium brown, the stigma dark brown. Head and thorax with numerous light, golden-brown setae; eyes bare.

Mandibles with a strong apical tooth and an oblique series of four smaller teeth. Clypeus fairly large, moderately developed in front of the antennal bases, the apex broadly subtruncate; median line barely elevated. Antennae very long and slender; flagellum densely clothed with pale setae which are about half as long as the width of the flagellum, and with distinct constrictions between the segments; antennal segments 9–11 each about 3.3 times as long as thick. Middle interocular line .58 times the transfacial line, 1.15 times the eye-height; ocello-ocular line 3.5 times the postocellar line; front moderately shining, alutaceous, punctures sparse, small, barely evident except under high magnification.

Pronotum smooth except for an interior transverse carina which is followed by a weakly foveolate depression. Mesonotum moderately shining, strongly alutaceous; parapsidal furrows and notauli both rather strong and practically complete. Propodeum with well developed median and lateral carinae, the dorsal surface alutaceous; spiracles slit-like, opening dorsally. Fore wing, fig. 3, with the transverse median vein sloping slightly, weakly arcuate below; discoidal vein rather strong, but scarcely as long as the basal, interstitial with the media.

Abdomen subsessile. Subgenital plate broadly truncate apically. Genitalia, fig. 7, with the parameres oddly shaped, with a short lateral process; volsellae with the digitus elongate, setose apically, the cuspis complex and difficult to resolve; aedoeagus terminating in two simple lobes.

Variation.—The four paratypes vary in size from 2.5 to 3.5 mm. In most of them the head and thorax are dark brownish-fuscous, the head nearly black. In one of the specimens, perhaps more freshly emerged than the others, there is a

small median tooth on the clypeus. In one of the paratypes the discoidal vein is interstitial with the media, as in the type, but in the other three it is slightly disjointed. In other respects the paratypes agree closely with the type.

Propristocera oriplana (Kieffer)

Pristocera oriplana Kieffer, 1911, Ann. Soc. Sci. Bruxelles, 35:215.
Propristocera oriplana Kieffer, 1914, Das Tierreich, 41:487.

Kieffer described this species from three localities in Guerrero, Mexico: Omilteme, Tepetlapra, and Amula. I have seen no specimens assignable to it. The species is particularly interesting because it shares so many characters in common with *Pristocera:* the size is relatively large (5–6 mm.), the discoidal cell is closed, the head is very coarsely punctate, and the pronotum is transversely furrowed. Kieffer presents a rather full description of this species, and it seems unnecessary to repeat it here.

A NEW TACHYEMPIS (DIPTERA: EMPIDIDAE)

This fall I received from P. H. Arnaud, of the National Museum, an interesting tiny Empid fly. It is an undescribed species of the genus *Tachyempis*, but is closely related to *T. longispina* which I described in the Genera Insectorum, fascicle 185, p. 289 (1927) from specimens from Cuba and Jamaica. In the key to species on page 289 it forms a group with *longispina* distinguished by having a very long spinous bristle attached to the end of the hind metatarsi, but is distinct in having longer wings.

This little fly was taken from a nesting site of the bee *Lasioglossum zephyrum* (Smith), where it would station itself near the nest entrance of the bee and make rapid passes at incoming pollen-laden bees.

Tachyempis longipennis, sp. nov.

Male.—Length 1.2 mm. Body subshining plumbeous black, legs, palpi, and halteres yellowish, hind femora darker apically, wings sub-hyaline, the base of the veins yellow, remainder of veins blackish, the fifth vein blackish throughout. The second vein reaches the margin very appreciably beyond the end of the fifth vein. In *longispina* the second and fifth veins terminate about opposite to each other.

Holotype and two paratypes: Riply County, Ind., 14 July, 1955; Dr. Leland Chandler, collector. The type is deposited in the National Museum collection (No. 63,497). The two paratypes are placed in the collections of Purdue University and myself.—A. L. MELANDER, *Riverside, Calif.*

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PROCEEDINGS OF THE

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LIRIOMYZA DIANTHI N. SP., A NEW PEST OF CARNATIONS IN CALIFORNIA[1]

(DIPTERA: AGROMYZIDAE)

KENNETH E. FRICK

Irrigation Experiment Station, Prosser, Washington

Late in 1956 a leaf miner appeared very suddenly in three or four commercial carnation plantings in Redwood City, California. The larvae form large white mines in the leaves (Pritchard, 1957, figs. of mined leaves). There may be several larvae per leaf and some leaves become almost totally mined. The presence of the conspicuous white mines reduces the market value of the cut flowers. Both F. L. Blanc, Bureau of Entomology, California Department of Agriculture, and A. Earl Pritchard, Division of Entomology, University of California, have written that this species is quite destructive. I am indebted to these two workers for specimens and information concerning this leaf miner.

At first Dr. Pritchard felt that the species may have been imported from Europe. The only records that I could find of a European *Liriomyza* attacking plants in the family Caryophyllaceae was *L. strigata*. That species is very yellow in comparison with *L. dianthi*. In a later letter, he mentioned that carnations had recently been imported from South America to the San Francisco Bay area. There are no South American records of agromyzid leaf miners on any member of the Caryophyllaceae but it must be remembered that the South American fauna is very poorly known.

A description is published at this time so that entomologists concerned with control and suppression may have a name available.

Liriomyza dianthi Frick, new species

(FIGS. 1 and 3)

Male.—Predominantly shining black, sparsely marked with yellow. Head yellow (fig. 1); ocellar triangle and occiput black, black reaching eye margin immediately dorsad of the median posterior curve of the eye, extending to vertex, both vertical setae arising from black; black from vertex extending down genovertical plates to lowest orbital seta or slightly beyond; all orbital setae at edge of black; subantennal grooves light brown. Antenna with first segment yellow; second and third light brown; third very dark brown distally; arista very dark brown. Proboscis yellow; palpi light brown, brown distally. Thorax with mesonotum shining black, not pollinose, black extending laterally to humerus and beyond bases of presutural, supraalar, and outer postalar setae. Scutellum with very large lateral black triangles, width of yellow about one-third the basal scutellar width; distal scutellar setae arising from yellow at edge of black or from black at edge of yellow. Humerus about one-half black, humeral seta arising

[1]Scientific paper No. 1583, Washington Agricultural Experiment Stations, Pullman. Project No. 1260.

from yellow or on yellow and black. Pleura, except for sutures, primarily black (fig. 3); anepisternum dorsally yellow for about one-fourth of the anterior height; katepisternum narrowly yellow dorsally; pteropleuron, mesepimeron, and hypopleuron dark. Legs black; coxae black except forecoxa being light brown on distal one-third; femora distally light brown to yellow for a distance subequal to the femoral diameter, fore- and midfemora light brownish posteroventrally on distal one-half; tibiae and tarsi black. Wing tinged with brown; base dark; veins dark brown, except costa to midway to humeral crossvein and radial sector to branch of R_1 that are yellowish; calypter dark gray, margin and fringe black. Halteres yellow. Abdomen shining black, intersegmental membranes, where visible, yellow. Male terminalia black, cerci yellow.

Head, in profile, with eye nearly eight-tenths as wide as high, rounded anteriorly. Gena, midway between vibrissal angle and posterior margin, one-third the eye height, sloping strongly posteroventrally from vibrissal angle; vibrissa strong; four setae on suberanial margin. Genovertical plates extending beyond eye margin; two upper-orbitals, reclinate and somewhat outwardly inclined; two lower-orbitals, inwardly inclined; five and six orbital setulae. Antenna with third segment subcircular, slightly broader than long, setulae in length less than the basal diameter of the arista; arista slightly longer than eye length, slightly swollen on basal one-fourth, setulae very short.

Thorax with four strong dorsocentral setae; fourth the longest, first about six-tenths, second about two-thirds, and third about eight-tenths the length of the fourth; spacing between dorsocentrals subequal, first and second about equidistant from the transverse suture. About 11 acrostichals, in four very sparse, irregular rows, extending from the first dorsocentral posteriorly to the third dorsocentral. Intraalar rows without intraalar seta; five to six setulae anterior to the transverse suture; two to three posterior, one very close to being in line with the dorsocentrals. Inner postalar about six-tenths the length of the outer. Humerus with three setulae plus the humeral seta.

Wing 2 mm. long. Costa terminating at wing tip; second segment nearly four times as long as fourth; third and fourth subequal in length; m-m crossvein about 1.4 times its length from r-m, perpendicular to penultimate section of M_{1+2}; ultimate section of M_{1+2} 7.7 times as long as the penultimate; ultimate section of M_{3+4} two times the penultimate.

Female.—Larger, nearly 2.5 mm. in wing length. Head with eye about seven-tenths as long as high; gena, midway between vibrissal angle and posterior margin, four-tenths the eye height; three setae on suberanial margin. Mesonotum with 15 acrostichals, extending posteriorly to one-third the distance from third to fourth dorsocentrals; inner postalar two-thirds as long as the outer. Wing with second costal section about five times the length of the fourth, third eight-tenths the length of the fourth; ultimate section of M_{3+4} 1.8 times as long as the penultimate. Seventh abdominal segment conical, subequal in length to the length of a tergite; basal one-third to one-half dull black, tomentose, shining black distally.

Holotype ♂.—Redwood City, San Mateo County, California, XII-3-1956 (H. Sciaroni), ex leaf of carnation, *Dianthus caryophyllus* L., deposited in the California Academy of Sciences. *Allotype* ♀.—topotypical, XI-27-1956 (V. A. Cana-

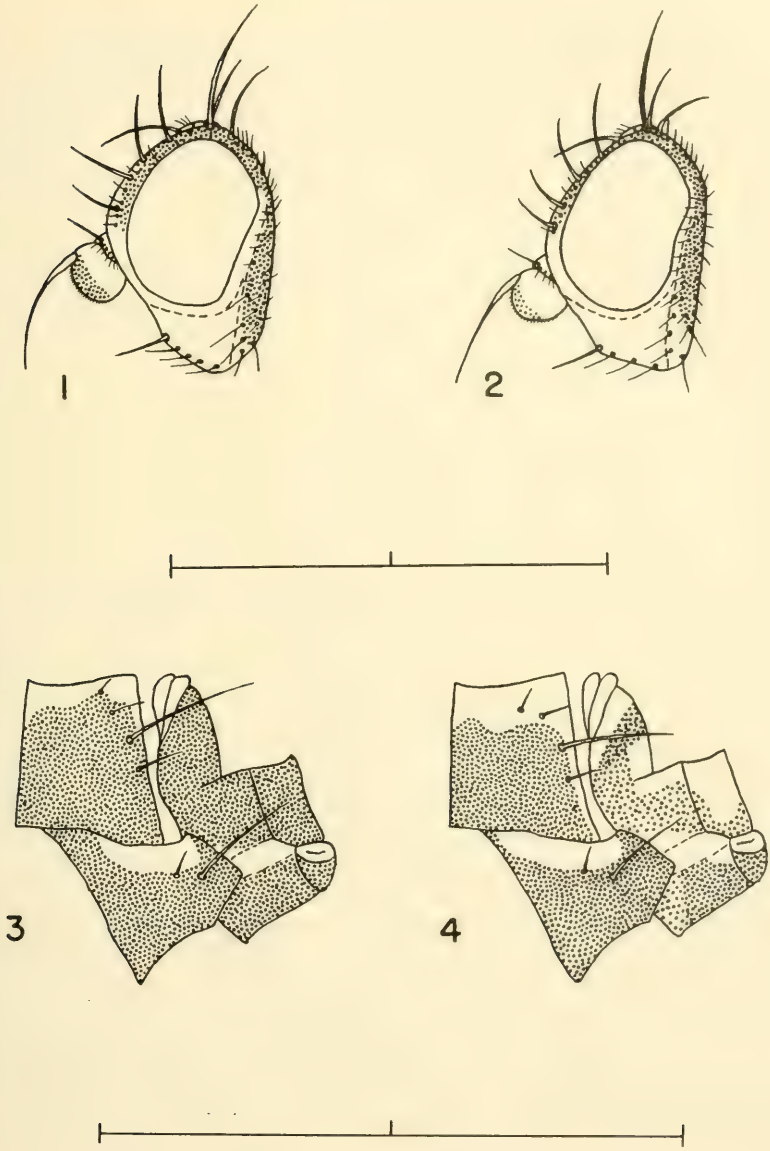

FIG. 1.—Head, in profile, of holotype ♂ of *Liromyza dianthi*. The solid line equals 1 mm. for the two illustrations of the heads; fig. 2, head, in profile, of topotypical paratype ♂ of *Liriomyza langei;* fig. 3, pleura of holotype ♂ of *Liromyza dianthi*. The solid line equals 1 mm. for the two illustrations of the pleura; fig. 4, pleura of topotypical paratype ♂ of *Liriomyza langei*.

vese), ex leaf of carnation (emerg. XII-10-1596), Calif. Dept. Agric. No. 56 K 647, also in the California Academy of Sciences. *Paratypes.*— 1 ♂, 4 ♀♀, same data as holotype; 2 ♂♂, 3 ♀♀, same data as allotype (emerg. XII-1, 3, 14-1956); 1 ♂, 2♀♀ (in alcohol), same data as holotype; 1 ♂ (in alcohol), same data as allotype. Paratypes have been deposited in the collections of the United States National Museum, California Department of Agriculture, California Insect Survey, and the author. There are also three moldy and teneral specimens, same data as the holotype. These 19 specimens are all that are known to exist.

Some of the variations between specimens that have been noted may be mentioned here. The acrostichals vary from 10 to 20, in from four sparse, somewhat regular rows (where 15 or more setae are present) to four ill-defined rows (with the smaller numbers of setae), and extending posteriorly from the third dorsocentral to nearly one-half the distance to the fourth dorsocentral. The inner postalar varies from six-tenths to seven-tenths the length of the outer. The humeral seta usually arises from yellow and the setal base may or may not touch the black area. This seta rarely arises from the black area of the humerus. The central yellow area of the scutellum is relatively narrow and the distal scutellars vary in having the setal bases on black, on yellow but touching black, or all on yellow, but not more than two setal base diameters removed from the black. Crossvein m m is usualy farther from r-m than its own length but in two specimens it is closer (nine-tenths of the length of m-m) and in one specimen it is exactly its own length from r-m. The ultimate section of M_{3+4} varies from 1.8 to three times as long as the penultimate, but is usually about twice as long.

L. dianthi is most similar to *L. langei* Frick. The type localities of these two species are only 15 miles apart. When *L. langei* was described it was the only North American species lacking the mesonotal prescutellar yellow area but having the yellow third antennal segment distally infuscated (Frick, 1951). Since that time *chlamydata* (Melander) has been transferred from *Haplomyza* and placed into this group. *L. chlamydata* lacks crossvein m-m, which separates it from *L. dianthi*. It is much darker in overall coloration than is *L. langei* and has the mesepimeron black, the same as it is in *L. dianthi*.

L. langei may be separated from *L. dianthi* by the slightly different head shape, the eye not being rounded anteriorly, the genovertical plates dorsally only slightly extending beyond the eye margin, and the genovertical plates and third antennal segment more lightly infuscated, being a light brown (fig. 2). The pleura of *L. langei* is more yellowish than the pleura of *L. dianthi* and the mesepimeron is more than one-half yellow (fig. 4). The fore- and midfemora of *L. langei* are more yellow, especially on the outer one-third where the femora are brownish with yellow streaks. The scutellum of *L. langei* has a relatively broad yellow area with the basal scutellar width being at least three-fifths yellow. The distal scutellar setae are at least one-half as far removed from the lateral black triangles as they are from each other, or at least the diameter of four setal bases from the black.

Three larvae were lent by F. L. Blanc. They are very typical of the genus *Liriomyza*. The only unusual character is the relatively large number of bulbs (8 or 9) on each posterior spiracle. The usual number is three. None of the bulbs is elongate and they are in an irregular row that slightly curves at both the dorsal and ventral ends towards the midline of the larva. The anterior spiracles each bear five to seven short bulbs.

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Pritchard, A. E., 1957. New carnation pests. California Agriculture 11(3):5.

A NEW SPECIES OF EUMYSIA FROM SOUTHERN IDAHO[1]

LEPIDOPTERA: PYRALIDAE

RICHARD A. MACKIE,
University of Idaho, Moscow

During the course of studies on insects associated with range plants in southern Idaho a caterpillar was found severely defoliating *Atriplex confertifolia* (Torr.), a valuable desert forage plant, in several localized areas of the Raft River Valley, near Malta, Idaho. A few specimens were reared and the adults subsequently identified by J. F. Gates Clarke as an undescribed species of *Eumysia*. The purpose of this paper is to provide a name for this species so that it might be used elsewhere.

The author is indebted to Dr. W. F. Barr, University of Idaho; Dr. J. F. Gates Clarke, U. S. National Museum, and Dr. F. D. Rindge, American Museum of Natural History, for their assistance in the preparation of this paper. Dr. Clarke also made available to the author paratype specimens of most of the other members of the genus. Special thanks are also due Arthur D. Cushman, U. S. Department of Agriculture, whose excellent drawings appear in this paper.

Eumysia idahoensis, new species

Male.—Alar expanse 22 mm. Body and forewings slate-gray in appearance, uniformly flecked with white. *Head* with antenna white, broadly annulated with black; labial palpus gray. *Thorax* with legs gray, darkened at joints. *Fore wing* dark slate-gray above, abruptly lighter in color beyond subterminal line, ocherous scales scattered over surface, moderately concentrated in areas of submedial

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[1]Published with the approval of the Director of the Idaho Agricultural Experiment Station as Research Paper 429.

and subterminal lines; submedial line moderately distinct, bordered inwardly by mixed black and ocherous scales to wing base and from posterior margin of wing to radial vein; subterminal line distinct, extending from costal to posterior margins of wings, interrupted twice medially leaving a small white dot near center; termen with row of seven black dots; undersurface solid gray-brown, abruptly gray beyond subterminal line and along costa, termen spots distinct. *Hind wing* above and below fuscous; costal margin white above and blackish below; termen and posterior margin blackish. Abdomen predominately dark gray; posterior margin of each segment with white scaling; segments 4, 5, and 6 with hind angles moderately tufted.

Genitalia with gnathos stout; hook prominent, distinctly curved; anellus rectangular in form, rounded posteriorly.

Female.—Alar expanse 20 mm. Body and forewings gray, slightly lighter than male. *Fore wing* gray with markings similar to male, slightly heavier concentrations of ocherous scales about areas of subterminal and submedial lines; underside correspondingly lighter than that of male. *Hind wing* above and below slightly lighter than that of male and only faintly dark along termen and posterior margin. Abdomen same as male but lacking tufts on segments 4, 5, and 6. *Genitalia* typical with papilla analis flatly rounded posteriorly.

Types.—Holotype, male (USNM No. 63511), allotype, female and three male paratypes from Malta, Cassia County, Idaho, Dec. 28, 1951 (J. R. Douglass). Additional paratypes as follows: One male and one female from 15 miles south of Nampa, Canyon County, Idaho, May 1952 (W. F. Barr); one male and two females from Raft River Valley, Cassia County, Oct. 9, 1951 (L. J. Farmer); one male from 4 miles southeast of Idahome, Cassia County, Dec. 20, 1951 (G. Zappettini); one male from 4 miles east of Idahome, Cassia County, Feb. 27, 1956 (W. F. Barr); two females from 4 miles east of Idahome, Cassia County, Feb. 18 and 21, 1957 (R. A. Mackie). All type material was reared from *Atriplex confertifolia.* Paratypes are to be deposited in the collections of the U. S. National Museum, American Museum of Natural History, and University of Idaho.

Food plant.—*Atriplex confertifolia* is the preferred host and large collections of larvae have been taken from this plant. Three larvae also were collected from Saltsage, *Atriplex nuttallii* Wats., and 4-winged saltbush, *Atriplex canescens* (Pursh).

Distribution.—Collections of *E. idahoensis* have been made only from southern Idaho, but this insect has not been found throughout the entire distributional ranges of its hosts. Thus far, no adults have been taken in the field and the distribution of the species is based entirely on larval collections. *E. idahoensis* is particularly abundant in several localized areas of the Raft River Valley near Malta and Idahome, Cassia County, Idaho. It also has been collected 15 miles south of Bruneau and 5 miles north of Murphy, Owyhee County; 15 miles south of Nampa, Canyon County, and 15 miles west of Mountain Home, Elmore County.

A moderate amount of variation has been noted in the eight specimens examined. The ground color of the forewing varies from a light to a dark gray, and the subterminal and submedial lines may be obscured, especially in the extremely light or dark specimens. The subterminal line may be interrupted from one to several times, but one large break, anterio-medially, is present in all specimens. The male genitalia of three dissected specimens were found to be quite uniform in structure and appearance.

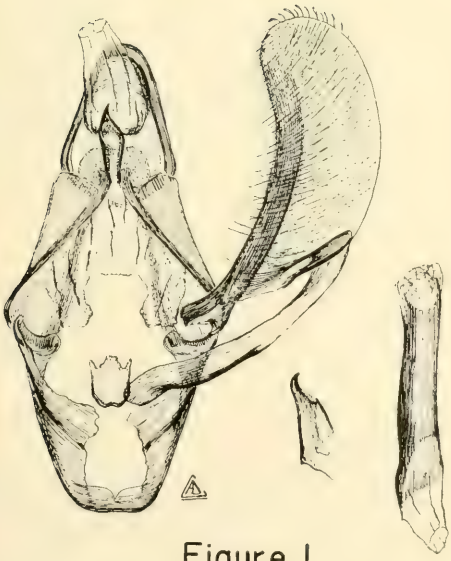

Figure 1

Figure 2

Fig. 1. Male genitalia of *Eumysia idahoensis;* fig. 2, female genitalia of *E. idahoensis.*

E. idahoensis most closely resembles *E. semicana* Heinrich, known only from Yakima, Washington, in general coloration and specifically in the color of the antenna, but may be separated by its much smaller size and by the presence of a distinctly lighter area beyond the subterminal line. *E. idahoensis* also differs from the remaining members of the genus *Eumysia* in color and size. It is the darkest species and averages smaller in wing expanse than any of the others. No other *Eumysia* has been recorded from Idaho. *E. mysiella* (Dyar) has been recorded from Arizona and New Mexico to as far north as Stockton, Utah; *midella* (Dyar) from New Mexico, Colorado, Arizona, California, and British Columbia, and *pallidipennella* (Hulst) from Colorado, New Mexico, California, and Washington.

The character which appears to be the most distinctive in separating *idahoensis* from other members of the genus lies in the structure of the male genitalia. Heinrich (1956) stated that "there are no structural differences in the genitalia that can be used to distinguish these supposed species." Only an illustration of the genitalia of *mysiella*, the genotype, was available to the author but an apparently significant difference between the two species is evident. The gnathos of *mysiella* as pictured is rather long and tapers terminally, whereas that of *idahoensis* (Fig. 1) is stout and tapers toward the base. The hook at the terminal end of the gnathos is distinctly curved in *idahoensis* but is straight in *mysiella*. The anellus also is different in the two species, that of *idahoensis* being rectangular in form and much longer than broad, whereas in *mysiella* it is as wide or wider than long and more or less crescent shaped. The male and female genitalia figured are of paratype specimens from the type locality and from the "Raft River Valley," respectively.

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ANNOUNCEMENT

An important part of the Society's program is to make available back issues of the *Proceedings*. In recent months stocks of many issues have dwindled to unprecedented lows. Members who wish to contribute to this important function are urged to send any of their back issues (preferably with covers unmarked) to the Custodian (address on inside front cover).

A DESCRIPTION OF THE IMMATURE STAGES OF LIMNOPHILA (EUTONIA) MARCHANDI ALEX.

(DIPTERA, TIPULIDAE)

DENNIS HYNES, *Department of Biology, University of Florida, Gainesville, Florida*

Limnophila marchandi belongs to an aberrant group of crane-flies composing the subgenus *Eutonia*, for which no immature stages have previously been described. Fully grown larvae and pupae of this fly were collected on the Edwin S. George Reserve in Livingston County, Michigan, during the spring of 1953, at the northwestern edge of "Southwest Swamp." As in the adult stage, the last instar larvae and pupa of this subgenus are readily distinguishable from the other species of the genus *Limnophila* by their conspicuously large size.

The habitat consists of moist soil composed of leaf debris and the rhizomes of mosses and ferns (*Osmunda*) impregnated with organic mud. The larvae were never taken deeper than 2 inches, and the pupae were taken near the surface of the soil. During the spring thaw, water completely covered this area, and later, during the time of collection and after the water had receded, no vegetation was present. In the summer a lush cover of plants occurred over the habitat.

Data which I have from closely related species found along streams in the Southeast indicate that this species probably completes its life cycle within 1 year. The pupal stage lasts for 7 days at room temperature. The larvae are carnivorous and will viciously attack other larvae, even of the same species and size, in the rearing cages. After emergence the adults were kept in the rearing cages from 3 to 5 days before they died.

The descriptions of the immature stages are drawn from 4 larvae and 1 larval exuvia, 4 pupae and 10 pupal exuviae. Three mature eggs were obtained from females which, when dying, oviposited on the bottom of the rearing cage.

Egg.—Length 1.08–1.09 mm.; width 0.37–0.40 mm.; cylindrical, elliptical, curved very slightly, the ends bluntly rounded. Chorion dark brown to black, smooth.

Larva.—Length 35.0–38.0 mm.; width 3.5–4.0 mm.; body elongate, slender, terete; covered with golden-yellow setae (fig. 1). Abdominal segments 2 through 7 have anterior patches of setae forming creeping-welts. Setae of these areas are vertical and short, the remainder appressed to body. Pencils of longer setae on each of the thoracic and abdominal segments. Chaetotaxy of these pencils of setae is shown in fig. 2a for the first thoracic segment; that of the second and third thoracic segments and the first abdominal segment in fig. 2b; and that of abdominal segments 2 through 7 in fig. 2c.

The diameter of the body decreases sharply immediately posterior to a band of short, brown setae which surrounds the anterior portion of the eighth abdominal segment. Four short, stout, white anal gills are present. The spiracular disk (fig. 6) is obliquely truncate with four pronounced lobes. The ventral pair of lobes is slightly longer than the lateral pair. There is a vestigial dorsal lobe with the area only slightly expanded. Lateral and ventral lobes have a fringe of delicate hairs which become progressively longer from the base to the tips of

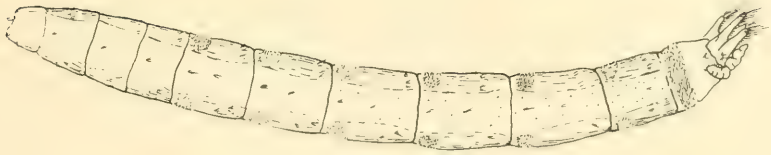
the lobes, their greatest length no more than twice that of the lobes. Ventral lobes with V-shaped dark brown marking—the outer arm of the V broad; the inner arm narrower, disappearing mid-length, appearing at base of lobe in triangular form; outer arm of V extended, partially surrounding the ventral and mesal margins of the spiracle. Lateral lobes possess triangular dark brown marking which ends adjacent to the lateral margin of the spiracle.

Head capsule (fig. 3) of the hexatomine type, depressed dorso-ventrally, the greatest width about one-half the length from labrum to caudal margin. Dorsal plate wide anteriorly, becomes narrower mid-length, broadens posteriorly into spatula, which because of weak chitinization appears to be incised at medial-caudal area. Edges of dorsal and lateral plates have distinct heavily chitinized ridges at margins. Labrum tri-lobed, a fringe of setae at ventral cephalo-lateral portions. The central lobe with membranous bulge on lateral edges which is covered with numerous indistinct papillae and a long sensory hair. At inner base of either bulge occurs a group of five or six chitinized papillae; between these on either side of median line is a sensory hair. The epipharyngeal surface possesses a central lobe-like area, slightly chitinized, which has on its tip two small divergent papillae directed cephalad. The hypopharynx, heavily chitinized, consists of two lateral rods and a transverse rod, the latter finely ribbed, giving finely serrated appearance to anterior edge; mentum membranous except for small chitinized area occurring just caudad of transverse rod. At either side of this plate and directly below hypopharynx a pencil of setae arises. Directly caudad to the hypopharynx on the inner margin of the esophagus a number of spines are found which appear fused at their bases. At mid-length of the head capsule surrounding the inner edge of the esophagus is an irregular band composed of numerous rows of spines with tips directed sharply caudad. The antennae are two-segmented with basal segment conical and stout; the second segment about one-third as long as first and barrel-shaped; on the inner edge of the tip of the second segment is a sensory hair; on the outer edge a large, delicately sculptured papilla about one-half as long as the second segment; between the two is a small conical papilla (fig. 5). The outer lobes of maxillae are slightly divergent, conical, stout at bases, and gradually narrow to bluntly pointed tips; tips are curved laterally, base of outer lobes supported by chitinized plates which project slender rods cephalad; outer lobe has short golden-yellow setae appressed to surface.

Dimensions of head capsule: caudal margin to cephalic edge of labrum, 3.7 mm.; caudal margin to tip of maxillae, 4.5 mm.; width at base of mandibles, 1.4 mm.; depth at base of mandibles, 0.40 mm.; length of antennae, 0.31 mm.

Pupa.—Length from cephalic tip of breathing horns to tip of cauda, 31.5–33.5 mm.; dextral-sinastral diameter at base of wing pads, 4.50–4.85 mm.; dorsal-ventral diameter at base of wing pads, 4.28–4.40 mm.; length of breathing horns, 2.52–2.60 mm.

Thorax rust-brown, abdomen golden-brown, eighth and caudal segments rust-brown. The entire body delicately sculptured (fig. 7). The abdominal pleura have a yellow to white stripe present from the first through the seventh segments along the medially carinate pleura. Form slightly depressed dorso-ventrally, stout to the eighth segment, then the diameter decreases abruptly ending in fleshy cauda. All abdominal tergal and sternal areas armed with spined tubercles. Tergal, sternal, and pleural plates fused, margins indistinct.



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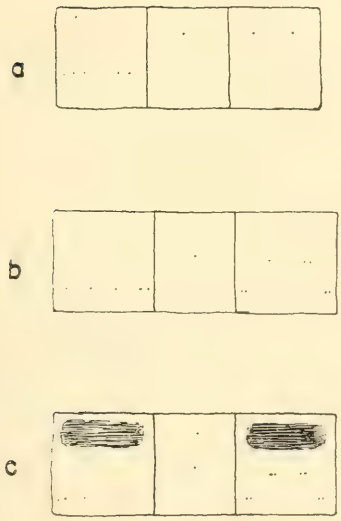

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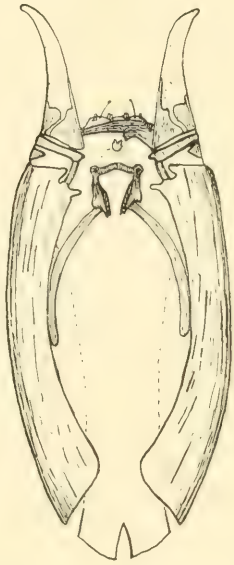

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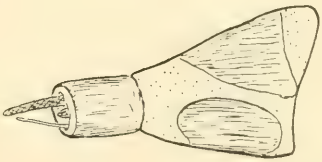

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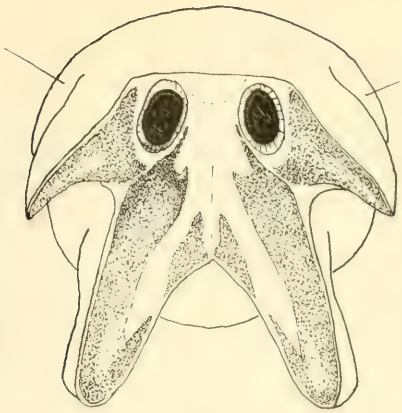
Fig. 1. Lateral view of larval body of *Limnophila marchandi;* fig. 2, *chaetotaxy* of segments—tergal, pleural, and sternal areas shown from left to right—(a) first thoracic segment, (b) second and third thoracic, first abdominal segments, (c) second through seventh abdominal segments; fig. 3, ventral view of head capsule; fig. 4, ventral view of mandible; fig. 5, antenna.

Mesonotal breathing horns (Byers, 1952) stout and laterally compressed, dull or brass yellow, have distinct annuli, the tips flattened and divided laterally into a thick inner flap and thin outer flap, both delicately sculptured. Antennal sheaths arise mid-length of mesal margin of eyes, ending just caudad of prothoracic leg fold, curving at tips. Eyes and antennal sheaths at this point emarginate or nearly so, dull yellow. Labral sheath bluntly rounded, two strongly divergent, heavily chitinized lobes appear at tip, the labial sheaths. The annulated maxillary sheaths end at, and perpendicular to, the antennal sheaths. Wing pads end just before the posterior margin of the second abdominal segment. Wing pads of mature specimens are dark rust-brown at margins, especially at base, sometimes making venation obscure.

Pronotum with lateral cephalic edges inflated, dull yellow, and unarmed. Medial line very dark, weakly carinate. Mesonotum rust-brown with dark thin median stripe, a black spot occurring dorsally on this line; setiferous, prominent, rounded, flattened abruptly at sides forming a pronounced ridge which extends laterally and slightly dorsad from the breathing horn to a point two-thirds the distance from breathing horn to wing-pad, then swings obliquely dorsad ending just before wing-pad base. At the point of pronounced bending of the lateral ridge occurs another ridge running ventrad, ending just dorsal to the tip of the antennal sheath. Anterior portion of the mesonotum medially carinate. The metanotum with distinct dark brown median spot at cephalic edge with two brown spots on either side. At base of metanotum just dorsal to the origin of the haltere sheaths occurs a dark brown longitudinal band. Haltere sheaths inflated at origin, gradually disappearing under wing-pads at the caudal margin of the first abdominal segment. Leg sheaths end at caudal third of third abdominal sternite. Posterior to the ends of the leg sheaths, a ridge occurs on which three transverse rows of spined tubercles appear, the central row containing about thirteen tubercles, and the two lateral rows containing 3 to 4 tubercles each. Along the side of the metathoracic leg sheaths occurs a longitudinal row of 10 to 18 tubercles.

The first abdominal tergite with central brown splotch, one small lateral brown marking on either side, a small but elongate marking lateral to these. The second through seventh tergites and the third through seventh sternites have a deep furrow transversing the anterior third of the area. The posterior third of these areas has a medial dark spot. Abdominal tergites two through seven have V-shaped markings on each side of spot, the arms not connected, the point directed caudad. Abdominal sternites three through seven have V-shaped markings on each side of spot, the arms not so divergent as on the tergites, connected, the point directed cephalad. Sternites three through six have two rows of spined tubercles, one anterior to furrow, the other near the caudal margin of the sternite. The latter is a straight, transverse row, while the former is usually separated to either side of the mid-line. The abdominal tergal and sternal markings and arrangement of tubercles are shown in fig. 8, a and b respectively.

The seventh abdominal segment has many large, spined tubercles surrounding the caudal edge of the segment. The eighth segment is abruptly smaller in diameter, with a spined tubercle at the medial caudal edge of pleura, sternite unarmed, dorsally possessing four large and slightly divergent tergal arms, not spined at tips and directed slightly caudad. The anterior pair of tergal arms



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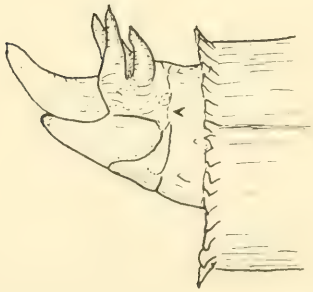

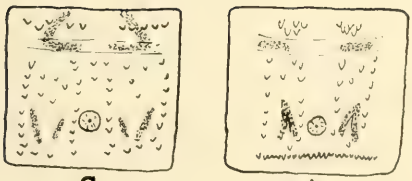

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Fig. 6, spiracular disk of *Limnophila marchandi* (fringe of setae not shown); fig. 7, lateral view of pupal body; fig. 8, diagrammatic sketch showing arrangement of tubercles and markings on (a) tergal area, (b) sternal area of abdominal segments; fig. 9, female cauda.

is slightly wider apart and more divergent than the posterior pair. Female cauda have tergal and sternal valves inflated, curved dorsally; both are dark at tips, lighter at base (fig. 9). The male cauda end in a pair of slightly divergent, pointed lobes, with tips directed very slightly mesad; sternal lobes bulbous, darkened at tips, lighter at bases.

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BOOK REVIEW

BEITRAGE SUR SYSTEMATIK DER LARVEN DER ITONIDIDAE (=CECIDOMYIIDAE, DIPTERA (Contribution to the systematics of the larvae of the Itonididae). Teil 1, Porricondylinae und Itonidinae Mitteleuropas. By Edwin Möhn. Zoologica, Original-Abhandlung aus dem Gesamtgebiete der Zoologie, Band 38, Lieferung 1, Heft 105. E. Schweitzerbart'sche Verlagsbuchhandlung, Stuttgart. Pp. 1-237, 3 text figs., 30 plates.

Consistent with most publications of its kind, the present work comprises a number of sections as follows: 1) materials; 2) methods; 3) discussion of characters (with text figures); 4) bionomics; 5) general remarks about generic groupings; and 6) the descriptive portion. Descriptions are given of the characters of the larvae of the family; of the two subfamilies, Porricondylinae and Itonidinae; and of each of the 176 genera. With only a few exceptions, each genus is represented by only one species. The treatment of the larvae of each species includes a diagnosis, description, habitat, location of material studied, collection locality, important literature references, and previously published illustrations.

In most cases only one species is used to illustrate the characters for one genus, in the opinion of the reviewer the sole fault of the work. The generic diagnoses and the concluding key to genera, then, are based on rather limited information and may be misleading to use unless this fact is kept in mind. On the other hand, the publication will be of considerable value to workers in the Americas, since many of the genera included in its have species that occur in the Neotropical and Nearctic Regions.

This is the first comprehensive treatise dealing with the larvae of gall midges ever to appear; it deserves high praise as a point of departure for the systematist in opening a hitherto inaccessible fund of separating and identifying characters. The males of some genera, and the females of most, almost defy determination, and it is the feeling of this reviewer that the final answer to exact identification in these cases is to be found in the immature stages. The work will also serve as a beginning for a comprehensive study of relationships among the genera. That subject has been in dispute by all gall midge workers and is one that is now ready for a thorough revision; not only have we recorded a large number of species, but Dr. Möhn's contribution very materially augments our present store of knowledge in this respect.—Richard H. Foote, *Entomology Research Branch, U. S. Department of Agriculture, Washington, D. C.*

MALAYA JACOBSONI (EDWARDS, 1930), A NEW OCCURRENCE RECORD FOR NORTHERN THAILAND

(DIPTERA: CULICIDAE)[1]

ERNESTINE B. THURMAN[2]

Iyengar (1953) reported *Harpagomyia genurostris* (Leicester, 1908) [*Malaya genurostris* Leicester, 1908] from Southern Thailand constituting the initial record of the occurrence of the genus in the country. Thurman and Thurman (1955) collected this species in a light trap operated in Northern Thailand. Stone and Knight (1957) revalidated *Malaya* Leicester, 1908, as the name of the genus and relegated *Harpagomyia* de Meijere, 1909, as a synonym. The present note adds a second species in the genus to the reported fauna of Northern Thailand, namely, *Malaya jacobsoni* (Edwards, 1930).

M. jacobsoni adults were netted or collected while resting on trunks of trees on 9 occasions from December 30, 1952, to March 31, 1953. Collections were made in 5 shady jungle areas during the daytime and at night on Doi (mountain) Sutep, Doi Chiengdao, and at Tad Muey Falls at elevations ranging from 1,000 to 5,000 feet. (Collectors: the late Deed C. Thurman, Jr., Manop Rattanapradith, and the author.)

To the list of species reported as collected in a light trap in Chiengmai (Thurman and Thurman, 1955) add the name of *M. jacobsoni;* 2 females collected July 9, 1952.

Adult *M. genurostris* differ from *M. jacobsoni* by having a complete line of silvery scales between the eyes, silvery scales on the abdominal sternites, and silvery scales on the thoracic patches. The flat scales on the vertex of *M. jacobsoni* are metallic blue and do not form a complete line between the eyes; golden scales are present on the abdominal sternites; and metallic blue scales are on the thoracic patches.

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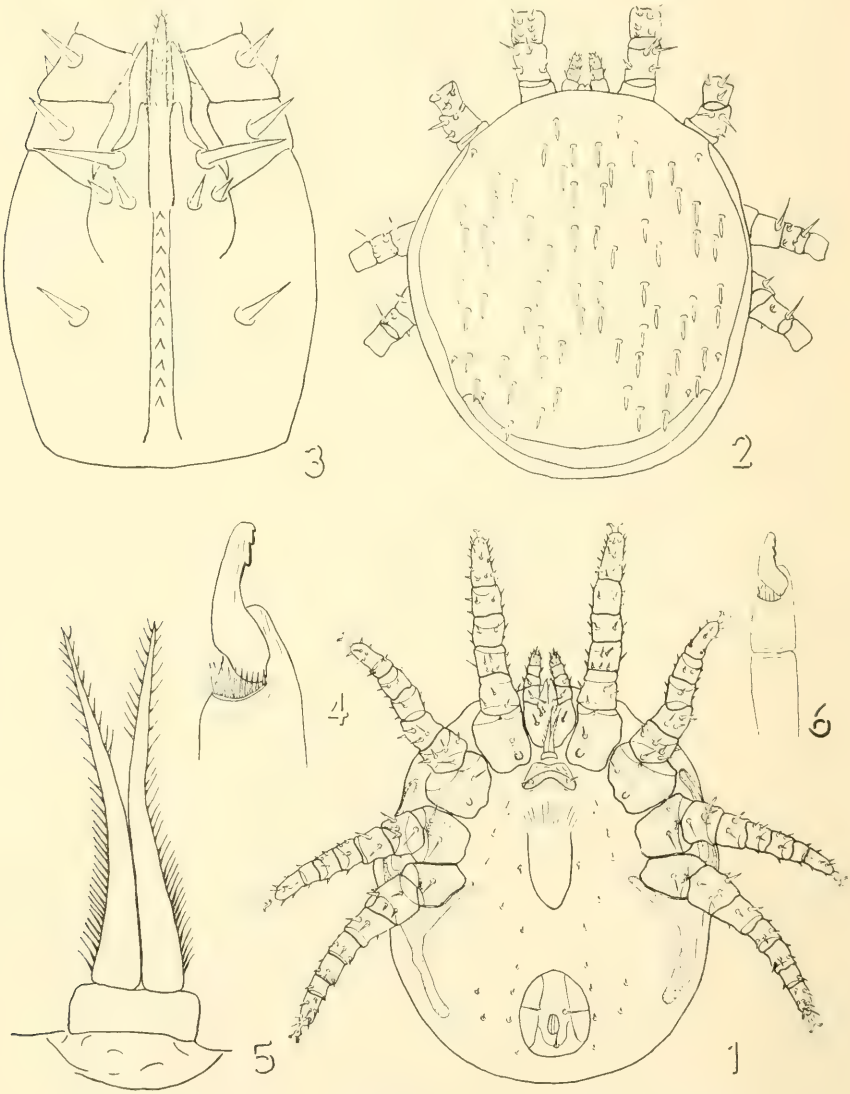
Thurman, D. C., Jr., and Thurman, Ernestine B. 1955. Report on the initial operation of a mosquito light trap in Northern Thailand. Mosq. News 15(4): 218–224.

[1]Acknowledgment is made of support by the Division of Research Grants, National Institutes of Health, Public Health Service, Department of Health, Education, and Welfare, under Grant E 809-C2 awarded to William E. Bickley, Department of Entomology, University of Maryland; and to the U. S. Operations Mission to Thailand, International Cooperation Administration; and the assistance rendered by the United States National Museum; and the Entomology Research Division, United States Department of Agriculture.

[2]Sanitarian (R), on detail from the Division of Research Grants, National Institutes of Health, Public Health Service, Bethesda, Maryland, formerly assigned as Malaria Control Training Adviser with U. S. Operations Mission to Thailand, International Cooperation Administration.

CORRECTION

The illustration below should replace that appearing in an article by Tibbetts and Strandtmann on p. 268 of Vol. 59, No. 6 (1957) of the *Proceedings*. The reprints of that article are correctly printed. The illustration now appearing on p. 268 of that bound number correctly appears in an article by David R. Cook on p. 19 of the present issue.



Ixodorhynchus gordoni, n. sp., female: Fig. 1, venter; fig. 2, dorsum; fig. 3, gnathosoma; fig. 4, chela; fig. 5, tritosternum; fig. 6, chelicera.

A NEW KOREAN MITE

(ACARINA, CAECULIDAE)

HAROLD G. HIGGINS AND STANLEY MULAIK
University of Utah, Salt Lake City

In a small collection of mites received by the senior author from Korea there was an apparently undescribed rake-legged mite of the genus *Caeculus*. This mite is named after Mr. Ted Tibbetts, who collected this species from several localities in Korea. The types will be deposited in the University of Utah Acarina collection.

Caeculus tibbettsi sp. nov.

Diagnosis.—Propodosomal plate projects over the gnathosoma; metapodosomal plate with 6 setae in a 2-2-2 sequence; leg I composed of 7 segments and slightly shorter than the body; trochanter I with 2 setae on the inner edge, 2 dorsal setae, and 2 small setae on the outer border; basifemur and telofemur I each with 1 large blunt spine on their inner border.

Description.—This animal is of medium size, and has a color of deep brown. The propodosomal plate is notched near the tip, narrowed near the attachment of legs I, projects over the gnathosoma, and covers the gnathosomal tubercles from above. This plate has 2 small setae in the notched areas on the anterior edge. A small seta is also found anterior to the eyes. Median metapodosomal plate has 6 spatulate setae in a 2-2-2 sequence. The left and right lateral metapodosomal plates each have 3 spatulate setae in a 1-1-1 sequence and 2 slitlike stigmata. The anterior transverse opisthosomal plate has 5 setae in a more or less straight line. There are 5 setae in a curved line on the posterior transverse opisthosomal plate.

Legs.—Leg I is longer than any other leg, but is slightly shorter than the body. Trochanter I has 2 large clavate setae located on tubercles on the inner edge, 2 dorsal clavate setae, and 2 small setae on the outer-ventral border. Basifemur and telofemur I each has 1 long blunt spine on their inner border. These spines are nearly as long as the segments on which they are located. Genua I has 2 long, blunt spines on the inner edge, but the posterior one is the shorter. Tibia I has 2 long spines and 1 short spine on the inner edge. The posterior tibial spine is about one-half the length of the other spines and is pointed forward. Tarsus I has 4 short, sharp spines on the inner edge terminating in a single claw.

Measurements of the holotype are: Length of body, 1.13 mm., width, .68 mm., length of leg I, without the coxa, 1.05 mm. Three other adult specimens have the following measurements: Length, 1.20, 1.12, 1.07 mm.; distance between eyes, .38, .32, .21 mm.; length of leg I, 1.05, .99, .92 mm.

Discussion.—Specimens are available from three localities in Korea. Although there are apparent differences between individuals, all specimens are believed to represent only one species. For example, one specimen from Amsa lacks the notched propodosomal plate, but it agrees within the known limits of individual variation in other details.

The holotype and 1 paratype were taken from under stones at Seoul, Korea, May 27, 1953 by Ted Tibbetts. Additional specimens, including 2 immatures, were taken at Seoul, May 27, 1953; 2 immature specimens were collected 8 miles S.E. Seoul, July 23, 1953; 1 specimen was found in moss and lichens at Osan, Feb. 17, 1953; and 1 specimen from cedar and oak litter at Amsa, August 15, 1953.

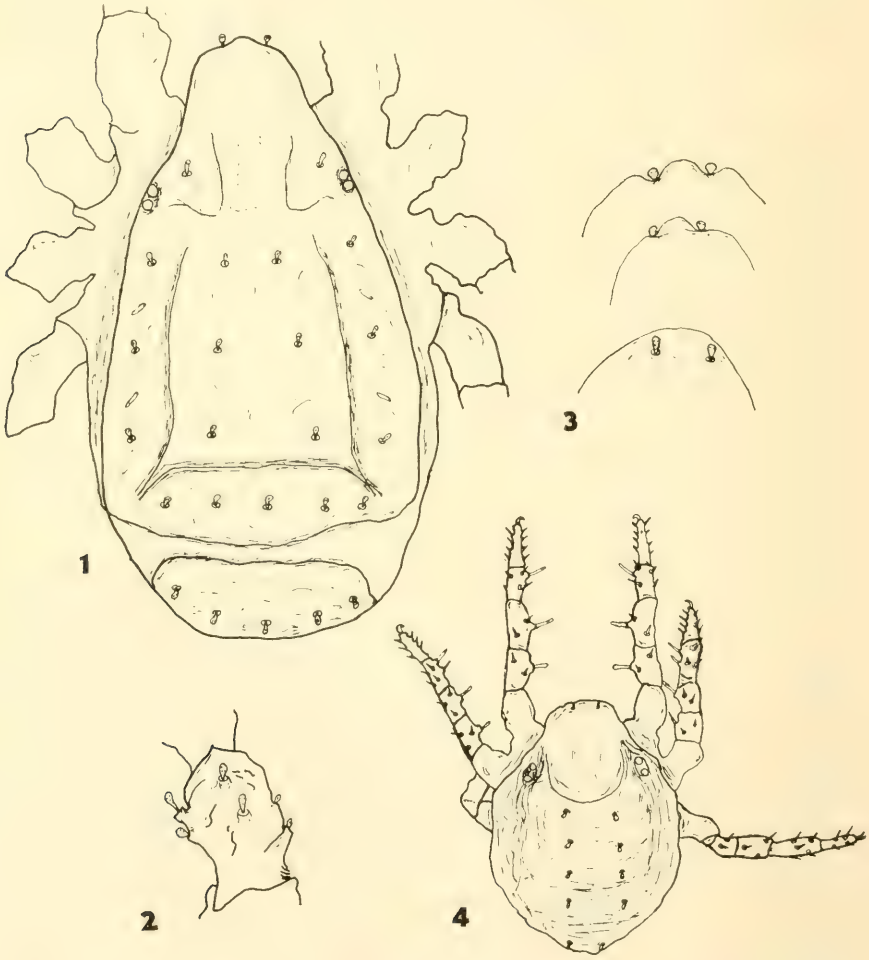


Fig. 1, Dorsal view of adult, *Caeculus tibbettsi* n. sp.; fig. 2, dorsal view of right trochanter I.; fig. 3, variation in the anterior edge of the propodosomal plate; fig. 4, dorsal view of larva.

A NEW SPECIES OF LITARACHNA FROM THE BRITISH WEST INDIES (ACARINA: PONTARACHNIDAE)[1]

DAVID R. COOK, *Department of Biology, Wayne State University, Detroit, Mich.*

While studying the parasites of gobiid fishes at the Lerner Marine Laboratory of the American Museum of Natural History, Bimini, B.W.I., during December 1955, Dr. Dominic L. DeGiusti collected specimens of the mites described in this paper. A marine hydrachnid was found in the digestive tract contents of two fishes belonging to the genus *Bathygobius*. Each was so freshly swallowed that they were still moving about. These two mites, a male and a female, belong to a new species of *Litarachna* distinct enough to necessitate establishing a new subgenus. They are the first members of the family Pontarachnidae recorded from eastern North America. A species belonging to a related genus, *Pontarachna cruciata*, was described by Hall (1912) from beach pools in the Laguna Beach area of California.

Genus **LITARACHNA** Walter

Litarachna Walter, 1926. Internatl. Rev. Ges. Hydrobiol. Hydrogr. 14: 32.
Generotype.—*Litarachna communis* Walter.
Generic diagnosis.—Soft bodied, dorsum without sclerites; capitulum opening ventrally, without a rostrum; posterior apodemes of capitulum broadly spreading; chelicera typical of Hydracarina in general, not styletlike; coxae directed posteriorly, fourth coxae widely separated; fourth coxae with a pair of long narrow projections that flank the genital field; genital acetabula absent; glandularia located between the projections of the fourth coxae with two gland openings and an associated seta; legs without swimming hairs; marine.

Subgenus **PARALITARACHNA**, new subgenus

Subgenerotype.—*Litarachna* (*Paralitarachna*) *degiustii*, new species.
Subgeneric diagnosis.—Differs from *Litarachna s.s.* (and all other known members of the family Pontarachnidae) in having the first pair of coxae fused in the midline.

LITARACHNA (PARALITARACHNA) DEGIUSTII, new species (Figs. 1-6)

Female.—Length of body approximately 302μ; length between anterior end of the first coxae and posterior end of projection from the fourth coxae 183μ; first coxae fused in the midline, apodemes between the first and second coxae distinct along the full length; with a moderate-sized, V-shaped identation at the posterior end of the first coxae; first coxa with two setae lateral to the capitulum and one seta posterior to the capitulum; second coxae touching each other; apodemes between second and third coxae distinct only in the anterior half; second coxa with two setae in the anterior portion and a single seta located slightly posterior to

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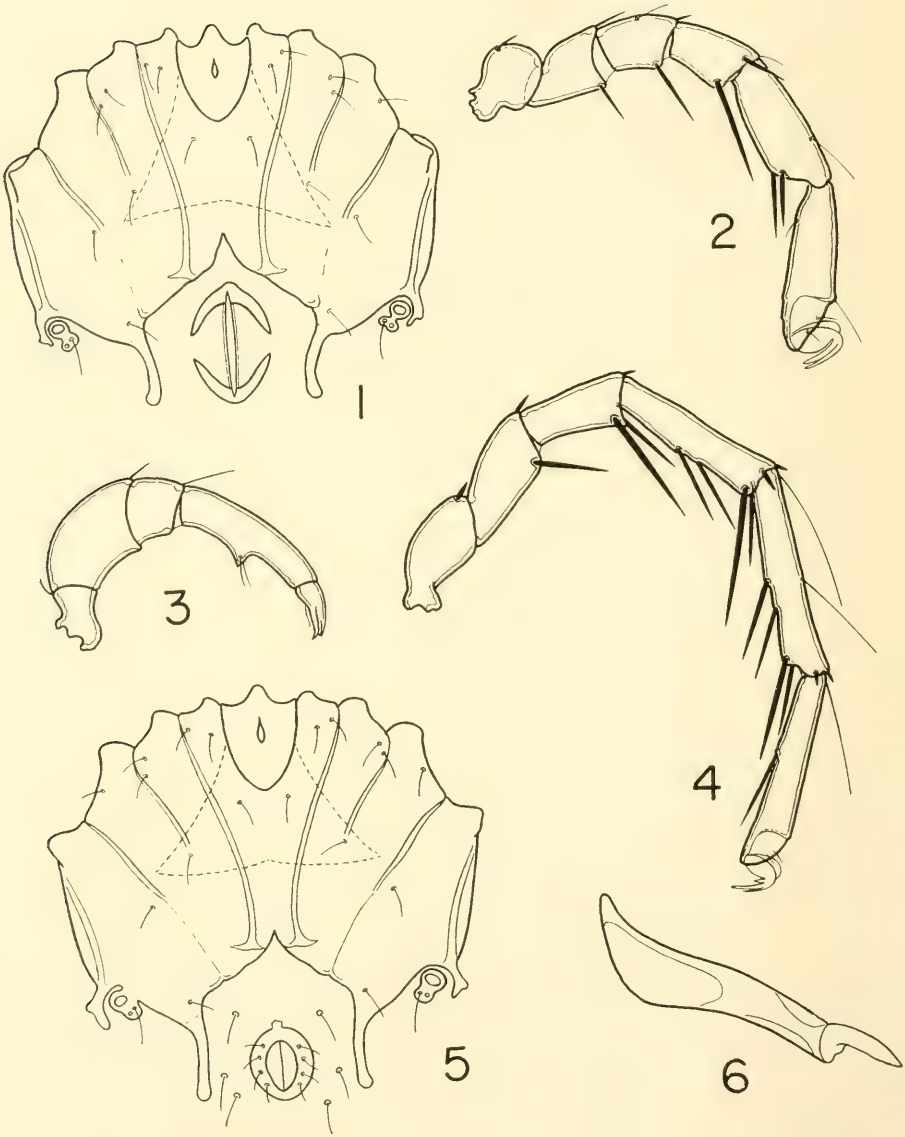
[1] Contribution from the Department of Biology, Wayne State University.



Litarachna (*Paralitarachna*) *degiustii*, new species: Fig. 1, Ventral view, female; fig. 2, first leg, female; fig. 3, palp, male; fig. 4, fourth leg, female; fig. 5, ventral view, male; fig. 6, chelicera, male.

the apodeme between the second and third coxae; apodemes between the third and fourth coxae distinct in the anterior half and again at the very posterior end; posterior projections from the fourth coxae approximately 40μ in length, these forming a genital bay that encloses the genital field; lateral surface of the fourth coxae with a shorter projection that partially surrounds the glandularia; glandularia constricted near middle, with one portion bearing a seta and the smaller gland opening, and the other portion bearing the large gland opening.

Genital field, 59μ in length, 40μ in width, consisting of pre- and postgenital sclerites, these not bearing setae; neither genital acetabula nor acetabular plates present; setae not present in the area between the projections of the fourth coxae and the genital field; capitulum 40μ in width at the anterior end; length between anterior end of the capitulum and the posterior end of the capitular apodemes approximately 95μ; capitular apodemes broadly spreading; dorsal lengths of the palpal segments were: P-I, 17μ; P-II, 71μ; P-III, 24μ; P-IV, 80μ; P-V, 26μ; P-IV with a setae-bearing projection on the ventral side similar to that found in *L. duboscqi* Walter; P-V relatively short.

Legs without swimming hairs; dorsal lengths of the segments of the first leg were: I, 38μ; II, 30μ; III, 34μ; IV, 40μ; V, 61μ; VI, 76μ; segments of the first leg relatively stocky, chaetotaxy shown in figure 2; lengths of the segments of the fourth leg were: I, 58μ; II, 45μ; III, 52μ; IV, 83μ; V, 92μ; VI, 99μ; segments relatively thin, chaetotaxy of fourth leg shown in figure 4. *Male*—Length of body approximately 272μ, length between anterior end of the first coxae and the posterior end of the projection from the fourth coxae 192μ; first coxae fused in the midline; apodemes between the coxae similar to those of female except that the first pair are closer together; glandularia similar to those of female except that they are not greatly constricted in the middle.

Genital field, not including small projection from anterior end, 31μ in length, 29μ in width; genital field consisting of a sclerotized ring bearing four pairs of setae; genital acetabula and acetabular plates absent; with three pairs of setae between the projections of the fourth coxae and the genital field; capitulum 35μ in width at the anterior end, similar to that of female; legs and palps similar in shape and chaetotaxy to those of the female; lengths of the palpal segments were as follows: P-I, 17μ; P-II, 66μ; P-III, 23μ; P-IV, 78μ; P-V, 26μ; dorsal lengths of the segments of the first leg were: I, 33μ; II, 29μ; III, 35μ; IV, 41μ; V, 65μ; VI, 78μ; lengths of the segments of the fourth leg were: I, 52μ; II, 44μ; III, 50μ; IV, 78μ; V, 90μ; VI, 98μ; length of chelicera 159μ; distal half of the end segment of the chelicera minutely serrate.

Types.—Holotype female, collected by Dominic L. DeGiusti near the Lerner Marine Laboratory, Bimini, B.W.I., during December 1955. Allotype male, same data. Both types will be placed in the Chicago Natural History Museum.

Habitat.—Both mites were recovered from the digestive tract of gobiid fishes collected in relatively shallow water (less than 1 meter) over a bottom composed of a mixture of sand and mud. The lack of swim-

ming hairs on the legs would suggest that these mites are very weak swimmers at best, and spend most of the time on the bottom.

Remarks. *Litarachna degiustii* may be easily separated from all other members of its genus by the possession of fused first coxae. The present species seems to be most closely related to the Mediterranian species, *L. duboscqi* Walter. The palpi of these two species are very similar, having a short fifth segment and a projection on the ventral side of the fourth segment. The genital field is rather similar in both cases.

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BOOK REVIEW

A REVISION OF THE GENUS PSELAPTRICHUS BRENDEL (COLEOPTERA: PSELAPHIDAE), by Robert O. Schuster and Gordon A. Marsh. University of California Publications in Entomology, University of California Press, vol. 11, no. 2, pp. 117-158, 74 figs., 5 maps. 1956. $1.00.

This paper represents a discerning, well expressed taxonomic and distributional account of a genus of beetles which until recently has been nearly overlooked. A combination of several factors are combined in it, creating a noteworthy endeavor in the field of modern systematic entomology.

First, the authors' efforts in collecting and preparing these beetles for study is no small achievement, for the members of the genus are very small creatures (the average length being about 1.50 mm.) which are found only in the accumulated litter of the forest floor. That the beetles are difficult to collect and tedious to study is, I think, best exemplified by the fact that of the thirty-two species now included in the genus, all but three were described either in this paper or in a previous one by these two men.

Next, the data are employed to their fullest extent and are interpreted in terms of present-day theories of systematics. Of special interest, in my opinion, is the section pertaining to speciation and distribution, where the authors' ideas concerning species formation, ecological factors governing distribution, and phylogeny of these beetles are discussed in an appropriately conservative manner.

Lastly, the completeness of the illustrative material appears exceptional. Over seventy figures are presented, which permit the easy comparison of many of the morphological structures which have been employed in the key and descriptions. In addition to these, maps are included which depict the collection localities for each species and which in many instances also indicate the probable range of the species—JEROME G. ROZEN, JR., *Entomology Research Branch, U. S. Department of Agriculture, Washington, D. C.*

BIOLOGICAL NOTES ON AMPULICOMORPHA CONFUSA ASHMEAD AND ITS FULGOROID HOST

(HYMENOPTERA: DRYINIDAE AND HOMOPTERA: ACHILIDAE)[1]

JOHN COLBURN BRIDWELL[2]

Forty-three years ago W. H. Ashmead (2) described a small, blackish winged wasp in the U. S. National Museum from California as *Ampulicomorpha confusa* as the unique North American representative of the peculiar tribe Embolemini in the family Proctotrypidae. After describing this insect he added that he had seen another individual of the species from Nevada in the collection of the American Entomological Society. There seems to be no record published of this species having been taken since, but there is another specimen with the type in the National Museum taken by W. F. Fiske in North Carolina. It was not until 1924 that any further record of the presence of the Emboleminae in our country was published. C. T. Brues (3) described a species of the wingless genus *Myrmecomorphus* as *Pedinomma nearcticum* from one individual from near Boston and another from Long Island. In the U. S. National Museum there are three individuals belonging to this genus which seem to represent three species. One of these from near Boston probably represents Brues' species. Another was taken by A. H. MacAndrews in North Carolina, and the third was taken by Pergande in Mexico. Besides these American Emboleminae, the U. S. National Museum has a specimen of *Embolemus ruddii* Westwood and some specimens of an undescribed *Embolemus* from Java. These peculiar insects have been but rarely taken in Europe and the limits of variation have not yet been established. Seven nominal species are recorded: two in *Embolemus*, supposedly winged males, and four in *Myrmecomorphus*, wingless males and females. None of these have been taken in series except *Embolemus ruddii*. A single species of *Myrmecomorphus* has been described from Chile. The biology of these insects has remained entirely unknown until the summer of 1936, when it became my good fortune to encounter *Ampulicomorpha* and to learn the main facts of its life history.

On April 13, 1936, while examining some rotten oak logs near the locally well-known Gravelly Spring, about two miles east of Vienna, Virginia, a white oak log covered with a small shelf fungus was found to support many insects of various orders and a small winged, blackish wasp was seen to run swiftly over the surface of the bark and hide

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[1] Published posthumously. See Mr. Bridwell's obituary, p. 27.—Ed.

[2] In November 1954, Mr. Bridwell gave five unfinished drafts of this manuscript to G. B. Vogt, Entomology Research Division, USDA, to prepare for publication. The work might otherwise have been destroyed in a fire, along with numerous other papers, in Mr. Bridwell's home in 1955. Of the five drafts, the third was selected for publication as the most complete; it is modified only in those portions enclosed in brackets [ ] by slight changes of wording or insertion of excerpts from the other drafts. Unused taxonomic notes, all unfinished drafts, and the specimens used in this study are deposited in the U. S. National Museum. Mr. Bridwell made brief reference to the findings presented herein in 1937 (1).

among the fungi. This was captured and on examination it proved to be an *Ampulicomorpha,* which had no appreciable characters to distinguish it from the type of *Ampulicomorpha confusa* Ashmead. On April 23, while examining some pine logs (*Pinus rigida* Mill. and *P. virginiana* Mill.) in a similar condition of decay and bearing shelf fungi, two other individuals of *Ampulicomorpha* were seen and one of them captured. These logs lay on the ground in the space between the tracks of the Washington and Old Dominion and Arlington and Fairfax Railroads, a little west of the place where they cross each other about one mile east of Vienna.

Careful re-examination of the logs in both stations showed some firm, half ellipsoidal cocoons firmly attached to the wood beneath the loose bark and covered with the debris from the adjacent surface, but unfortunately those found no longer contained living contents, the adults having emerged. They were, however, as was subsequently learned, the cocoons of these wasps. Careful consideration of the insects seen upon these logs made it clear that the only insects common to the pine and oak logs which seemed likely to be the prey of the wasps [were] some fulgorid nymphs found on both. When these were submitted to P. W. Oman he told me that they must be nymphs of some achilid (Fulgoroidea) species, presumably *Epiptera* or *Catonia.* Subsequent rearing showed the nymphs upon the pine logs to be those of *Epiptera floridae* (Walker) while the nymphs from oak were not distinguishable.

These nymps occur in small colonies beneath the loosened bark of oak and pine logs in close association with white sheets of compacted fungus hyphae, and each nymph bears on each side of each of the three tergites before the pygofer a subquadrate glandular area which secretes numerous fine, straight threads of "wax" which are fragile and easily detached and the location of each of the colonies may be recognized even after the insects are gone by the fibers remaining.

It was not until August 16 that *Ampulicomorpha* was again encountered. [On the pine logs an adult was found very near one of the still problematic cocoons with an emergence hole. Other cocoons with living contents were found in places where the former presence of the fulgorid nymphs was indicated by the wax strands. Still others were associated with the nymphs themselves, which were rapidly transforming to adults. But I did not then or subsequently find any remains of nymphs which indicated the method of attack by the wasps upon them. On this and subsequent visits up to August 27, more than 20 viable larvae and pupae were found in cocoons. Also, some adults were taken in the open, so that altogether some 10 adults were secured. On August 18 it was discovered that the females were winged, and with difficulty were distinguishable from the males.]

From this material, it was possible [by September 2, when the last wasp died] to follow out the biology of the species and to learn that it is in all essential particulars a dryinid biology.

The *Epiptera* nymphs, as stated, live in close association with hyphal sheets of fungi and when placed in confinement with the host material on bits of bark, they run about briskly until they find a favorable position where they may remain quiescent for long periods of time. When disturbed or startled, they make a single leap, which in the open may project them a distance of several inches. When an adult female *Ampulicomorpha* was placed in a glass tube with these nymphs a great commotion ensued and continued for several minutes. The wasp, her long antennae held at right angles to her body, ran rapidly in pursuit of the running nymphs and these, when closely pressed, jumped but often too late. Often the pursuit was too rapid to be followed by the eye, but soon a nymph would be seen firmly gripped by the wasp. Once seized, the nymphs were unable to dislodge the wasp, and the wasp would be seen with its head on the upper side of the body of the nymph in the space between the wing pads and the body disposed across the body of the nymph, and the abdomen of the wasp bent down and firmly pressed against its ventral surface, stinging at a point near the mid-ventral line behind the hind leg. In some cases, when more than one wasp was placed in a tube, two females attacked the same nymph on opposite sides. In no case was an external egg seen.

The *Epiptera* nymphs transformed so rapidly that when the *Ampulicomorpha* adults were available only a few nymphs were present. What at first seemed a series of unfortunate accidents was [further] reducing the scanty material at hand. Several nymphs were seen wounded on the middorsal line where the integument is destined to split in ecdysis. Not until the last available female made the last observed attack was this explained. In this case I was able to see the wasp gnaw away at the middorsal line of the nymph until the body fluid began to ooze forth, upon which the wasp fed.[3] In the other attacks observed, which lasted perhaps from three to five minutes, the wasp was vigorously engaged in stinging and ovipositing. The nymphs, after being released, seemed none the worse for the attack and walked off about their affairs as if nothing had happened. None of the earlier observed attacks resulted in the development of any larvae, and it seemed this part of the story would not be secured, but after the last female had died one of the nymphs, perhaps four or five days after being placed with the wasp, showed a translucent, rounded mass under the wing pad, which increased in size for three or four days, remaining colorless, and then managed to complete its feeding and cocooning, while not under observation and these details were not seen. The larva, however, died without completing its transformation and was devoured by a mite. [It is pointed out that similarly in other Dryinidae the egg is inserted within the body of the prey and the resulting larva emerges into a larval sac beneath the

[3] [R. C. L. Perkins (4) in his observations of the dryinid *Echthrodelphax* states that under unnatural conditions such as the confinement of a small jar or glass tube, and probably under the pressure of hunger the wasps attack their leafhopper hosts frequently killing them outright and to some extent devouring them.]

wing pad and after some days of growth entirely devours the body contents and then leaves the empty skin of the host to cocoon elsewhere.]

After a female *Ampulicomorpha* was placed in a tube with nymphs of *Epiptera* and some attacks upon the nymphs had been made, the commotion soon died down and wasp and nymphs became quiet, moving about only when disturbed. With the addition of fresh nymphs to the tube, the same commotion and attack would be renewed, followed again by quiet. While very few nymphs besides the preadult instar were available for use, it seemed that these were preferably attacked when present. In no instance did the wasps show any interest in adults of *Epiptera* present with them. While these experiments were going on, a species of *Catonia*, the other achiliid genus in the local fauna, was bred and on two or three occasions nymphs of *Catonia* were placed with the *Ampulicomorpha*, which showed no interest in them. It is desirable, however, that this matter should be further investigated since it is not quite certain that these may not sometimes be attacked.

The cocoons collected were placed in separate tubes for rearing, and when newly emerged males and females were placed together copulation resulted immediately, with almost no preliminary courting, and continued for some minutes. Thereafter the sexes seemed indifferent to each other but the addition of fresh males would result in renewed mating.

When males were placed in tubes with cocoons, they showed no interest in them, differing in this conspicuously from the males of the bethylid genus *Sclerodermus*, (studied some years ago), which would force their way into the unopened cocoons and mate with the young females within (5). Unlike that genus the cocoons remain intact after emergence, except for the opening through which the adult escapes.

While the *Ampulicomorpha* cocoons are often found in groups with a colony of *Epiptera*, they are never placed in cocoon masses such as are common among the bethylids, each one being formed separately and entirely distinct from the others, even when touching.

The pupae of *Ampulicomorpha* lie in the cocoons with the dorsum against the substratum so that the mandibles of the developing adult lie in contact with the wall of the cocoon, a little before its end and in emerging the adult itself unaided gnaws out an emergence hole and escapes with none of the subsocial behavior of *Sclerodermus*.

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JOHN COLBURN BRIDWELL, 1877-1957

John Colburn Bridwell was born at Pella, Texas, September 23, 1877, and died near Culpeper, Virginia, August 9, 1957. Of the Bruchidae, or seed beetles, he became the leading scholar of his time, and he also contributed significantly to our knowledge of other insect groups, especially the aculeate wasps. From 1920 until 1943 he was a member of the Entomological Society of Washington, and during much of that period he was located at the U. S. National Museum. He was an unusual entomologist, endowed with tremendous enthusiasm for natural history, remarkably well schooled in fundamentals and the early literature of his group, very well informed on botanical matters, and a keen observer and indefatigable collector in the field.

Bridwell's paternal ancestors were English; his great-grandfather, Strother Bridwell, moved westward from Stafford County, Virginia, in the middle 1700's. His mother's people were Scotch-Irish and Dutch; they too came to America at an early date, and their descendants still live in eastern Massachusetts. William Wallace Bridwell, a circuit-riding Methodist minister, was father of the future entomologist, who was born in a frontier home at Pella, in northern Texas, not far from the Chickasaw Nation in what is now Oklahoma. He had six brothers and one sister. The family moved to Baldwin, Kansas, site of Baker University, when Bridwell was only four to five years old. He was graduated from Baker with a degree of B.S. in the Class of 1900. In 1899 he published his first paper, a list of Kansas Hymenoptera. As a boy he had suffered an injury to his leg, when a gun went off in a spring wagon while on a hunting trip. This made him lame all the remainder of his life and may have been partly responsible for his spending time in the quiet pursuit and observation of

insects as a young man, thus determining his career. It may also have helped to shape his personality, giving him an independence and a distaste for routine work patterns.

The chronology of Bridwell's professional affiliations after leaving Baker University, and prior to going to Hawaii in 1913, is as follows: Fellow, Ohio State University, 1901-1902; Assistant to State Entomologist, Georgia, 1902; Federal employee on tobacco stalk weevil (*Trichobaris*) at Willis, Texas, March-July, 1903; instructor in Zoology, University of New Hampshire, 1903; Fellow, Massachusetts Agricultural College, 1906; Professor of Biology, Pacific College (Oregon), 1907; instructor in Zoology and assistant entomologist, Oregon State College, 1907-1911; instructor in Entomology, University of California (Berkeley), 1911-1913. Some of the positions were held for brief periods. He remained in New Hampshire at least until the spring of 1904, as shown by the record of *Ctenothrips bridwelli* Franklin, which he collected at Dover, N. H., April 11, 1904. While in Massachusetts he identified many Hymenoptera in the College collection, and he was closely associated with Dr. H. J. Franklin, who was actively studying bumblebees, and with Dr. E. A. Back, who later was with him in Hawaii and who became his supervisor in the Bureau of Entomology.

In 1913 Bridwell was appointed Assistant Superintendent, Division of Entomology, Board of Agriculture and Forestry, Territory of Hawaii. He arrived in Honolulu about June 3, 1913, about two weeks after the arrival of Dr. Filippo Silvestri, who, since the previous July, had been on a trip to Africa in search of parasites which it was hoped would contribute to the control of the Mediterranean fruit fly and the horn fly. His work on the program of rearing and releasing parasites began June 8, and he had the advantage of spending a few days with Dr. Silvestri. During the summer he assisted David T. Fullaway in the rearing activities, and during October 1-December 31 was in charge of the program, aided by a crew of three to five workers. The magnitude of the program is indicated by the published figure of 92,658 parasites (4 species) which were reared during October-December, and the total of 99,376 parasites (5 species) which were liberated in the period June 1-December 31, 1913.

In May 1914, Bridwell and Fullaway left Hawaii for Olokomeji, Nigeria, for the special purpose of obtaining *Tetrasticus giffardianus*, a parasite which Silvestri had discovered the previous year, but which did not survive the trip to Hawaii. They soon found it and other parasites, and Fullaway departed with them for Honolulu. Bridwell remained in West Africa to collect specimens of the rich fauna, and within a few months made a large collection. However, he contracted a serious case of malaria and went to South Africa to be hospitalized. After recovering, he made further collections, made an extended stop in Australia for additional field work, and finally returned to Hawaii late in 1915.

Early in 1916 Bridwell left the employ of the Board of Agriculture and Forestry, spent some time working privately at the Experiment Station of the Hawaiian Sugar Planters' Association, and late in the fall was appointed to the staff of the Bishop Museum as an assistant to O. H. Swezey, Honorary Curator of Entomology. A primary task was to aid in the arrangement of the Helms Collection, recently obtained from Australia, but an accident disabled him so that little was accomplished that year. By 1918 he had returned to private research and was studying Bruchidae with great enthusiasm. This specialty led to his employment, November 20, 1919, to February 1, 1920, by the Union Feed Company of Honolulu, to study the insects, mainly bruchids, attacking algaroba beans.

In January 1920 Bridwell was appointed as a specialist on Bruchidae and their parasites by the Bureau of Entomology, and in the late spring of that year went to Washington to undertake the study of the family, thus beginning his long association with the U. S. National Museum. In December he went to Texas to collect and ship bruchid parasites to Hawaii, and from then until he left the Bureau in early 1924 he divided his time between the Museum and the field.

Bridwell left for India in August 1924 and remained there until 1927, engaged in a business partnership based on the exportation of cashew nuts. His time, except for side trips, was mainly divided between Portuguese Goa and the vicinity of Bombay.

Following his return to Washington in 1927, Bridwell did private research, mainly on bruchids, at the National Museum until he left the Washington area in March 1944. During part of this period he was aided by a private cooperator interested in supporting research on bruchids. While working at the Museum Bridwell lived in several communities, mainly in Virginia, and twice his residence burned. After leaving the Museum he lived about two years at Hillsboro, Virginia, then at Culpeper for about a year, and finally he lived alone in a small country house at Lignum, Virginia, from May 1947 until it burned in December 1955. While there he assembled a few notes for publication, but suffered the loss of nearly all remaining unpublished notes, of which there were many, in the fire. In the spring of 1956 failing health forced him to enter a home for the aged. Following his death and cremation, the ashes were scattered in a woodland area of natural beauty, at Cabin John, Maryland, in accordance with his wish.

Surviving relatives include a daughter, Juliet, in Washington, D. C., and seven granddaughters, also two brothers, Arthur in Baldwin, Kansas, and Robert in Cleveland, Oklahoma. On November 11, 1912, at Ukiah, California, Bridwell married Miss Juliet Greer, who was President of her class at Vassar College, and was Dean of Domestic Science and Art at Oregon State College, when they met. Mrs. Bridwell continued some teaching, both in Hawaii, where their daughter was born in 1918, and in New York City during her husband's

early years in Washington. She shared many travels with him, joining him in India in 1925, and meeting him in Australia on his return from Africa. In Australia his collecting ventures in unexplored areas led to long absences, and after one such occasion he and Mrs. Bridwell sat in their hotel in Sydney and read in New York and San Francisco newspapers that he had been lost in the bush! She died December 12, 1942, when the family was living at Vienna, Virginia, near Washington, D. C.

During his residence in Honolulu, Bridwell was a member of the Hawaiian Entomological Society, and he was elected Secretary-Treasurer for 1914, but was able to serve only briefly because of his departure for Africa. He was very active in the presentation of notes at meetings, and they may be consulted in the Proceedings, volumes 3 and 4. Later he became active in the Entomological Society of Washington. Abstracts of the notes given by him there appear in volumes 10-13, 15 and 19 (1920-23, 1925, 1929) of the Journal of the Washington Academy of Sciences (pages carrying reports of Entomological Society meetings shown in Contents at end of each volume), and in the Proceedings of the Entomological Society of Washington, volumes 35-37, 39, 44, and 46 (1933-1944). Among notes dealing with bruchids, the following merit special mention: Jour. Wash. Acad. Sci. *12:* 464, 467, 1922; *13:* 261-262, 1925; *15:* 80, 1925; Proc. Ent. Soc. Wash., *37:* 185, 1936; *46:* 23, 1944.

A great many unusually valuable specimens deposited in the National Museum, mostly in Bruchidae, Chrysomelidae, Curculionidae, and Hymenoptera, attest Bridwell's remarkable observational ability through their significant associated biological information. For many years he cooperated closely with the late H. S. Barber, not only in the acquisition of notes on the habits and relationships of various beetles, but on the intricacies of their nomenclature as well. He always retained a deep interest in Hymenoptera. In 1936 he discovered in Virginia, for the first time in the United States, the ant *Anergates*, a social parasite of another ant, *Tetramorium*. In the middle and late 1930's he worked out the unusual biology of the previously little known primitive sawflies of the genus *Xyela*, and studied their parasites of the genus *Idiogramma* (formerly *Lysiognathus*) (reported in notes, and by Cushman, Jour. Wash. Acad. Sci. 27: 438-444, 1937). He was proud that standard reference works, such as Clausen's Entomophagous Insects, contained references to his pioneer work with wasps in Hawaii.

Bridwell's life was plagued by misfortunes, the accidents and fires already mentioned, and also by his own fertile mind that seemed ever to beckon him along the untrodden paths of new investigations before the results of the previous ones were written. It is a pity that an entomologist of his great and proven ability did not publish more, yet his published record and the assembled material resulting from his collecting and observations are marks of long-lasting accomplishment.

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GEORGE B. VOGT

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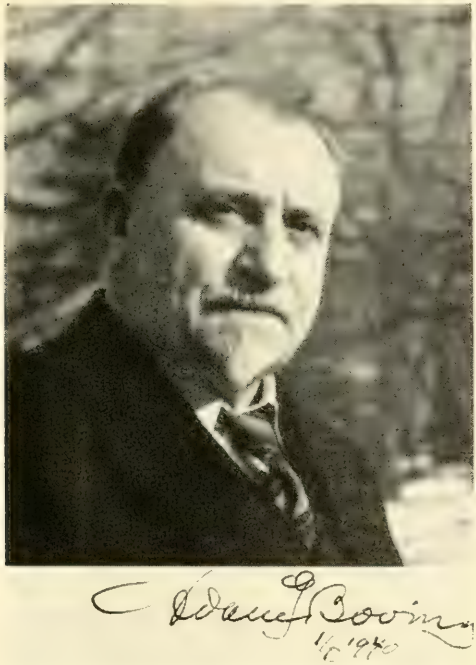

Adam Giede Böving
1869-1957

Adam Giede Böving, internationally known specialist on beetle larvae, died at his home, 221 Rock Creek Church Road, Washington, D. C., on March 16, 1957, in his 88th year. His death was preceded by two short bouts of illness caused first by heart failure and then circulatory difficulties from which, however, satisfactory recovery was being made. His passing was peaceful, the result of a second thrombosis.

Born in Saby, Denmark, July 31, 1869, he was the son of Niels Orten Böving, a Lutheran minister. Because the income of a country minister must have been extremely modest, Adam and his two brothers and three sisters knew the necessity for frugality early in life. It was at considerable sacrifice by the rest of the family that Adam was encouraged in his intense desire to follow scholarly pursuits. After the required preparatory education, including six years in Latin school, he entered the University of Copenhagen in 1888.

He lived at the home of a wealthy uncle during the first two years at the University, but moved to less pretentious quarters, where he found living under more difficult economic conditions more satisfying, since his pursuit of knowledge was not interrupted by so many social

diversions. He supported himself by teaching courses in botany and zoology in a school for boys and a school for girls. He enjoyed teaching very much and continued for years afterwards, even after he had completed his education and obtained a position at the Zoological Museum.

At the University, Böving came under the influence of Professor Frederik Meinert, and in later years he fondly referred to Meinert as "my old teacher." Meinert had considerable acquaintance with immature insects and it is very likely that he influenced Böving's choice of the subject for his dissertation. The chrysomelid genus *Donacia*, larvae of which live on aquatic plants below the water level, was the subject of his thesis research. Careful observations on the biology and the intricate adaptations to submerged living, coupled with a painstaking study on anatomy, led to a dissertation of outstanding merit. Much of the information was gathered while Adam "lived with" the insects at a small lake, Furesöen, where Professor Wesenberg Lund maintained a summer laboratory. Böving defended his thesis successfully and received the degree of Doctor of Philosophy in 1906. Before he completed his formal education he had an official status at the Royal Zoological Museum, and after he received his degree he continued as Assistant Curator of Entomology until he came to the United States.

During the winter of 1907-08, Dr. Böving studied the collections of beetle larvae at Paris, London and Cambridge. He had many pleasant experiences there and was greatly stimulated through acquaintance with several leading scientists in those entomological centers. While still at London, in the spring of 1908, he was asked to join a Danish expedition that was organized to study the geology and biology of Southeastern Iceland. The report of the trip formed the basis, years later, for his address as retiring President of the Entomological Society of Washington.

In 1903, Dr. Böving married Paula Brönnum. Eight years later his wife became ill and died shortly thereafter from tuberculosis.

From 1906 to 1913 Böving broadened his knowledge of coleopterous larvae, and the background obtained during those years prepared him for the breadth of his later understanding of the problems presented by those larvae. It was also during this period that he produced a significant contribution to the basic information on adult Coleoptera: a study of the musculature of male genitalia of dytiscids.

The circumstances through which Dr. Böving knew of the possibility of a position in the United States Bureau of Entomology are obscure. At any rate Böving came to the United States and received a conditional appointment, effective April 1, 1913, as "Expert" in the Bureau of Entomology. Böving was not loathe to leave Denmark for the larger United States. He felt that there was greater opportunity to carry on research in his chosen field, and he greatly admired L. O. Howard. Furthermore he was too able a man to remain Assist-

ant Curator at the Copenhagen Museum, but the position of Curator, to which he had aspired, was not available to him.

He found life and associations pleasing in this country and felt so strongly about the desirable features of the United States that he was able to convince Anna Christensen that she should leave Denmark and join him here. She came in 1916 and arrived at New York after being on board ship for 18 days. The Bövings were married in New York and then proceeded to Washington. Shortly thereafter they bought the house on Rock Creek Church Road that was to become their home. Böving became a citizen of the United States in 1918, and continued in the Department of Agriculture until his retirement at the end of July 1939. At that time he held a position as Senior Entomologist.

Even though retired he was actively involved in research on larvae and imagines of the scarabaeid genus *Phyllophaga*, sponsored jointly by the American Philosophical Society and the National Academy of Sciences, reported in 1942 as Memoir No. 2 of the Entomological Society of Washington. During World War II he was prevailed upon to reenter Government service and was reinstated effective June 1, 1942. Although in his 73rd year he was in good health and was able to work the six-day work week required during the war years. His reinstatement continued almost three years before he again retired, April 30, 1945. While he was reemployed, Dr. Böving spent a month (February, 1944) on the Texas-Mexico border with personnel of the Division of Foreign Plant Quarantines. It was one of the pleasanter trips of his career for he had an opportunity to pass on to the inspectors a part of the vast fund of knowledge he possessed and to train them to make identifications of the more commonly intercepted beetle larvae.

When Böving came to the United States he found a great deal to interest him in the collections of the National Museum. Numerous larvae were available for study, larvae collected by Hubbard, Schwarz and Barber in their foresighted realization of the importance of larvae to a knowledge of insects. Furthermore, Böving was most closely associated with entomologists who were concentrating on forest insects and who were rearing and conducting field studies on many species of insects, under the direction of A. D. Hopkins. From those rearings a large amount of material accumulated, much of it representing groups the larvae of which were previously unknown. In later years these collections were augmented significantly by gifts and exchanges which were arranged in large part by Dr. Böving. The National Museum contains many larvae sent from Denmark, especially by J. P. Kryger, and that fine material attests the long friendship and mutual respect of the two men. Other important exchanges were arranged with such outstanding students of beetle larvae as van Emden in England and Gardner in India. In the United States also, respect for Böving resulted in the deposit at the Museum of important material from Keifer, Ritcher, Glen, etc.

Dr. Böving must have brought with him from Denmark the idea of separating the larger groups of Coleoptera on the basis of larval characters. It was not long after his arrival that he and F. C. Craighead began working together on such a project. Later they received active assistance from St. George, Hyslop, and others. The masterful Synopsis of the Principal Larval Forms of Coleoptera was completed in the middle 1920's and was published by the Brooklyn Entomological Society, with a personal subsidy from Böving, in four parts in 1930 and 1931.

There can be no doubt of the stimulating effect that the Synopsis had on the study of beetle larvae in the United States as well as in other countries. For the first time a serious effort to arrange the larvae of this major order of insects in a natural or nearly natural system was successful. No attempt was made by the authors to develop any startling changes in the existing classification of the Coleoptera. Some changes were imperative, however, and subsequent reexamination of the adults has proved them justified. The desirability of additional changes was indicated in places as a guide to workers on adult Coleoptera that the existing arrangement should be reviewed.

Before, as well as after, the appearance of the Synopsis, Dr. Böving published many important papers dealing with large families of Coleoptera or important groups within families. The breadth of interest and facility with which these various problems were approached and handled demonstrate his remarkable abilities. After retirement he continued his very active interest in these researches and produced a monumental work on larvae of the Anobiidae. At the time of his death he was studying larvae of the Nitidulidae. He had completed careful drawings of the available genera, developed a key to them, and had hoped to include a diagnosis for each genus. His excellent drawings and the manuscript notes will be prepared for formal publication.

Dr. Böving's stature as a scientist was widely recognized in this country and various countries in Europe. He was an honorary member of several of the numerous scientific societies to which he belonged. European societies with which he was affiliated include the following:

Zoological and Botanical Society of Finland (Correspondent)
Entomological Society of Finland (Correspondent)
Entomological Society of Denmark (Honorary Member)
Danish Natural History Society (Correspondent)
Entomological Society of Stockholm (Honorary Member)
Royal Danish Academy of Sciences and Letters

He was a member of the following societies in the United States:

Washington Academy of Sciences
Entomological Society of Washington (Honorary Member)
Society of Sigma Xi—District of Columbia Chapter (Honorary Member)
Biological Society of Washington (Life Member)

Brooklyn Entomological Society (Honorary Member)
Entomological Society of America (Honorary Fellow)
Academy of Natural Sciences of Philadelphia (Correspondent)
American Association for the Advancement of Science

He was appointed as an Associate in Zoology by the Smithsonian Institution in 1939.

One of the finest honors paid Dr. Böving was his designation as a Knight of the Order of Dannebrog, conferred on him in 1927, and in 1949 he received the more imposing title of Commander in the same Order. It is probable that the fact that he was born in Denmark had some bearing on his being so honored by the Danes. However, the decisions to confer the honors were undoubtedly based on a recognition of Dr. Böving's contributions to entomology and demonstrate the importance attributed to scientific accomplishments by the Danish Government. The honor was, further, a recognition of his help to many visiting Danish scientists by making their trips to the United States more pleasant and profitable.

His scientific stature was again recognized by Danish scientists in 1934. At that time he and his family were invited to make a trip to Denmark where he delivered a series of lectures on the organization of entomological research in the United States. He also had an opportunity to discuss the classification of beetle larvae with scientists from Denmark and other European countries.

Dr. Böving is survived by his wife, Anna, who resides at the home on Rock Creek Church Road, a son, Dr. Bent Böving, who holds a responsible position in the Department of Embryology, Carnegie Institution of Washington, in Baltimore, Maryland, and three grandchildren. Three sisters, living in Denmark, also survive.

In addition to a delightful personality, Dr. Böving possessed many sterling qualities of mind and heart. A man of high ideals, and absolute freedom from professional jealousy, his genial, wholesome, courteous disposition readily won for him enduring friendships wherever he went, and the breadth of his intellectual attainments and ability to converse with his friends on a wide variety of subjects of interest to them proved unquestionably one of his fine attributes. That gift and the obvious friendliness of both Dr. Böving and his sweet wife, Anna, made even casual visitors completely at ease in their company and in their home. An energetic, careful worker, a patient observer, tireless in his efforts always to maintain highest standards of excellence, association with him was made a constant source of inspiration to his colleagues. Likewise, he will long be remembered with gratitude for his deep interest in the problems and the advancement of younger workers, particularly those whose good fortune it was to be for a time under the stimulus of his leadership. It was a source of deep satisfaction to him that some of these later advanced into positions of leadership and responsibility in entomology. A quiet, serene and kindly spirit, the memory of Adam Giede Böving will long hold high place of veneration and affection in the hearts of all of those who knew him best.

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[1] This list of publications, including papers appearing in 1942, was prepared by Dr. Böving himself.

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——. Descriptions of larvae of the genera *Diabrotica* and *Phyllobrotica*, with a discussion of the taxonomic validity of the subfamilies Galerucinae and Halticinae (Coleoptera: Chrysomelidae). Proc. Ent. Soc. Wash. 29: 193-205, Pl. 11 (p. 206).

1928. The larva of *Enoclerus lecontei* Wolcott and *Callimerus arcufer* Chapin, of the beetle family Cleridae. Proc. Ent. Soc. Wash. 30: 93-100, Pls. 5-6.

1929. On the classification of beetles according to larval characters. Bul. Brooklyn Ent. Soc. 24: 55-97, Pls. 1-17.

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C. F. W. Muesebeck
J. S. Wade
W. H. Anderson

SOCIETY MEETINGS

The 660th regular meeting of the Entomological Society of Washington was called to order at 8:00 PM by President F. L. Campbell in Room 43 of the U. S. National Museum on Thursday, February 7, 1957. Forty two members and fifteen visitors were present. The minutes of the previous meeting were read and approved.

P. X. Peltier gave the report of the Treasurer for 1956. Kellie O'Neill read the report of the Corresponding Secretary for 1956 for Kelvin Dorward, and Herbert J. Conkle gave the report of the Custodian for 1956. Each was accepted.

The following candidates for membership wert presented and elected: *Mrs. Minnie B. Callaway,* Entomology Research Branch, ARS, U. S. Department of Agriculture, Washington 25, D. C. *Stanley R. Joseph,* Route 1, Box 28A, Annapolis, Md. *Horace R. Lanchester,* Agricultural Research Service, Agricultural Center, Beltsville, Md. *Dr. Frederico Lane,* Departamento de Zoologia da Secretaria da Agricultura, Caixa Postal 7172, Sao Paulo, Brazil. *Florence A. Snyder,* Division of Insects, U. S. National Museum, Washington 25, D. C., and *Nixon Wilson,* 522 N. 3rd St., Bardstown, Ky.

President Campbell suggested that local members of the Society contribute to the funds for the local Science Fairs in justice to non-resident members who will be called upon for support in their own areas. He will request members to fill out cards for the Washington Academy of Sciences to indicate what they might be able to do to assist with the Science Fairs in the Washington area.

Dr. Samuel H. Williams, Stanford Research Institute, spoke briefly about his recent experiences in Austria. Dr. Williams served as a guest professor in the Zoological Institute of the University of Vienna and became one of the best known and most respected American scientists in Austria because of his long and devoted service to that country in behalf of the United States. In 1956 Dr. Williams' reputation was carried into Hungary by the Hungarian revolution of 1956, and he assisted many Hungarian scientists to make American contacts. Dr. Williams extolled the courage of Hungarians who had escaped Hungary and the hardships they had endured, and commended the Austrians for help in the form of food and shelter they gave to many thousands of Hungarians. In conclusion, he asked his audience to bear in mind the Hungarian scientists who have come or who may come to the United States and who will need further help. (President's abstract)

W. E. Bickley announced a forthcoming lecture entitled "Recent Researches on Honey Bee Physiology and Behavior," by Dr. Eva Crane, sponsored by the University of Maryland chapter of the Sigma Xi. Dr. Bickley also introduced Frank J. Burke, who exhibited cynipid galls on black oak, *Quercus volutina,* upon which his senior entomology project was based.

Robert H. Nelson reported briefly upon a paper delivered by A. N. Tissot at the recent meeting of the Cotton States Branch, ESA. Dr. Tissot demonstrated an increase in the number of southern entomologists who received their training in southern institutions.

The principal paper of the evening was an address by retiring President R. A. St. George, "Highlights of Fifty Years of Research on Insects Attacking Forest Products." Mr. St. George traced the beginnings of forest entomology in the United States by describing the study made by Dr. A. D. Hopkins of the killing of pines by *Dendroctonus frontalis* Zim., and the publication at about the same time of forest insect information by Dr. A. S. Packard in the Fifth Report of the U. S. Entomological Commission. In the U.S.D.A. career that made Dr. Hopkins known as the father of forest entomology, he was employed jointly by the Division of Entomology and the Forest Service, and when the Division of Forest Insects was created in 1902 he was called to Washington to become its chief and served until 1923. Dr. F. C. Craighead followed him and was succeeded in 1950 by the present Division leader, Dr. J. A. Beal. Mr. St. George recounted a number of advances in forest entomology made by Dr. Hopkins and his assistants, some of whom became specialists in taxonomy and were assigned to the Division of Insect Identification. Research on forest product insects includes studies on ambrosia beetles, bark beetles and wood borers at the Eastern Field Station, at Tallulah, La., and at Gulfport, Miss., and work on protection of logs and posts by sapstream injections at Asheville and Bent Creek, N. Car., and Hat Creek, Calif. At the Eastern Field Station the natural resistance of wood and of preservatives applied to wood by various methods were evaluated. Entomologists in Australia, South Africa, Hawaii, and Panama cooperated in the "International Termite Exposure Test," now in its 28th year. The pressure treatment of buildings was studied in Panama, and the evaluation of soil poisons for termite control was studied at Long Island, Beltsville, Crown Point, La., Saucier, Miss., and the Canal Zone. Research on the biology and control of *Lyctus* powderpost beetles has been in progress since the early days of the Division at the Eastern Field Station, and includes projects at Tallulah, La., Beltsville, and Gulfport. During the past 5 years, the old house borer, *Hylotrupes bajalus* (L.), has received a great deal of attention, and research on it has been initiated at Gulfport, Miss., and New Haven, Conn.

Society members with long memories recognized some of the pioneer forest entomologists in the slides Mr. St. George showed. (Secretary's abstract.)

Visitors introduced were *Faustino C. Francia*, Forest Products Laboratory, College of Agriculture, University of the Philippines; *Dr. William Goodwin*, en route to Libya with ICA; and *Stanley Joseph*, new member.

The meeting was adjourned at 11:00 PM.—KELLIE O'NEILL, *Recording Secretary.*

The 661st regular meeting of the Entomological Society of Washington was called to order at 8:00 PM by President Campbell in Room 43 of the U. S. National Museum on Thursday, March 7, 1957, with 39 members and 21 visitors attending. The minutes of the previous meeting were read, corrected, and approved.

President Campbell announced the appointment of a committee consisting of H. H. Shepard (chairman), W. H. Anderson, and E. F. Knipling, to revise the Society's constitution and by-laws. He exhibited the Air Force edition (unbound) of the Handbook of Biological Data, and the directory recently issued by the Chemical Society of Washington, expressing his wish that the Society might have a similar one.

F. W. Poos read J. S. Wade's "Note on the Respiration of Entomologists," from the 1929 Proceedings (31: 139). The concensus indicated that Mr. Wade's observations are still pertinent.

The principal paper of the evening was presented by George B. Vogt and was titled, 'A Survey of *Halogeton glomeratus* Mey and Related Plants and the Insects Affecting them in the Old World." An eight-month survey of this and related plants and the insects affecting them was carried out in the arid regions of southern Spain, the Middle East, and the Far East. The purpose of this survey was to observe possible agents for biological control of this serious weed pest of western rangelands. The itinerary began with Vogt in southern Spain (near sea level) in late March and proceeded to Syria via Lebanon, central and northern Iran, north-central Afghanistan and via New Delhi to Indus Valley (elevation 10,500-11,000') in Ladadakh. After September 10 the itinerary reversed over the same route in order to obtain the late seasonal picture. At Kabul, Vogt joined C. J. Davis and J. J. Drea and the three observed together the areas in north-central Afghanistan and Iran. Davis and Drea remained in Tehran in order to set up a laboratory for propagation and testing of candidate biological control agents for halogeton. Early in November, Vogt proceeded westward to Spain, not being able to re-enter Syria owing to the international crisis. In southern Spain, as further east, *Halogeton* was observed matured and in full fruit as contrasted to the small seedlings observed in the early spring. Five (one questionable) species of *Halogeton* were studied. For each locality surveyed for *Halogeton*, related plants of the Chaenopodiaceae, especially of the tribe Salsolae, were studied as well. Approximately 35 plant species in addition to the species of *Halogeton* were thus observed. Altogether 80 to 120 species of insects were found affecting 18 to 20 species of the tribe Salsoleae. Included among these are the insects found to occur on *Halogeton*, one species of which, *H. glomeratus*, was too local and scarce to support significant populations. About 60-80 species of insects were found on the remaining species of *Halogeton*. Among these insects are examples that attack the seedling plant, suck stem leaf and bract, defoliate, bore stem, chew and bleed stem, bore taproot and crown, bore taproot, chew and bleed taproot, feed on fruiting branches and feed on seeds. In general the insects range widely in the vast geographical region surveyed and foodplantwise they range generally over the members of the tribe Salsoleae, apparently with only a few highly specific forms. However, there are indications and good possibilities that a number of them are forms sufficiently specialized that they will hardly range outside the tribe Salsoleae and much less likely outside the subfamily Suaedoidea to attack economic and otherwise important plants of the western U.S.A. belonging to the subfamily Chenopoidea, including sugar beet, table beet, spinach, and winterfat (*Atriplex* spp.). (Speaker's abstract.)

Visitors introduced were *Mr. and Mrs. Archie H. Symonds* and *Mrs. E. R. McGovran*, and member *J. Maldonado Capriles*. Dr. Maldonado is en route to Pakistan as a public health officer for ICA. The meeting adjourned at 10:00 PM. —KELLIE O'NEILL, Recording Secretary.

The 662nd regular meeting of the Society was held in Room 43 of the U. S. National Museum on Thursday, April 4, 1957, with 33 members and 17 visitors present. President Campbell called the meeting to order at 8:00 PM and the minutes of the previous meeting were read and approved.

President Campbell announced the appointment of a committee, consisting of A. B. Gurney (chairman), W. D. Reed and W. B. Wood, which is to advise the president on other committee appointments as well as to nominate officers for the coming year.

The following persons were elected to membership: *Alberto W. Vazquez*, 5722 N. 11th St., Arlington, Va.; *Dr. George W. Evans*, Dept. Entomology, Virginia Polytechnic Institute, Blacksburg; *Elroy R. Krestensen*, Univ. Maryland Fruit Lab., Hancock; *John A. Davidson*, 239 Park Ave., Takoma Pk., Md.; and *Robert O. Schuster*, Dept. Entomology, University of California at Davis.

President Campbell reported that a special Executive Committee meeting had been held to arrange the commemoration of the hundredth anniversary of Dr. L. O. Howard's birth. It was voted that the Society join the Insecticide Society of Washington to sponsor a dinner appropriate to the occasion. M. D. Leonard was appointed chairman for this dinner. Helen Sollers told about activities honoring Dr. Howard in other societies, and suggested that members of the Society might tell their friends in other entomological groups about the Society's plans. M. P. Jones asked President Campbell to place an item about the Howard dinner in the Entomological Society of America Bulletin.

The deaths of R. A. Cushman, Ina L. Hawes, J. G. Saunders and Honorary Member A. G. Böving were announced by President Campbell, who appointed committees to prepare the several obituaries. W. H. Anderson spoke about Dr. Böving; C. F. W. Muesebeck told about Mr. Cushman's life and service to entomology; Margaret S. Bryant, USDA Library, spoke about Miss Hawes; and President Campbell gave a talk on Mr. Saunders prepared by M. D. Leonard, who was not present.

The principal speaker of the evening was Neal A. Weber of Swarthmore College, whose title was, "The Fungus-Growing Ants and their Fungi." The primary purpose of the present studies is to explain how ants maintain a flourishing culture of only one fungus when they take into their nest a pellet of caterpillar or beetle feces containing the spores of *Penicillium*, *Aspergillus*, *Trichoderma* or other fungi and/or bacteria. While primarily a tropical American group, these ants have extended their range into the United States and the arid part of Mexico by finding the requisite and constant high humidity deep in the soil. Many species form a typical crater entrance, that of the Florida to New Jersey pine barrens, *Trachymyrmex septentrionalis*, is usually a semi-circular crater, while other species may have circular crater or turret entrances. Many species form large nests of

many thousands of workers. In order to study these colonies in detail, it is necessary to bring portions into the laboratory. A Petri dish may suffice for an entire colony of a small species, while others are kept in larger observation nests of lucite or glass. When a portion of a colony and part of its garden are placed on sterile nutrient agar, the ants may successfully maintain their own fungus as an island surrounded by numerous colonies of contaminants. To succeed in this manner appears to require an unusual antibiotic activity. The constant licking of the ant fungus and new substrate and the frequent defecation on them impart special qualities to the garden that may explain this condition. The ant fungi are being cultured in the absence of the ants. These fungi on standard nutrient media are easily overwhelmed by common contaminants. The fungus of the 2 mm. *Cyphomyrmex costatus* Mann of Central America was successfully reared to the mature sporophore stage and represents the first ant fungus to be so reared. It is now being named by the French authority on the tropical members of this group. (Speaker's abstract.) The paper was followed by questions and comments by President Campbell, Mr. Wade, T. E. Snyder, K. E. Lipinsky, W. H. Anderson, A. B. Gurney, and others.

Visitors introduced were *Katherine A. King*, University of Maryland student, and *W. G. Bruce*, Plant Pest Control Division, ARS, USDA.

The meeting was adjourned at 10.00 PM.—KELLIE O'NEILL, *Recording Secretary.*

A Cyanamid Report

MALATHION FOR DIRECT APPLICATION ON ANIMALS

With newly-granted residue tolerances, malathion can be applied directly to beef cattle, poultry, and swine. This is the result of three years of extensive research in 11 states. The work proved conclusively the safety and usefulness of malathion as a spray for controlling cattle and poultry lice, poultry mites (northern fowl and chicken red mite), and cattle and poultry ticks. In addition, malathion dust may be applied to nests, litter, and floor space. Roost paints using malathion emulsifiable liquid may also be used in poultry houses. In addition to spraying beef cattle with malathion for lice control, rubbing devices incorporating the product have been most effective in suppressing lice and horn flies.

Do not apply malathion to lactating dairy cows, since it has not yet been accepted for this use, nor should it be used on calves under one month of age.

PROTECTANT FOR STORED GRAIN

With newly-granted residue tolerances for malathion on wheat, barley, oats, rice, rye, corn, grain sorghum, and peanuts (post-harvest), grain handlers storing grain have a method of protecting grain from loss to insects. Malathion, either in dust or spray form, *applied to the grain as it is being loaded into bins,* affords protection against confused flour beetle, rice weevil, granary weevil, saw-toothed grain beetle, flat grain beetle, red flour beetle, rusty grain beetle, lesser grain beetle, and Indian meal moth. It is also suggested as a residual wall, floor, and machinery spray in grain elevators, in treating truck beds, box cars, and ships' holds before loading grain. Where Indian meal moth infestations develop, *surface* applications of malathion dusts or sprays at prescribed intervals afford protection.

NEW USES FOR MALATHION ON CROPS

Tolerances have been established on 37 additional crops, including:

Vegetables	Fruits
Asparagus	Bramble family
Carrots and other root crop	Nectarines
Garlic—Leeks—Shallots	Quinces
Several leaf vegetables	Currants
Pumpkins	Gooseberries

Also, small grains, cotton, mushrooms, peppermint, spearmint, corn and rice. With these additions, malathion is now recommended on 93 crops.

Developers and producers of malathion and parathion

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PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY
of
WASHINGTON

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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 over 18 years of age who have an interest in the science of entomology. Annual dues for members are $4.00; initiation fee is $1.00 (U. S. currency).

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The Society does not exchange its publications for those of other societies.

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PROCEEDINGS OF THE

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Vol. 60 APRIL 1958 No. 2

ADDITIONS DURING 1956 AND 1957 TO THE WASP FAUNA OF LOST RIVER STATE PARK, WEST VIRGINIA, WITH BIOLOGICAL NOTES AND DESCRIPTIONS OF NEW SPECIES

(HYMENOPTERA, ACULEATA)

KARL V. KROMBEIN, *Entomology Research Division, U. S. Department of Agriculture, Washington, D. C.*

The wasp fauna of Lost River State Park, Hardy County, West Virginia, has been the subject of several earlier papers (Krombein: Proc. Ent. Soc. Wash. 54: 175-184, 6 figs., 1952; Bul. Brooklyn Ent. Soc. 49: 1-7, 1954; Proc. Ent. Soc. Wash. 58: 153-161, 3 figs., 1956). Those papers catalogued the wasp fauna as it occurred early in the summer (June 18-25 and July 18, 1951; June 29-July 5, 1953; and July 4-11, 1955). About 80 species were taken during each of those years, and the cumulative total amounted to 128 species.

We were able to spend part of our family vacation in the Park in 1956 from August 21 to September 2, and again in 1957 from July 29 to August 11. The summer of 1956 was cooler and rainier than normal, and more species (120) were active than during earlier periods in preceding years. In contrast, extreme drought conditions prevailed during the summer of 1957, and 82 species were collected. In 1956 I collected 39 species not taken in previous years, and in 1957 there were 28 new to the Park list. Allowing for duplications in these two years, the faunal list now stands at 179 species in the families already listed. In addition, another family, the Chrysididae, has now been worked up, and the 12 species collected in the Park during these five years brings the grand total to 191.

In addition to the collection data presented below for the species not listed previously, I am recording a few biological notes, descriptions of three new species, *Chrysis* (*Chrysis*) *cembricola*, *Methocha* (*Methocha*) *impolita* and *Gorytes* (*Gorytes*) *deceptor*, a redescription of *Spilomena alboclypeata* Bradley, and a description of the previously unknown male of *Nitela virginiensis* Rohwer.

I am indebted to the following specialists for identification of the prey captured by several of the wasps: B. J. Kaston (Araneae), Kellie O'Neill (thysanopterous prey of *Spilomena pusilla* (Say)), and C. W. Sabrosky (Diptera).

Additions to the Wasp Fauna

Family **CHRYSIDIDAE**

This family of cuckoo wasps was not included in the previous reports, so all collection data are given here.

Omalus iridescens (Norton). 1 ♀, July 18, 1951; 1 ♂, July 1, 1953; along trails.

Omalus laeviventris Cresson. 1 ♀, July 18, 1951; 1 ♀, June 30, 1953; 1 ♂, August 26, 1956; two of these taken along trails on vegetation.

Omalus sinuosus (Say). 1 ♀, June 21 and 1 ♂, July 18, 1951; 2 ♀♀, June 29 and July 5, 1953; 1 ♀, July 10, 1955; some of these taken on log cabin walls, others along trails.

Hedychridium dimidiatum Say. 2 ♀♀, June 30 and July 4, 1953; 1 ♀, 2 ♂♂, July 4-8, 1955; 3 ♀♀, 2 ♂♂, August 25-27, 1956; 10 ♀♀, 1 ♂, August 1-11, 1957; along trails, mostly on ground but some on foliage.

Hedychridium fletcheri Bodenstein. 1 ♂, August 30, 1956; along trail.

Hedychrum violaceum Brullé. 5 ♂♂, June 30-July 4, 1953; 3 ♀♀, 4 ♂♂, July 5-10, 1955; 1 ♂, August 24, 1956; mostly along trails, but a few on log cabin walls.

Chrysis (Chrysogona) verticalis Patton. 1 ♂, July 5, 1953; 2 ♀♀, July 4-10, 1955; 4 ♀♀, 2 ♂♂, August 23-30, 1956; 2 ♀♀, July 30-August 10, 1957; mostly along trails, but several on log cabin walls.

Chrysis (Trichrysis) parvula Fabricius. 1 ♀, June 24, 1951; 1 ♀, June 30, 1953; 2 ♀♀, 3 ♂♂, July 4-10, 1955; 2 ♀♀, 1 ♂, July 31-August 7, 1957; mostly on log cabin walls, but several along trails.

Chrysis (Chrysis) cembricola, new species. 6 ♀♀, June 19-24, 1951; 1 ♀, June 30, 1953; 6 ♀♀, July 5-10, 1955; 1 ♂, August 30, 1956; mostly on log cabin walls, but a few along trails including the single male.

Chrysis (Chrysis) chalcopyga Moesáry. 12 ♀♀, June 18-24, 1951; 1 ♀, July 1, 1953; 1 ♀, July 29, 1957; mostly on log cabin walls, but a few along trails.

Chrysis (Chrysis) coerulans Fabricius. 2 ♀♀, 1 ♂, June 19-20, 1951; 1 ♀, 2 ♂♂, August 22-27, 1956; 1 ♀, 1 ♂, August 7-11, 1957; mostly along trails, but at least one on log cabin wall.

Mesitiopterus kahlii Ashmead. 1 ♂, August 28, 1956; along trail.

Family **BETHYLIDAE**

Epyris sp. 1. 4 ♂♂, August 25-29, 1956; 1 ♀, 8 ♂♂, August 1-10, 1957.

Anisepyris columbianus (Ashmead). 1 ♂; August 25, 1956. [Det. H. E. Evans].

Rhabdepyris sp. 1. ♂, August 27, 1956

Holepyris sp. 2 ♀♀, 2 ♂♂; August 25-29, 1956; 2 ♂♂ August 7-9, 1957.

Pseudisobrachium myrmecophilum (Ashmead). 1 ♂, August 11, 1957; crawling on gravelly soil along trail edge. [Det. H. E. Evans].

Family **TIPHIIDAE**

Tiphia intermedia Malloch. 5 ♀♀, 2 ♂♂; August 23-30, 1956; 1 ♀, 1 ♂, August 3-8, 1957.

Tiphia transversa Say. 1 ♂, August 3, 1957.

Tiphia sp. 1. 1 ♀, 19 ♂♂, August 6-7, 1957; on ground and flying low over ground in an area of two square meters.

Methocha (Methocha) impolita, new species. 1 ♀, August 8, 1957; crawling in sun on gravelly soil along trail edge.

Myrmosa (Myrmosa) blakei Bradley. 1 ♀, August 25, 1956; 1 ♀, August 7, 1957; crawling on gravelly soil at trail edge.

Family **MUTILLIDAE**

Dasymutilla vesta vesta (Cresson). 1 ♀, August 3, 1957.

Ephuta pauxilla pauxilla Bradley. 2 ♂♂, August 23-25, 1956; on foliage along trail.

Ephuta scrupea (Say). 5 ♂♂, August 23-29, 1956; along trail on foliage. I recorded a female of this species as *conchate* Mickel in 1956. The latter species should be deleted from the Park list.

Family **VESPIDAE**

Zethus (Zethusculus) spinipes spinipes Say. 1 ♀, August 11, 1957.

Stenodynerus (Stenodynerus) blepharus Bohart. 1 ♂, August 26, 1956.

Family **POMPILIDAE**

Priocnemioides unifasciatus unifasciatus (Say). 1 ♂, August 29, 1956; crawling over leaf litter in open woods.

Dipogon (Dipogon) brevis brevis (Cresson). 1♂, August 27, 1956.

Dipogon (Dipogon) brevis recalvus Townes. 2 ♂♂, August 24-25, 1956. This and the preceding species were taken within several hundred feet of each other in identical habitats. I wonder if this does not indicate that *recalvus* is actually a distinct species rather than a subspecies of *brevis*.

Priocnemis (Priocnemis) hestia (Banks). 9 ♀♀, 5 ♂♂, August 23-29, 1956; 1 ♂, July 29, 1957; in open woods flying among undergrowth.

Auplopus caerulescens subcorticalis (Walsh). 3 ♀♀, 2 ♂♂, August 23-26, 1956; 1 ♀, 1 ♂, August 6-7, 1957.

Ageniella (Ageniella) cupida (Cresson). 1 ♀, August 28, 1956.

Ageniella (Ageniella) norata Banks. 14 ♀♀, 56 ♂♂, August 22-29, 1956; 1 ♂, August 7, 1957; mostly taken in open woods flying among undergrowth.

Ageniella (Ageniella) partita Banks. 1 ♀, August 29, 1956.

Ageniella (Ageniella) sp. 1 ♀, August 29, 1956; 1 ♀, August 10, 1957. This is possibly the unknown female of *mintaka* Brimley which has been taken in the Park in two previous years.

Ageniella (Priophanes) agenioides (Fox). 1 ♀, August 28, 1956.

Ceropales hatoda Brimley. 2 ♀♀, 4 ♂♂, August 26-30, 1956; 1 ♀, 2 ♂♂, July 31-August 10, 1957.

Evagetes subangulatus (Banks). 1 ♀, August 29, 1956.

Tachypompilus ferrugineus nigrescens (Banks). 1 ♀, August 28, 1956; in clearing in open woods.

Aporinellus taeniatus wheeleri Bequaert. 1 ♀, August 30, 1956; on gravelly path.

Family **AMPULICIDAE**

Ampulex (Rhinopsis) canaliculata Say. 1 ♀, August 26, 1956; on rail fence.

Family **SPHECIDAE**

Astata (Astata) leuthstromi Ashmead. 2 ♀♀, August 23-25, 1956; 2 ♀♀, 1 ♂, August 1-9, 1957; on gravelly soil along trail edge in sun.

Astata (Astata) nubecula Cresson. 3 ♀♀, August 23-25, 1956; 1 ♀, August 10, 1957; on gravelly soil along trail edge in sun.

Solierella plenoculoides plenoculoides (Fox). 2 ♀♀, 1 ♂, August 26-30, 1956; 2 ♀♀, July 30, 1951; on gravelly path.

Nitela virginiensis Rohwer. 3 ♀♀, 1 ♂, August 24-27, 1956.

Tachysphex sepulcralis Williams. 3 ♂♂, August 24-28, 1956; on gravelly path.

Tachysphex n. sp. 1. 2 ♀♀, August 26-30, 1956; on gravelly path.

Tachysphex n. sp. 2. 1 ♂, August 30, 1956; 3 ♂♂, August 3-11, 1957; on gravelly path.

Motes (Notogonius) argentata (Beauvois). 1 ♀, 1 ♂, August 24-25, 1956; 1 ♀, August 8, 1957; on gravelly path.

Trypoxylon (Trypargilum) tridentatum Packard. 1 ♀, August 9, 1957.

Psen (Psen) erythropoda Rohwer. 1 ♀, July 31, 1957.

Mimesa (Mimesa) pauper Packard. 1 ♂, August 6, 1957.

Stigmus (Stigmus) inordinatus universitatus Rohwer. 3 ♀♀, August 27-September 1, 1956; 1 ♀, August 9, 1957; along trail through open woods. This species was not known previously from east of Colorado.

Spilomena alboclypeata Bradley. 1 ♀, August 24, 1956; crawling on log of cabin wall in sun.

Sphex aureonotatus (Cameron). 1♀, August 22, 1956; 1 ♀, 1 ♂, July 30-August 1, 1957.

Sphex urnarius urnarius (Dahlbom). 1 ♂, August 26, 1956.

Nysson (Nysson) lateralis Packard. 4 ♀♀, 1 ♂, August 24-27, 1956; 9 ♀♀, August 1-11, 1957; on gravelly soil along trail edge in sun.

Lestiphorus cockerelli (Rohwer). 1 ♀, August 26, 1956; on oak foliage in sun.

Gorytes (Gorytes) deceptor, new species. 3 ♀♀, July 31-August 8, 1957.

Crabro (Crabro) discretus Fox. 1 ♀, August 29, 1956; 2 ♀♀, July 31-August 1, 1957; on trail through open woods.

Ectemnius (Ectemnius) brunneipes (Packard). 1 ♀, August 26, 1956.

Oxybelus decorosum Mickel. 4 ♂♂, July 30-August 6, 1957; on gravelly path.

Biological Notes

Family **POMPILIDAE**

Dipogon (Deuteragenia) sayi sayi Banks

A female (73057 A), 7.5 mm. long, was captured with her paralyzed spider prey on vegetation at the edge of a clearing in the woods, July 30, 1957. The spider was an adult female thomisid, *Xysticus fraternus* Banks, 5.1 mm. long.

Calicurgus hyalinatus alienatus (Smith)

One female (8357 A), 6.3 mm. long, was taken on August 3, 1957. She was pulling her paralyzed spider prey beneath some leaf litter at the edge of a trail exposed to the full sun. The spider was a male araneid in the penultimate instar, *Araneus marmoreus* Clerck, 6.1 mm. long.

A second female (8857 A), 5.7 mm. long, was captured while she was transporting her paralyzed spider prey in a similar habitat on August 8, 1957. The spider was a male araneid in the penultimate instar, probably of a species of *Neoscona*, 4.1 mm. long.

Anoplius (Lophopompilus) carolina (Banks)

A slightly worn female (82856 A), 12 mm. long, was captured August 28, 1956, on a trail through the woods in dense shade. She was walking backward over the trail, dragging a large paralyzed spider, which she held by the hind coxae in her mandibles. The spider was a mature male agelenid, *Wadotes hybridus* (Emerton), 13 mm. long.

Family **SPHECIDAE**

Spilomena pusilla (Say)

A slightly worn female (83056 A), 2.4 mm. long, was collected August 30, 1956, as she walked on a log in the cabin wall in the sun near the entrance to her burrow. She held in her mandibles a paralyzed immature thrips 0.72 mm. long. The nymph was probably in the second instar and appeared to belong to the *variabilis* (Beach) section of the genus *Sericothrips*.

Euplilis (Corynopus) coarctatus modestus (Rohwer)

A newly emerged pair (82656 A) was taken *in copula* on oak foliage at the edge of a trail through open woods on August 26, 1956.

Crabro (Crabro) discretus Fox

A somewhat worn female (82956 A), 11.5 mm. long, was captured on the ground August 29, 1956, on a trail through open woods. She was struggling to get into the air with her prey, a large, paralyzed male larvaevorid, *Achaetoneura* sp. (possibly *aletiae* Riley), which was 12 mm. long and much bulkier than the wasp.

Taxonomic Notes

Family **CHRYSIDIDAE**

Chrysis (Chrysis) cembricola, new species

(Figure 1)

This rather small, slender *Chrysis* is seemingly closer to *chalcopyga* Mocsáry (= *nitidula* auctt. not F.) than to any other species in the Nearctic fauna. Such characters as the relative length of the head and pronotum, sculpture of frontal concavity, and shape of the lateral and apical margins of the third abdominal tergum cause it to run to *nitidula* in Aaron's key to the North American species (Trans. Amer. Ent. Soc. 12: 232-233, 1885). However, it is distinguished at once from *chalcopyga* by its smaller size (7.5 mm. as against 9.5 mm. average length), the different head length:width ratio (0.56 as compared to 0.45), first and second abdominal terga with the punctures mostly separated instead of confluent in longitudinal rows medianly on the first and basal half of second, and the ocelli in an equilateral triangle instead of a lower, flattened triangle.

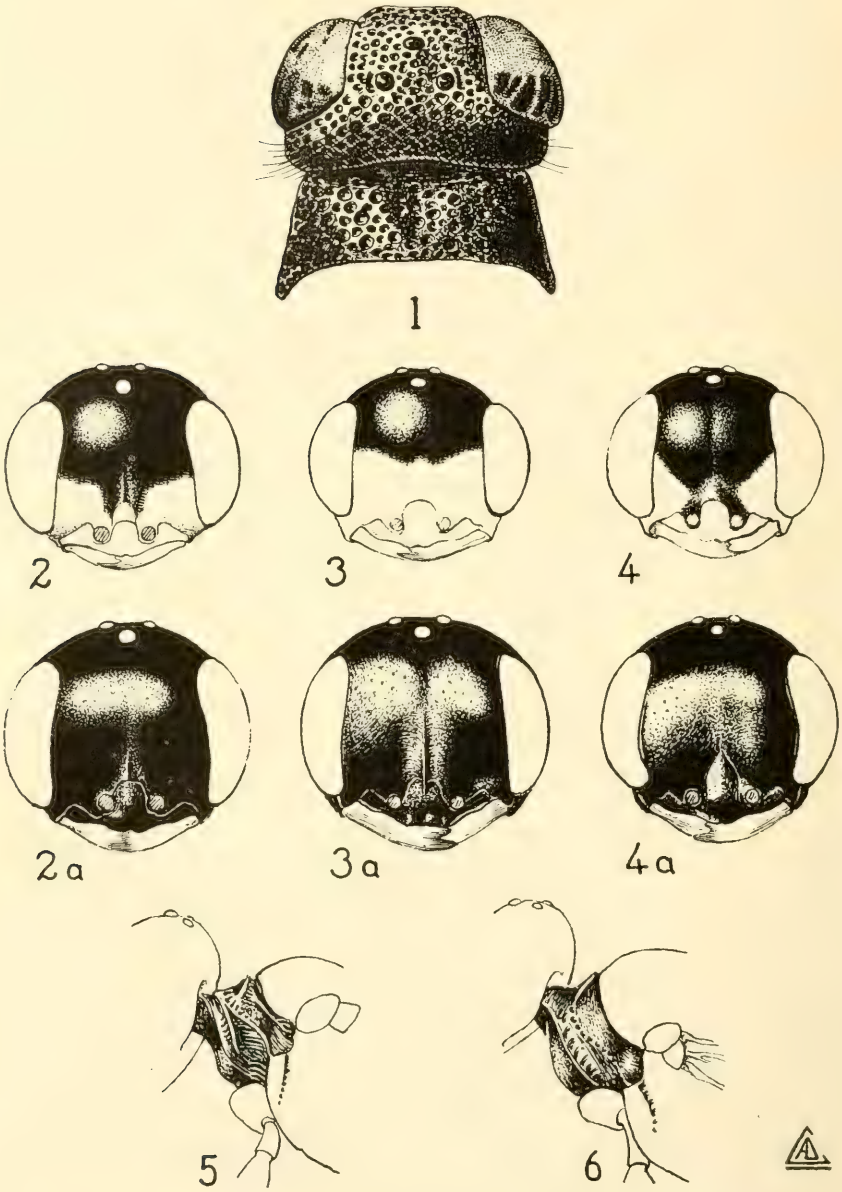

Fig. 1, *Chrysis cembricola*, female, dorsum of head and pronotum; figs. 2-4, *Spilomena* spp., frontal view of male heads, figs. 2a-4a, same of female heads; figs. 2, 2a, *S. pusilla;* figs. 3, 3a, *S. ampliceps;* figs. 4, 4a, *alboclypeata;* fig. 5, *S. pusilla*, lateral view of female pronotum; fig. 6, *S. alboclypeata*, the same. (Drawings by A. D. Cushman; fig. 1 is 22 X, figs. 2-6, 44 X; specimens for figs. 1, 2, 3, 5 from Lost River St. Pk., W. Va., for figs. 4, 6 from Arlington, Va.)

Type. ♀ ; Lost River State Park, W. Va.; July 5, 1955 (K. V. Krombein; on log cabin wall in sun) [U. S. National Museum, Type No. 63508; by donation from author's collection].

Length 7.4 mm., forewing including tegula 5.4 mm. Mostly metallic blue, the frontal concavity, temples, legs and venter with bright green reflections in certain aspects; tarsi dark brown and flagellum black beyond second segment. Wings clear, the anterior edge of marginal cell narrowly infumated, the veins dark brown. Pubescence generally short, erect and inconspicuous; light brown on dorsum of head and thorax, somewhat longer and pale on sides of head and thorax, and thoracic venter; very short, suberect, denser and pale on abdominal dorsum.

Head in frontal aspect with the width 1.1 times the height, the interocular distance at level of facial carina 0.45 times the head width; in dorsal view (fig. 1) the length from facial carina to occiput 0.56 times the head width and subequal to interocular distance at level of posterior ocelli; mandible without an inner tooth; clypeus with median length subequal to diameter of antennal fossa, tumid medianly, the apical margin broadly and shallowly emarginate for a distance equal to half the total width, with scattered punctures except a narrow apical rim smooth; facial concavity with height subequal to width, moderately concave, closely punctate, the punctures becoming progressively larger toward the facial carina; the latter not as strong and sharp as in *chalcopyga,* four-fifths the interocular distance at that level, the central three-fourths of the carina bowed slightly downward in middle, the extreme sides of carina turned downward at a very obtuse angle; dorsum of head with rather coarse, close punctures and a narrow smooth strip laterad of each hind ocellus; ocellar triangle equilateral, situated a little closer to facial carina than to occiput, only slightly raised, the lateral ocelli directed obliquely outward but not situated in pits; ocellocular line subequal to postocellar line; malar space very short, 0.6 times the length of antennal pedicel; temporal carina extending upward from base of mandible to a point opposite the facial carina; relative lengths of first four antennal segmnts as 5:2:3:2.

Pronotum (fig. 1) at humeri 0.8 times the head width, the median length of disk one-third the humeral width and half the head length from facial carina to occiput; humeri not projecting, right-angled as viewed from above; prehumeral slope almost perpendicular and with small close punctures except for a small smooth median area which is oblique; pronotal disk with larger, mostly subcontiguous punctures, such interspaces as are present with a few minute punctures, small depressed area at middle anteriorly; lateral margins of pronotum straight and slightly divergent posteriorly so that posterior width is 1.1 times the humeral width; lateral surface of pronotum with fine irregular rugulae and without a pit; scutum with length two-thirds the width, the surface with coarse, contiguous punctures, notaulices well-developed, subparallel, the parapsidal furrows slightly convergent posteriorly, weak and present on apical two-thirds only; scutellum feebly convex, two-thirds as long as scutum, with large, shallow, contiguous pits; postscutellum more strongly convex, two-thirds as long as scutellum, sculpture as on scutum; mesopleuron divided into upper and lower plates by a series of foveae which intersect an oblique series of foveae, a rather large, shallow, smooth depressed area at the intersection; metapleural spine acute, short, barely reaching base of postero-lateral propodeal projection; propodeum obliquely declivous posteriorly, viewed

from above the posterolateral projections are short and acutely angulate (about 60°); U-shaped groove of propodeal dorsum relatively broad, crossed by a few weak carina, the area enclosed by groove sculptured like postscutellum.

Relative median lengths of abdominal terga as 7:15:6; first tergum with a broad shallow depression anteriorly, with moderately large punctures which are more or less separated except laterally where they are confluent and somewhat larger and deeper, discally with scattered minute punctures also; width of second tergum three-fourths the median length and one and one-half times the length of lateral margin, the posterolateral angles extending below anterolateral edge of third tergum; large punctures of second tergum smaller than those of first, separated more widely along posterior margin than elsewhere but not confluent anywhere, and with a very few scattered minute punctures, the apical margin slightly thickened; third tergum with lateral margins straight, apical margin with teeth short and obtuse, separated by shallow emarginations, the lateral and median teeth closer to each other than the two median teeth; punctures of third tergum about equal in size to those on second but mostly confluent; submarginal foveate groove extending two-thirds of distance to base of third tergum, the foveae not deeply impressed, about eight on a side.

Allotype. ♂; Lost River State Park, W. Va.; August 30, 1956 (K. V. Krombein; along trail through woods) [USNM].

Length 6.0 mm., forewing including tegula 4.0 mm. Color as in female except more purplish and with no green reflections, center of second tergum blackish, flagellum black beyond first segment. Wings and vestiture as in female. Sculpture and body proportions similar to female except as follows: facial carina evanescent; first flagellar segment relatively shorter, only slightly longer than second; submarginal foveate groove of third tergum with the groove evanescent laterally and represented by only a few small pits; apical teeth of third tergum shorter and right-angled.

Paratypes. 12 ♀♀; same data as type but June 19, 22, 23 and 24, 1951, June 30, 1953, and July 5, 6, 9 and 10, 1955 (K. V. Krombein; mostly on logs on cabin walls). 12 ♀♀; Arlington, Va., June 14, 1952 (1 ♀), June 21 and September 7, 1953 (2 ♀♀), May 22 and 31, 1954 (2 ♀♀), and April 29 (1 ♀ reared from wooden trap nest K 11 of *Symmorphus canadensis* (Saussure), May 26 (3 ♀♀), May 30 (2 ♀♀) and June 2 (1 ♀), 1957 (K. V. Krombein; on wooden walls of old cowshed). 1 ♀; Dunn Loring, Fairfax Co., W. Va.; September 11, 1954 (K. V. Krombein; on honeydew secretions of *Toumeyella liriodendri* (Gmel.) on foliage of *Liriodendron tulipifera*). 3 ♀♀; Westmoreland State Park, Westmoreland Co., Va.; July 4 and 8, 1951 (K. V. Krombein). 1 ♀; Brookland, Washington, D. C.; May 15, 1908 (R. W. Van Horn; bred from hickory) [USNM]. 1 ♀; Washington, D.C.; May 28, 1944 (G. E. Bohart) [GEB]. 1 ♀; Washington, D. C.; July 12, 1927 (lot no. 3978) [USNM]. 2 ♀♀; Biltmore, Buncombe Co., N. C., June 10, 1924 (R. A. St. George) [USNM]. 1 ♀; Harrisburg, Dauphin Co., Pa.; June 17, 1916 (W. S. Fisher; on hickory) [USNM]. 1 ♀; Overbrook, Philadelphia Co., Pa.; August 16, 1914

(G. M. Greene) [USNM]. Paratypes are in the U. S. National Museum and personal collections of K. W. Cooper, G. E. Bohart and the author.

About half of the paratypes have some greenish reflections on head and thorax. They are quite similar to the type in other details of the color, sculpture and pubescence, and are 5.9-7.8 mm. long.

Biology. One female of *cembricola* was reared at Arlington, Va., from a wooden trap nest (K 11) provisioned by the solitary vespid, *Symmorphus canadensis* (Saussure). This trap nest contained a boring 70 mm. long with a diameter of 3 mm. It was set out in a horizontal position two meters above the ground on the wooden wall of an old cowshed on June 24, 1956. The host wasp completed her nest four days later. I split open the nest on June 30 and found two stored cells at the inner end, 19 and 21 mm. long respectively, separated by clay partitions and with an empty vestibular cell 18 mm. long between cell 2 and the closing clay plug at the entrance. The cells were stored with paralyzed larvae of the chrysomelid leaf-miner in locust, *Chalepus dorsalis* Thunberg. The egg of the vespid was attached by a slender thread to the ceiling at the inner end of each cell, that in cell 1 being shriveled. I did not see the chrysidid larva in cell 1 on June 30, but presumably it had sucked out the fluid contents of the host egg before beginning to feed on the stored prey as is customary with some other species of Chrysididae. On July 5 the chrysidid larva was beginning to spin its cocoon, and the *Symmorphus* larva in cell 2 was almost full grown.[1] The chrysidid larva coated the cell walls and ends with transparent silk. Then it spun a cocoon of transparent silk, almost 3 mm. in diameter and 6 mm. long, with rounded ends and with two small opaque patches of dense white silk near the outer end. I inspected this nest periodically during the next several months but the chrysidid remained in the prepupal state through October 8. On October 12 I placed all my trap nests outdoors for winter storage and brought them into my office again on April 20, 1957. I made the first inspection of these over-wintering traps on April 22, and found a pale pupa with black eyes in this cocoon. My experience has been that 2-3 days after pupation are required before a chrysidid pupa reaches the black-eyed stage, so this individual must have pupated not later than April 20. On April 26 there was a fully colored pupa in the cocoon. The adult wasp had cut through the cocoon and emerged when I opened the nest on April 29. Adult *Symmorphus canadensis* emerged from other trap nests kept under similar conditions from May 14 to 26.

It is probable that *cembricola* preys only on wasps nesting in preexisting cavities in wood. Of the specimens in the type series nine of the thirteen females at Lost River State Park, W. Va., and all three females at Westmoreland State Park, Va., were taken on logs forming

[1]The *Symmorphus* larva in cell 2 died several days later. However, there can be no reasonable doubt as to the identity of the host wasp. I have reared *Symmorphus canadensis* from other trap nests containing the same prey and from the same station, and I know of no other wasp which preys on larvae of *Chalepus dorsalis*.

the cabin walls, and all twelve females at Arlington, Va., were taken on the wooden wall of an old cowshed. There were a number of species of wasps nesting in abandoned beetle burrows or other cavities in the logs or wood in each of these three localities, but the wasp that was most abundant and suitable in size to serve as a host for the chrysidid in each locality was *Symmorphus canadensis*. It seems likely that this vespid may prove eventually to be one of the chief hosts of the chrysidid. I looked over the material of *Symmorphus canadensis* in the U. S. National Museum and found four females and two males bearing the same label data as the Biltmore, N. C., paratypes of *cembricola*, and one female with the same label data as the Washington, D. C. (lot no. 3978), paratype of *cembricola*. There are no label data indicating a parasite-host relationship, but the identical label data suggest the possibility that the specimens might have occurred in the same restricted habitat.

The rather limited collection and rearing data suggest that *cembricola* has successfully adjusted its developmental cycle to that of *Symmorphus canadensis*. The *Symmorphus* population nesting in my cowshed in Arlington is almost entirely univoltine as demonstrated by trap nest rearings and seasonal flight range. The population of the chrysidid at the same locality is largely univoltine as evidenced by similar data. However, occasionally there may be a very small partial second generation of both *canadensis* and *cembricola*. *Symmorphus* was active during all our visits to Lost River State Park, but with noticeably higher population levels earlier in the season, indicating at least a partial second generation. All of the female *cembricola* at the Park were taken during periods coinciding with the population peak of *Symmorphus*, and the capture of a male at the end of August suggests at least a partial second generation of the chrysidid.

Family **TIPHIIDAE**

Methocha (Methocha) impolita, new species

The female of this species is one of the most distinctive of the Nearctic forms, and may be recognized at once by the dull, roughened integument of the head and thorax as contrasted to the highly polished, smooth integument of the other known species of this region. In addition, the following combination of characters will serve to distinguish it from its congeners: the very short malar space (0.09 times the eye height); the front almost flat between the eyes; moderately gibbose scutum and scutellum; blunt mesosternal teeth; and basal and apical abdominal segments red, the intervening segments black in part or almost entirely. *M. stygia* (Say), the only species now known to occur within the range of *impolita*, has a longer malar space (0.18 times the eye height), the front rounded between eyes, the mesosternal teeth acute, and the abdomen is rarely so colored, usually being either entirely black, or entirely red, or with the base only red. The male of *impolita* is unknown.

M. impolita has been collected in Lost River State Park, W. Va., at or near Washington, D. C., and at Ithaca, N. Y. The three specimens which I collected were all taken in open, sunny areas, on soils having a high content of gravel or larger stones. D. G. Shappirio informs me that the single specimen captured by him was from a similar soil type.

Type. ♀ ; Lost River State Park, W. Va.; August 8, 1957 (K. V. Krombein; crawling in sun on gravelly soil along trail) [U. S. National Museum, Type No. 64088; by donation from author's collection].

Length 7.4 mm. Head black, mandibles and basal seven antennal segments red; legs red except for some infuscation on femora above at apex, on tibiae outwardly and the last segment of all tarsi; abdomen red, the second to fourth terga with black bands covering the posterior half or two-thirds of these segments except for extreme apices, the bands broader along midline and narrowed toward sides, the posterior margins straight, the anterior margins arcuate. Pubescence quite sparse, pale golden on head and thoracic dorsum, silvery on rest of thorax, legs and abdomen.

Head dull, strongly narrowed behind eyes, its greatest width 2.2 times the width at occipital carina; clypeus tumid in middle above the wide, depressed apical rim but not tuberculate there; malar space very short, 0.09 times the eye height; front almost flat between eyes; front and vertex with the integument finely shagreened, and with scattered large punctures which are closer between ocellar triangle and eyes than elsewhere; least interocular distance half the head width; ocelli in a compact right-angled triangle, the ocellocular distance 1.6 times the posterior interocellar distance.

Thorax dull; pronotum along midline as long as combined lengths of scutum, scutellum and postscutellum, in profile strongly rounded, the surface finely shagreened and with a few scattered punctures and with some very close and fine, longitudinal wrinkles dorsally; scutum and scutellum subequal in length, gibbose, in profile the scutum separated from pronotum by a right-angled notch, the surface finely shagreened; mesopleuron finely shagreened and with a few oblique rugae above posteriorly; mesosternum with a pair of erect blunt teeth in front of mid coxae; metasternum with a pair of acute teeth in front of hind coxae; propodeum finely shagreened, dorsally with very close and fine, longitudinal wrinkles, posteriorly with half a dozen arcuate carinae above abdominal insertion, and laterally with fine, close oblique wrinkles.

Abdomen shining and with a few scattered fine punctures; first sternite with a median groove on basal two-thirds.

Male. Unknown.

Paratypes. 2 ♀♀ ; Dunn Loring, Fairfax Co., Va.; June 26, 1949, and July 26, 1947 (K. V. Krombein; crawling on clayey soil having a high gravel content in an area open to sun) [KVK]. 1 ♀ ; Clifton, Fairfax Co., Va.; June 9, 1933 (J. C. Bridwell) [USNM]. 1 ♀ ; Rock Creek Park, Washington, D. C.; June 26, 1947 (D. G. Shappirio) [DGS]. 1 ♀ ; Van Natta's Dam, Ithaca, Tompkins Co., N. Y.; July 20, 1931 (P. P. Babiy) [CU].

The paratypes vary in length from 5.1 to 8.7 mm. The color also shows considerable variation as follows: in the specimens with the most red (Clifton and Dunn Loring) the head and thorax are as in type but the legs are all red and the black stripes on second to fourth terga are narrower and do not extend as far laterad; in the specimens with the least red (Washington and Ithaca) the head, thorax and legs are as in type but the second to fourth terga are all black except for extreme base of second, narrow apices of each, and small anterolateral areas on third and fourth. The vestiture and body proportions are quite similar. The sculpture varies somewhat as follows: the smallest specimen (Dunn Loring) lacks the fine close wrinkles on pronotum and propodeum as does the Ithaca specimen, and the next to the smallest (Washington) lacks them on propodeum; and the two largest (Clifton and Dunn Loring) have a few oblique to arcuate wrinkles on gibbose part of scutum.

Family **SPHECIDAE**

Nitela virginiensis Rohwer

The male of this species has not been reported previously. It is extremely similar to the female in details of the sculpture, color and vestiture, and, aside from secondary sexual characters, it differs only in being a bit smaller, 3.5 mm. long. Neither the legs nor antennae bear any sexual modifications. The seventh sternum has the surface convex and clothed with moderately dense, short erect hair, and the apical margin is broadly and shallowly emarginate; the preceding sterna do not bear modified vestiture.

Spilomena alboclypeata Bradley

(Figures 4, 4a, 6)

This species has not been recognized since its description fifty years ago from a unique male from British Columbia. Some time during the intervening years the head of the type was lost. The original description is very brief and fails to give the facial maculations in precise detail, so that the exact identification remained in doubt until I had an opportunity recently to dissect the genitialia from the type. A study of these and of the external characters of the thorax and abdomen enabled me to identify as *alboclypeata* a short series of males and a much larger series of associated females from British Columbia, Oregon, California, Idaho, Montana, Utah, Arizona, New Mexico, Colorado, Kansas, West Virginia and Virginia. I am giving a redescription of the male below, as well as a description of the hitherto unknown female, and also a key for the separation of the three species of *Spilomena* known from Lost River State Park.

Marginal cell of forewing with scattered minute setae; pronotum with a delicate carina extending from side of pronotal disk onto pronotal lobe; propodeal dorsum with a broad U-shaped area delimited by a sharp carina. FEMALE: greatest width of temple 1.3 times eye width; face (fig. 3a) delicately but

noticeably lineolate, quite shiny. MALE: lower half of face yellow (fig. 3); flagellum testaceous except apical segment, clothed with appressed setae; third and fourth abdominal sterna with appressed short setae on apical third or half ..... *ampliceps* Krombein

Marginal cell of forewing devoid of setae; pronotum (fig. 5) with a delicate carina extending from side of pronotal disk onto pronotal lobe; propodeal dorsum with a broad U-shaped area delimited by a sharp carina. FEMALE: greatest width of temple subequal to eye width; face delicately and noticeably lineolate, rather dull (fig. 2a). MALE: face yellow in middle for only a short distance above clypeus, the sides more broadly yellow (fig. 2); flagellum dark, clothed with appressed setae; third and fourth sterna with very narrow bands of dense, short appressed setae at apices ..... *pusilla* (Say)

Marginal cell of forewing devoid of setae; pronotum (fig. 6) without such a carina; U-shaped area on propodeal dorsum without marginal carina. FEMALE: greatest width of temple subequal to eye width; face very shiny, the lineolations evanescent (fig. 4a). MALE: face immaculate above middle of clypeus, the sides with a moderately large, subtriangular, pale yellow to white spot (fig. 4); flagellum dark, clothed with denser suberect setae; third and fourth sterna with sparser, appressed setae on apical half or more ..... *alboclypeata* Bradley

Female. Length 2.2-2.8 mm., forewing including tegula 1.6-2.2 mm. Black, without metallic reflections; mandible light red, the base and apex darker; tegula transparent, testaceous; legs varying from almost completely testaceous except coxae to the following condition—apices narrowly of trochanters and femora, and bases and apices of mid and hind tibiae, fore tibia, and tarsi except apical segment, testaceous. Pubescence short and inconspicuous, silvery; extremely sparse and short on front and mesopleuron; a little denser on scutum, scutellum and last three abdominal segments; denser, though still relatively sparse, on mesosternum. Wings clear hyaline with violaceous reflections, sparsely setose, the marginal cell of forewing bare; stigma dark brown; veins pale to darker testaceous.

Head very shiny, the lineolation delicate and evanescent; in frontal view (fig. 4a) subcircular, the height and width subequal; viewed from above the width twice the length, and vertex as long as dorsal eye length; in lateral view the temple slightly angulate opposite middle of eye, its greatest width a bit greater than eye width; antennal scape 0.6 times as long as clypeal width at anterior mandibular condyles; postocellar distance 0.8 times the ocelloccipital distance and 0.7 times the ocellocular distance; clypeus tumid in middle, but without a sharply defined trigonal platform, the margin of median lobe slightly emarginate; lower third of front with a very delicate median carina which is gradually evanescent above, and which extends slightly downward onto clypeus.

Thorax except propodeum, very shiny; pronotum dorsally with a strong, complete carina, viewed from laterally not produced upward into a tooth, no delicate carina extending from side of pronotal disk onto pronotal lobe (fig. 6); scutum and scutellum more noticeably lineolate than front, with scattered minute punctures discernible at 68 diameters, notaulices as long as in *pusilla* but not so strongly impressed; mesopleuron smooth with a few tiny punctures, episternal suture minutely foveolate; propodeum dull, the dorsal surface with a pair of

longitudinal carinae near midline converging slightly toward apex; broad U-shaped area on propodeal dorsum not margined by a carina, the surface with fine and moderately close, transverse carinae; lateral propodeal surface separated from dorsal and posterior surfaces by a fine carina, the surface with oblique separated carinae; posterior surface with delicate, more or less transverse carinae and a stronger median carina on lower half.

Second submarginal cell of forewing about three-fourths as wide above as below, the width above subequal to height of cell; first recurrent nervure received near apex of first submarginal cell or interstitial with first transverse cubital vein.

Legs and abdomen without noteworthy modifications.

Male. Length 2.1-2.6 mm., forewing including tegula 1.5-1.9 mm. Black, without metallic reflections; the following testaceous—tegula, fore leg except coxa and usually the fore tibia outwardly, mid and hind femora and hind tibia narrowly annulate at base and apex, mid tibia entirely, mid and hind tarsi except apical segment; the following varying from white to pale yellow—mandible except apical teeth which are light red, clypeus, malar space, postmandibular triangle, a triangular spot on side of face extending upward along eye margin two-fifths of distance to anterior ocellus, and antennal scape. Pubescence as in female except antennal flagellum clothed with rather dense, suberect short setae, and apical half of third abdominal sternum and all of fourth sternum with moderately dense, short appressed setae. Wings as in female.

Head sculptured as in female, in frontal view the width slightly greater than height (1.06 times) (fig. 4); viewed from above the width 2.2 times the length, and vertex a little shorter than dorsal eye length; in lateral view the temple slightly angulate opposite middle of eye, its greatest width subequal to eye width; antennal scape 0.6 times as long as clypeal width at anterior mandibular condyles; ocellocular and ocelloccipital distances subequal, the postocellar distance 0.7 times as great; lower fourth of front with a very weak median carina which does not extend downward onto clypeus.

Thorax and abdomen much as in female except for vestiture on third and fourth sterna.

Legs without modifications.

Venation similar to that of female except second submarginal cell of forewing about five-sixths as wide above as below, the width above subequal to height of cell.

Three of the females (82253 C, 83053 A, and 92653 B) captured in Arlington, Va., were taken with prey. Each was taken near her burrow entrance in a board in a cowshed wall. Each was carrying a paralyzed, immature, pale green thrips in her mandibles. Two of the specimens of prey were lost before being measured, but the third (92653 B) was 0.84 mm. in length. Females were active from at least 1000 to 1730 hours in Arlington, and were taken in May, July, August and September in 1953 and 1954.

Gorytes (Gorytes) deceptor, new species

This is extremely similar to *simillimus* Smith in size, general color pattern and sculpture, but differs consistently in certain details of the

color and sculpture, and apparently also in the preferred prey. In *simillimus* the upper sector of the metapleural-propodeal suture is foveolate, while in *deceptor* this part of the suture is a faint simple impression. The propodeal sculpture also separates the two at once: both sexes of *simillimus* have the rugae confined to the extreme base of the enclosure and to a small area adjacent to insertions of the abdomen and hind coxae; in *deceptor* the propodeal enclosure is entirely longitudinally rugose in the male and on the basal half or more in the female, and both sexes have a much more extensive area of the posterior surface rugose. The most noticeable differences in color are as follows: the palpi are yellow except basal segment in *deceptor*, entirely fuscous in *simillimus;* in the female of *deceptor* the antennal flagellum and mid and hind trochanters are yellow beneath, while in *simillimus* the apical segments of the flagellum and all trochanters are dark beneath; in *deceptor* males the trochanters are yellow beneath but in *simillimus* they are dark. I am indebted to I. H. H. Yarrow of the British Museum for comparison of material with the type of *simillimus* Smith.

There are two published records of *simillimus* preying on adult Cicadellidae in Buffalo, N. Y., and in Westmoreland State Park, Va. (Krombein: Ent. News 47: 93, 1936 and Trans. Amer. Ent. Soc. 78: 95, 1952). K. W. Cooper captured a female of *deceptor* at Princeton, N. J., transporting an adult membracid.

G. deceptor is known at present from a more circumscribed geographic range than is *simillimus*, but additional collecting may prove them to be coextensive. Both species fly together at Lost River State Park. There are definite records of *deceptor* from New Hampshire, Connecticut, New York, New Jersey, Virginia, West Virginia, Ontario, Michigan, Minnesota, Kansas and Nebraska. Published records indicate that *simillimus* occurs from Nova Scotia, New Brunswick and Maine south to Georgia, and in Ontario, Michigan, Illinois, Nebraska, and British Columbia. It is possible that some of these records for *simillimus* may be based on misidentifications.

Type. ♀; Lost River State Park, W. Va.; July 31, 1957 (K. V. Krombein) [U. S. National Museum, Type No. 64095; by donation from author's collection].

Length 10.5 mm., forewing 8.5 mm. Black and shining, the following lemon yellow: palpi except basal segment, base of mandible, clypeus except very narrow apical margin, supraclypeal area except subantennal sutures, narrow stripe along lower two-thirds of inner eye margin, antenna beneath, narrow stripe on pronotal dorsum, posterior half of pronotal lobe, small spot on mesopleuron below base of forewing, band on posterior half of scutellum, a round spot on each side of propodeal enclosure behind spiracle, apical bands on first five terga, that on first covering the posterior third and with a deep right-angled emargination anteriorly toward middle, the remaining bands narrower, small posterolateral spots on second to fifth sterna which become progressively smaller toward apex, apices of all coxae beneath, all trochanters beneath, femora within on apical fourth or more, tibiae

except in varying amounts beneath, and fore and mid tarsi. Wings with a faint yellowish cast, the marginal cell somewhat infuscated; veins fuscous.

Sculpture and body proportions very similar to *simillimus*. Front rather dull from dense fine punctures and with some scattered superimposed larger ones; vertex and thorax except propodeum with minute, well-separated punctures; metapleural-propodeal suture well-marked on lower two-thirds, evanescent above; propodeal enclosure delimited by foveolate grooves, with a narrow central furrow on either side of which are about ten longitudinal rugae on the basal two-thirds; posterior surface of propodeum and area above hind coxa with some vertical rugae extending about halfway to upper horizontal surface; pygidium triangular, rather narrow, the basal width about two-thirds the length, the surface shining and with scattered, moderately small punctures.

Allotype. ♂; Rochester, Monroe Co., N. Y.; June 1939 [USNM]. Length 10.1 mm., forewing 7.6 mm. Color pattern similar to type with following exceptions: clypeus all yellow, flagellum dark beneath, first sternum with narrow apical band, second and third sterna with lateral spots connected by a broader band, apices of coxae and trochanters entirely yellow beneath.

Sculpture and body proportions as in type except as follows: narrow longitudinal tyloides on first four flagellar segments as in *simillimus;* propodeal enclosure entirely rugose and posterior surface covered with vertical rugae, the lateral ones terminating above on the yellow propodeal spots.

Paratypes. 2 ♀♀; same data as type, but August 1 and 8, 1957 (K. V. Krombein) [KVK]. 1 ♀; Arlington, Va.; July 11, 1954 (K. V. Krombein) [KVK]. 2 ♀♀; Princeton, Mercer Co., N. J.; June 9, 1946 and August 2, 1941 (the latter pinned with an adult membracid, *Spissistilus constans* (Wlk.)) (K. W. Cooper) [USNM]. 1 ♀; Shokan, Ulster Co., N. Y.; July 8, 1936 (H. K. Townes) [KVK]. 2 ♀♀; Cornell University Campus, Ithaca, Tompkins Co., N. Y.; June 18 and July 6, 1937 (P. P. Babiy) [CU]. 1 ♀; Ithaca, N. Y. (Chittenden) [USNM]. 1 ♀; Ithaca, N. Y., July 14, 1917 (E. C. Van Dyke) [Cal. Acad. Sci]. 1 ♀; Ringwood, Ithaca, N. Y.; July 5, 1920 [CU]. 1 ♀; Forest Lawn Cemetery, Buffalo, Erie Co., N. Y.; June 20, 1934 (K. V. Krombein) [KVK]. 1 ♂; Hartford, Hartford Co., Conn.; June 12, 1895 [U. Calif., Davis]. 1 ♂; New Hampshire [USNM]. 1 ♂; Rondeau Park, Kent Co., Ont.; June 28, 1936 (G. Steyskal) [U. Mich.]. 1 ♀; Ann Arbor, Washtenaw Co., Mich.; July 27, 1935 [U. Calif., Davis]. 1 ♂; Detroit, Wayne Co., Mich.; June 14, 1936 (G. Steyskal) [U. Mich.]. 1 ♀; Olmsted Co., Minn. (C. N. Ainslie) [USNM]. 1 ♀; Baldwin, Douglas Co., Kans.; June (J. C. Bridwell) [USNM]. 1 ♀; Carns, Rock Co., Nebr.; July 1, 1902 (W. D. Pierce) [U. Nebr.].

Female paratypes range from 8.5 to 11.5 mm. in length There is no significant variation in details of the sculpture except that rugae may cover only the basal half of the propodeal enclosure. Likewise, there is very little variation in the coloration, the chief difference being a slight reduction in extent of the yellow markings in a couple of the specimens. The male paratypes are much like the allotype in coloration, but the rugae on posterior surface of propodeum do not extend quite as high; they range from 8 to 9.5 mm. in length.

AN ANNOTATED CHECK LIST OF THE MOSQUITOES OF MONA ISLAND, PUERTO RICO, AND THE LARVA AND MALE OF AEDES OBTURBATOR D. & K.

(DIPTERA, CULICIDAE)

J. MALDONADO-CAPRILES,[1] WARREN F. PIPPIN,[2] AND MERLE L. KUNS[3]

Mona Island is located in latitude 18° 05′ North and longitude 67° 85′ West in the southern entrance to the Mona Passage between Puerto Rico and Hispaniola, West Indies. Politically the island is a part of Puerto Rico. The island is about 7 miles long from east to west and 3½ miles from north to south, thus covering about 14,000 acres.

The island is relatively flat and with two clear cut levels, the very narrow sandy and rocky coastal plain and the limestone plateau that ranges from 125 to 300 feet in elevation. Annual rainfall averages only 40 inches. Water is permanently found in less than half a dozen wells and cisterns built by people who have sporadically lived on the island. Due to the constant breeze and the relatively high diurnal temperature, water evaporates rapidly from the rock pools, etc. Additional information on topography, climate, soil, vegetation, fauna, and flora can be found in condensed form in Ramos (1946).

In his paper Ramos lists only two species of mosquitoes as occurring on the island, namely, *Aedes aegypti* (L.) and *Culex pipiens* L. A total of 14 species were collected by the authors during the period 1953 to 1956. All of these except *Aedes obturbator* D. & K. and *Psorophora insularia* (D. & K.) have been reported from Puerto Rico. The identifications have been checked by Dr. Alan Stone, of the U. S. D. A., Washington, D. C., and for this and other suggestions we are indebted to him.

1. ***Aedes aegypti*** **(Linnaeus).**—Ramos (1946) says "Curran 1928:10 reports 4 ♂ ♂ collected February 21-26, 1914." This species has never been collected again.

2. ***Aedes taeniorhynchus*** **(Wiedemann).**—Repeatedly found breeding in the small mangrove swamp and in an open cistern on the western shore near Sardinera. It is a vicious biter both day and night. Found together with *Psorophora johnstoni.*

3. ***Aedes mediovittatus*** **(Coquillett).**—This species was found breeding in artificial containers in the western lowland, near the Coast Guard Station, in one concrete tank located near the center of the island, in bromeliads (probably *Guzmania* sp.), and in pools formed by water dripping from the roof of a cave near the light house. The water in these cave pools had a pH of 8.2. The part of the cave where these pools were found is well lighted. Adults are vicious biters both day and night.

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Aedes (*Ochlerotatus*) *obturbator* D. & K.: Fig. 1, head, dorsal view; Fig. 2, individual spines of lateral comb of eighth segment; Fig. 3, air tube, lateral view; Fig. 4, anal segment, lateral view; Fig. 5, basistyle, ventral view; Fig. 6, claspette, lateral view; Fig. 7, tenth sternum, ventral view; Fig. 8, ninth tergum, dorsal view.

4. *Aedes obturbator* Dyar and Knab.—Found in semipermanent rain pools formed in rock depressions on the plateau and in cement catchment in the lowlands. Adults were taken feeding both day and night.

Larva—Skin glabrous. Head (fig. 1) approximately one and one-half times as wide as long, swollen at sides. Antenna relatively short, one-third as long as head, nearly smooth except for an irregular double row of very small peg- or spine-like structures along dorsoposterior side, very few longer spines on apical third; antennal hair double. Postclypeal hair (No. 4) very small, branched; frontal internal hairs (Nos. 5, 6) simple and long ante-antennal hair (No. 7) multiple, long. Hair No. 8 simple and long; No. 9 short and branched. Mental plate triangular, with a larger median tooth and 15 to 16 lateral teeth on each side.

Eighth segment with lateral comb formed by 18 to 23 very weakly sclerotized elongated spines in a triangular patch; individual spines with a central longer spine and two to four smaller on each side (fig. 2). Air tube (fig. 3) about twice as long as basal width; pecten reaching to apical two-thirds, with 14 to 15 spines, each successive spine slightly larger than preceding, last four more separated from each other, individual spines with a strong tooth and a smaller basal one; skin of air tube of scaly appearance; tuft close to last spine of pecten, multiple. Anal segment (fig. 4) equal or slightly longer on its dorsal margin than wide at base; ringed by sclerotized plate; skin of scaly appearance; ventral brush with 8 multiple hairs; dorsal brush with a single and a multiple hair. Anal gills four, as long or slightly longer than anal segment; the dorsal pair slightly shorter than the ventral pair. Lateral abdominal hairs long and single, on segments III to VI shorter.

Runs to couple 3 in Lane's (1953) key to the Neotropical *Aedes*. Can be separated from *A. fulvus* and *A. pennai* by the shorter anal gills, the different head hairs, and the different antennal tuft.

Male—The male at hand runs without any difficulty to *A. obturbator* in Lane's key to adult *Aedes*, therefore, it is very similar to the female. Proboscis one-fifth longer than fore femur; one and one-half times as long as antenna. Palpus as long as proboscis. Anterior claw serrate, others missing. Proboscis, palpus, torus, clypeus, legs, and thorax laterally yellowish; scales strongly iridescent, thus all these parts can look metallic blue, green, or black. Mesonotum with brown integument along the median line and behind, on each side yellowish; covered with golden yellow scales, with brown scales on median line. Abdominal terga blackish with basal band of broad white scales; sterna paler with less conspicuous basal white band.

Genitalia—Basistyle (fig. 5) uniform, relatively short, twice as long as broadest width, apical lobe very small, inconspicuous, not spined; basal lobe subtriangularly produced, evenly setose, on basal margin with a thicker and much longer hair. Dististyle missing. Claspette (fig. 6) with curved base; blade as long as base, slightly curved, with a conspicuous retrose point before apex. Tenth sternum ending in two closely united teeth, apex of each on lateral aspect as in figure 7. Mesosome subconical, weakly sclerotized. Ninth tergum very finely pilose, with the lobes separated, lobes with apical margin narrowly and slightly sclerotized, with three or four setae (fig. 8).

Two larvae with associated females and a male with the corresponding genitalia on a slide have been deposited in the United States National Museum.

5. *Aedes tortilis* (Theobald).—Found in limited numbers in temporary ground pools.

6. *Culex bahamensis* Dyar & Knab.—Larvae taken from temporary splash pools by the seashore and in a cistern in small numbers. Also in cave pools together with *Aedes mediovittatus*.

7. *Culex americanus* (Neveau-Lemaire).—Found breeding in great numbers in the axils of bromeliads the year around. Adult rest during the day in cracks in rocks.

8. *Culex pipiens* Linnaeus.—This species was found in limited numbers near the lighthouse on the southeast coast of the island and in a shallow well on the western lowlands.

9. *Culex nigripalpus* Theobald.—Found in cistern and a grassy pool in the lowland area.

10. *Culex secutor* Theobald.—This species is represented by one larva taken from a deep well near base of cliff.

11. *Anopheles grabhami* Theobald.—Larvae were taken on two occasions, once in a cistern and once in a water catchment. One male was taken in a light trap. There is the possibility that this species was introduced by aircraft from Puerto Rico and will not become established on the island.

12. *Psorophora johnstonii* (Grabham).—This species was encountered on one occasion when great numbers emerged after heavy rains.

13. *Psorophora pygmaea* (Theobald).—Larvae found in temporary pools of brackish water exposed to full sunlight. Large swarms occur during the rainy season.

14. *Psorophora insularia* (Dyar & Knab).—Collected in moderate numbers in splash pools on the rocky southern shore.

15. *Deinocerites cancer* Theobald.—Found in crab holes primarily in the lowland area near the base of the cliff. Taken the year around.

References

1. Lane, J., 1953. Neotropical Culicidae. Published by Univ. São Paulo, Brazil. Two volumes, 1112 pp., illus.

2. Ramos, José A., 1946. The insects of Mona Island (West Indies). Journ. Agr. Univ. P. R. 33(1):1-74.

TWO NEW NAMES IN MOSQUITOES

(DIPTERA, CULICIDAE)

Work on a catalogue of the mosquitoes of the world has brought to light the need for two new names in mosquitoes, which we here propose.

Aedes (Aedes) lankaensis, new name

Aedes ceylonicus Edwards, 1917, Bull. Ent. Res. 7:221. (nec Theobald 1910).

Theobald (Mon. Culic. 5:391, 1910) proposed the name *Culex* (?) *japonicus* var. *ceylonica* n. v. for specimens from Ceylon, one of which he had previously determined as *Culex japonicus* Theobald var. (Mon. Culic. 3:158, 1903). This so-called variety was placed as a probable synonym of *Aedes chrysolineatus* Theobald by Edwards (Gen. Insectorum 194:151, 1932), and Knight (Ann. Ent. Soc. Amer. 40:636, 1947) verified the synonymy. This action placed *ceylonica* Theobald in the genus *Aedes* where it preoccupies *Aedes ceylonicus* Edwards 1917. The name we choose is based on an ancient name for the island of Ceylon.

Culex (Culex) starckeae, new name

Culex basicinctus Edwards, 1922, Bull. Ent. Res. 13:96. (nec Edwards 1921)

Edwards (Bull. Ent. Res. 12:78, 1921) transferred *Leucomyia annulata* Taylor 1914 to the genus *Culex* and since it was there preoccupied by *C. annulatus* Schrank 1776, he proposed a new name, *Culex basicinctus*, for it. Later Edwards decided that the species he took to be *Leucomyia annulata* Taylor was actually a different species and in 1922 (loc. cit.) he described the species he had and proposed to use the name *basicinctus* for it, placing Taylor's *Leucomyia annulata* as a synonym of *Culex vicinus* (Taylor). Although Edwards, in 1921, briefly characterized the species he had, the Copenhagen Decisions on Zoological Nomenclature (p. 75-76, par. 142) clearly state that, "Where a specific name, when first published, is expressly stated to be a substitute for a previously published name . . . the species to which the new name applies is invariably that to which the previously published name applied." Therefore *Culex basicinctus* Edwards 1921 remains a synonym of *Culex vicinus* (Taylor) and the species described by Edwards as *basicinctus* requires a new name. The one we propose is in honor of Miss Helle Starcke, who brought this nomenclatorial problem to our attention. We accept as type material of *starckeae* the specimens Edwards listed in 1922, p. 97, a male being marked as type in the British Museum.—ALAN STONE, *Entomology Research Division, U. S. Department of Agriculture,* and KENNETH L. KNIGHT, *Bureau of Medicine and Surgery, Department of the Navy,* both *Washington, D. C.*

A NEW SPECIES OF NYSIUS FROM ALASKA AND ALBERTA, CANADA

(HEMIPTERA, LYGAEIDAE)

HARRY G. BARBER, *Collaborator, Entomological Research Division, U. S. Department of Agriculture, Washington, D. C.*

Nysius fuscovittatus, new species

Head much wider than long, 75:60; preocular portion nearly on third longer than eye, 35:20, and shorter than interocula rspace, 35:40; surface coarsely, closely punctate. Bucculae rather low, lower edge nearly straight, gradually narrowed posteriorly, terminating just before base of head. Antennae long, much longer than combined length of head, pronotum and scuttelum, basal segment extended well beyond apex of tylus, second segment longest; proportions of segments one to four: 25, 60, 40 and 50.

Pronotum very little shorter than head, much wider than long, 90:55, lateral margins fairly straight, surface densely, coarsely punctate with fuscous, obsoletely carinate along the middle and the humeral angles smooth.

Scutellum one fifth wider than long, 55:45, longitudinally carinate through the middle, finely punctate on each side.

Hemelytra dusky opaque, surface rather densely covered with short, recurved hairs interspersed with a few long hairs; basal costal margins sparsely pilose, these margins parallel for a distance equal to length of the commissure thence gently rounded to apices. Membrane translucent, the length very nearly equal to length of the corium and twice as long as its marginal length. **Color.**—Head black with several rather obscure testaceous spots on the vertex and a pale spot in the middle of the basal margin. Antennae and also the femora except testaceous spices, black. Pronotum stramineous, very closely and coarsely punctate with fuscous, a small black spot before each humeral angle. Scutellum black. Hemelytra dusky; area between costal margin of corium and subcostal vein pale, extreme costal margin, subcostal and median veins, outer margin of clavus and entire apical margin, fuscous. Following parts pale: spot in the middle of basal margin of head, bucculae, humeral angles of pronotum, anterior margin of prosternum, acetabular flanges and margins of osteole. Venter black, densely pilose. **Length** 6.30 mm.

Types.—Holotype female: Lower Tonsina, Alaska, June 28, 1953, W. C. Frohne. Paratype, male: Jasper, Alberta, Canada, Aug., C. T. Parsons.

N. fuscovittatus n. sp. is most closely related to *paludicola,* in fact so close in general appearance that a male specimen from Alberta, Canada, was included as a paratype in the *paludicola* series. *N. fuscovittatus* differs in having less elevated bucculae, antennae somewhat shorter, corium very little longer than membrane and posterior margin with an unbroken fuscous line. From *groenlandicus*, which also occurs in Alaska, *fuscovittatus* differs in being a little longer, the preocular part of the head is longer in relation to the eye, and antennae and hemelytra relatively longer.

NEW AMBRYSUS RECORDS FOR MEXICO

(HEMIPTERA, NAUCORIDAE)

By IRA LA RIVERS, *University of Nevada, Reno*

The following new records and comments on species already established as part of the Mexican *Ambrysus* fauna are largely the results of the recent Mexican collecting of Dr. C. J. Drake and Dr. F. C. Hottes, to whom I am indebted for the privilege of examining specimens. Because a recent comprehensive synonymicon is available for these species in the author's Mexican revision (1953), usually only this last-mentioned paper will be necessary (in addition to the original citation) to bring the listings up to currency.

Ambrysus parviceps Montandon 1897

Ambrysus parviceps Montandon 1897, Verh. zool.-bot. Ges. Wien, 47:17; La Rivers, 1953A, U.S.N.M. Proc. 103 (3311): 6; 1953B, Univ. Kansas Sci. Bull. 35 (II: 10): 1294-1296.

This species has been previously reported from the States of Chihuahua, Guerrero, Michoacan and Mexico; recent Drake and Hottes collecting has added two more states: OAXACA (*Oaxaca*, 21(vii)51, C. J. Drake & F. C. Hottes) and PUEBLA (*Puebla*, 20(vii)51, Drake and Hottes.

Ambrysus pudicus pudicus Stål 1862

Ambrysus pudicus Stål 1862, Stet. Ent. Zeit., 23: 460.

Ambrysus pudicus pudicus, La Rivers, 1953B, Univ. Kansas Sci. Bull. 35(II: 10); 1294-1296.

PUEBLA (*Puebla*, 20(vii)51, C. J. Drake & F. C. Hottes)—this record extends the range of this southern segment of the species from the States of Mexico and Guerrero eastward into adjacent territory. The species is also known from Guatemala, so it is only a question of time until the several intervening states will be added to the list.

Ambrysus pudicus barberi Usinger 1946

Ambrysus barberi Usinger 1946, Univ. Kansas Sci. Bull. 31(1): 189-190.

Ambrysus pudicus barberi, La Rivers, 1953B, Univ. Kansas Sci. Bull. 35 (II: 10); 1298-1299.

SAN LUIS POTOSI (*Tamazunchalo*, 31(iii)51, J. D. Lattin) (Univ. Kansas). This is an expected addition in the way of a general area to the known range of this variety, since it was previously known both north and south of Tamazunchalo.

Ambrysus abortus La Rivers 1953

Ambrysus abortus La Rivers 1953B, Univ. Kansas Sci. Bull. 35 (II: 10); 1299-1301.

The types of this species were from the State of Mexico, and the following record continues the distribution eastward; OAXACA (*Oaxaca*, 21(vii)51, C. J. Drake & F. C. Hottes).

The relationship between *A. abortus* and *A. hungerfordi* may well change with future collecting; through *A. hungerfordi angularis*, the rather variable *A. hungerfordi* makes some approach to the condition found in *A. abortus*—at present, the latter has a somewhat restricted range paralleling that of the southern components of *A. hungerfordi* to the northeast, at least in Mexico. In Guatemala, where an extreme form of *A. hungerfordi* occurs (*A. h. spicatus*), *A. abortus* is as yet unknown, so at the present time, the two entities are specifically separable.

Ambrysus vanduzeei Usinger 1946

Ambrysus vanduzeei Usinger 1946, Univ. Kansas Sci. Bull. 31 (1): 207-209; La Rivers, 1953B, Univ. Kansas Sci. Bull. 35 (II: 10); 1308-1309.

The paragraph describing the pronotal features of this species was omitted from the author's Mexican revision, and is here added for completeness:

Pronotum: shiny, but minutely, almost smoothly, roughened and punctate, incipient transverse rugulosities developing centrally behind region of deepest head penetration. Ground color yellowish with a variable development of discal brown suffusion and dotting; when best developed, the entire disc suffused with brown, which becomes darker laterally and medially; some comparatively gross brown dotting is evident in the suffusion upon close examination, particularly laterally and centrally; generally a short, blunt, somewhat lunar spot in antero-lateral part of disc. Broad, whitish, posterior pronotal border conspicuously separated by transverse, thin, blackish posterior pronotal line (interrupted in middle) from the varicolored disc. Lateral edges smooth, unserrate, in unrubbed specimens with sparse, barely discernible marginal pilosity. Percent of pronotal lateral curvature, expressed in terms of straight-line distance between anterior and posterior lateral angles and greatest vertical distance between this base line and line-of-curvature, is 13% (88::11). Postero-lateral angles well-rounded. Venter rich yellow, lightening laterally with a slight lateral darkening behind eyes; conspicuous golden pilosity along posterior margin and on keel. Dorsal ratios are:

(1) width between anterior angles to greatest pronotal width, 52::95 (55%)
(2) median length to greatest width, 32::95 (34%)
(3) width between anterior angles to distance between anterior angle and posterior base line of pronotum, 52::46 (88%).

Ambrysus mormon australis La Rivers 1953

Ambrysus mormon australis La Rivers 1953B, Univ. Kansas Sci. Bull. 35 (II: 10): 1311-1313.

This subspecies was described from the northern State of Chihuahua, and the following records show this southern subspecies of the widely ranging *A. mormon* to occur well into southern Mexico:

CHIHUAHUA (*Camargo*, 12(vii)51, C. J. Drake & F. C. Hottes); GUERRERO (*Acapulco*, 3(vii)51, Drake & Hottes); JALISCO (*Lake Chapala*, 15(vii)51, Drake & Hottes); CHIAPAS (*Escuintla*, 18(vii) 26, J. J. White).

Ambrysus inflatus La Rivers 1953

Ambrysus inflatus La Rivers 1953B, Univ. Kansas Sci. Bull. 35 (II: 10): 1316-1318.

The following new records indicate that this well defined species ranges more southerly and easterly than its type locality in the State of Jalisco:

DISTRITO FEDERALE (*Mexico City*, 30(vii)50, C. J. Drake & F. C. Hottes); MICHOACAN (*Patzcuaro*, 17(vii)51, Drake & Hottes).

Ambrysus signoreti Stål 1862

Ambrysus signoreti Stål 1862, Stet. Ent. Zeit. 23: 450; La Rivers, 1953B, Univ. Kansas Sci. Bull. 35 (II: 10): 1321-1323.

The specimens representative of the following records come closest to my conception of Stål's *A. signoreti*, although I am still not satisfied that they are that species:

SAN LUIS POTOSI (*Ciudad Valles*, 8(vii)51, C. J. Drake); TAMAULIPAS (*Tampico*, 16(vii)50, C. J. Drake & F. C. Hottes).

Although the evidence is as yet not conclusive, it appears that my *A. portheo* is a variant of *A. signoreti;* connexival spination and female subgenital plate terminal outlines are somewhat exaggerated over the condition found in the Stockholm Stål type, but otherwise there seem to be no specific differences.

Ambrysus mexicanus Montandon 1897

Ambrysus mexicanus Montandon 1897, Verh. zool.-bot. Ges. Wien. 47: 21-22; 1909, Bull. Soc. Sci. Buc.-Roum. 17 (5-6): 322; Champion, 1900, Biol. Centr.-Amer., Hemipt. 2: 357; Usinger, 1946, Univ. Kansas Sci. Bull. 31 (I: 10): 198, 206-207; De Carlo, 1950, An. Soc. Cient. Argentina, 150: 8.

Ambrysus dilatus Montandon 1910, Bull. Soc. Sci. Buc.-Roum. 18 (5-6): 190; Usinger, 1946, Univ. Kansas Sci. Bull. 31 (I: 10): 198; De Carlo, 1950, An. Soc. Cient. Argentina, 150: 10; La Rivers, 1953B, Univ. Kansas Sci. Bull. 35 (II: 10): 1327-1329.

Ambrysus hintoni Usinger 1946, Univ. Kansas Sci. Bull. 31 (I: 10): 206-207; De Carlo, 1950, An. Soc. Cient. Argentina 150: 12-13; La Rivers, 1953B, Univ. Kansas Sci. Bull. 35 (II: 10): 1327.

Montandon's original locality for both *A. mexicanus* and *A. dilatus* was simply "Mexico;" to the States of Michoacan and Mexico given specifically in the author's Mexican revision can be added the following more easterly record: PUEBLA (*Puebla*, 20(vii)51, C. J. Drake & F. C. Hottes).

Ambrysus bispinus La Rivers 1953

Ambrysus bispinus La Rivers 1953A, U.S.N.M. Proc. 103 (3311): 4-6.

Previously known only from the States of Veracruz and Oaxaca, this species' range can be extended westerly into an adjacent area: PUEBLA (*Teziutlan*, 27(vii)50, C. J. Drake & F. C. Hottes). The male of this very distinctive *Ambrysus* is still unknown.

Ambrysus occidentalis La Rivers 1951

Ambrysus occidentalis La Rivers 1951, Univ. Calif. Publ. Entom. 8 (7): 322-325; 1953B, Univ. Kansas Sci. Bull. 35 (II: 10): 1323.

This species, long confused with *A. signoreti* in the southwestern United States, was inadvertently omitted from the Mexican list, although its occurrence south of the United States was noted in the revision of *Ambrysus* for that area. For the sake of completeness, the Mexican record is re-iterated here:

BAJA CALIFORNIA (*Ensenada*, 11(iv)40, R. G. Miller (U. Michigan)); SONORA (*Palmer dist.*, Alamos, 27(x)34, H. S. Gentry (U. Kansas).

Ambrysus hybrida Montandon 1897

Ambrysus hybrida Montandon 1897, Verh. zool.-bot. Ges. Wien 47: 22; / 1909, Bull. Soc. Sci. Buc.-Roum. 17 (5-6): 322; Champion, 1900, Biol. Centr.-Amer., Hemipt. 2: 357; Usinger, 1946, Univ. Kansas Sci. Bull. 31 (I: 10): 198-199, 209; De Carlo, 1950, An. Soc. Cient. Argentina, 150: 8.

Ambrysus fuscus Usinger, 1946, Univ. Kansas Sci. Bull. 31 (I: 10): 198-199; De Carlo, 1950, An. Soc. Cient. Argentina, 150: 11; La Rivers, 1953B, Univ. Kansas Sci. Bull. 35 (II: 10): 1333-1334.

Through the kindness of Dr. Max Beier of the Naturhistorisches Museum at Wien, Austria, the writer was able to examine several Montandon types and note the above synonymy as well as to confirm the uses of other names in *Ambrysus*. Previously, *A. hybrida* had been omitted from the Mexican treatment since it had gone unrecognized as such in the material studied. It is, however, a distinctive enough species and no difficulty need be associated with its detection in future.

REFERENCE

La Rivers, Ira. 1953. The Ambrysus of Mexico (Hemiptera, Naucoridae). Univ. Kansas Sci. Bull. 35(II: 10): 1279-1349.

LAELAPS KEEGANI, NOM. NOV. FOR LAELAPS BERLESEI KEEGAN, 1956

(ACARINA, LAELAPTIDAE)

Laelaps berlesei Keegan, 1956 (*nec* da Fonseca, 1939), Egyptian Pub. Hlth. Assoc. Jour. 31(6): 246, Fig. 45.

Keegan (1956) inadvertently created a primary homonym by naming an Egyptian mite *Laelaps berlesei* after this combination of names had been proposed by da Fonseca (1939, Memor. Instituto Butantan; 12: 104, Figs 1 & 2) for a Brazilian mite. The name *Laelaps keegani, nom. nov.* is proposed for *Laelaps berlesei* Keegan, 1956, with the description and illustration by Keegan as applicable. The holotype female has been deposited in the U. S. National Museum. The unique specimen was collected from *Arvicanthis niloticus* (striped mouse) at Pyramids, Giza Province, Egypt, 22 March 1953, by H. Hoogstraal.—ERNESTINE B. THURMAN, *Sanitarian (R), Division of Research Grants, National Institutes of Health, Public Health Service, DHEW, Bethesda 14, Maryland.*

A NEW SPECIES OF LIZARD MITE AND A GENERIC KEY TO THE FAMILY PTERYGOSOMIDAE

(ACARINA, ANYSTOIDEA)[1]

By JOHN A. DAVIDSON, *University of Maryland, College Park*

The family Pterygosomidae as now understood, is comprised of 8 genera. These are variable in general appearance and habitus. Most species are parasites of lizards while a few parasitize arthropods. Those forms found on lizards are usually baglike in appearance and dorso-ventrally flattened. Free living species are elongate and flattened. In the new species of *Geckobiella* here presented, the male is free living in form while the female is parasitic, having the body laterally compressed and shaped in such a way as to fit between scale bases beneath the host's scales (Fig. 3).

In an attempt to facilitate identification of pterygosomid species, Miss Margaret Grayson, Dr. F. Cunliffe, Dr. R. F. Lawrence, and Dr. E. W. Baker collaborated to produce the key found herein. Since several genera are represented by relatively few species, the discovery of new forms may necessitate changes in the key as well as in generic concepts.

Geckobiella harrisi, new species

(Figs. 1-8)

Diagnostic characters may be found in the laterally compressed body of the adult female; short clublike dorsal setae which occur in patches; short peritremes which in the female, do not extend to the second palpal segment, and the absence of eyes.

Adult female—Body longer than wide, distinctly laterally compressed and angular; clublike setae present in patches, especially numerous on the anterior dorso-lateral surface and becoming less abundant but larger posteriorly. Palpus 4-segmented with the tibia and tarsus fused; dorsum of segments 2, 3 and 4 each bearing a single long barbed seta, the second seta being longest; palpal thumb bearing 4 simple setae and 2 rodlike sensory setae; palpal tarsus with 1 lateral simple seta in addition to the dorsal barbed seta. Leg 1 somewhat longer than 2, 3, or 4, and with the last 3 segments distinctly enlarged; segments 3, 4, and 5, of all legs with 1 mildly pilose seta dorsally; duplex setae present on tarsus 1 and 2, consisting of a long whiplike barbed seta, and a shorter rodlike sensory seta. Abdomen prominently bilobed posteriorly; 2 pairs of large clublike setae and 1 large simple seta on each lobe; a ventral tubercle present anterior to each lobe, bearing a large seta which is medially pointed.

Adult male—Unlike the female, the male retains the free living form, being dorso-ventrally flattened; considerably smaller in size; tapering anteriorly and posteriorly. Clublike setae present on the margins of the dorsum are most abundant anteriorly. Palpus 4 segmented with the tibia and tarsus fused; segments 2-3 with dorsal barbed setae above; palpal tarsus with 3 simple setae above and 4 simple

[1]*Scientific Art. No. A623, Contribution No. 2805, of the Maryland Agricultural Experiment Station, Department of Entomology.*

and 2 rodlike setae below on the palpal thumb; duplex setae present on legs 1-2 only. Aedeagus present (Fig. 7). Posterior end of the dorsum with a pair of tubercles, and a pair of subapical setae antero-ventral to the tubercles. Anterior to the subapical setae are a pair of genital papillae, bearing 3 setae each. Posterior end of the venter with a pair of seeming genital plates, each bearing a finely barbed lateral seta and lanceolate median seta.

Geckobiella harrisi, n. sp.: fig. 1, Lateral view of adult female; fig. 2, Dorsal seta of female; fig. 3, Female in position on host (dotted lines indicate scale bases); fig. 4, Tarsus 1 of female; fig. 5, Ventral view of female mouthparts (enlargement shows palpal thumb).

Types—The holotype female, USNM No. 2365, and the allotype are deposited in the U. S. National Museum, Washington, D. C. Thirty-two female paratype specimens are deposited in the U. S. National Museum and the Institute of Acarology, University of Maryland, College Park, Md.

Type host—*Plica plica* (Linn.)

Type locality—12 miles south of Santarem, Para, Brazil.

Material examined—33 adult females and 1 adult male. No nymphs were found. All the material examined came from the ventral surface between the gular fold and the anal vent. The single iguanid host specimen was collected by Professor Lester E. Harris, Jr., in whose honor this mite is named.

Geckobiella harrisi, n. sp.: fig. 6, Tarsus 1 of male; fig. 7, Ventral view of male genital—anal region; fig. 8, Dorsal view of adult male.

Remarks—Banks (1905, p. 134) described the species *Geckobia texana*. Hirst (1917, p. 138) erected the genus *Geckobiella* using *Geckobia texana* as the type. This species was refigured by Hirst (1925, p. 200), Lawrence (1953, p. 16), and Lane (1954, p. 96). Until now the genus *Geckobiella* was mono-typic, and known to occur only on species of the iguanid genus *Sceloporous*.

Although the male and females here considered to be *G. harrisi* differ markedly in body form and shape, they appear to be the same species because they both have clublike dorsal setae occuring in patches, similar duplex setae, identical chaetotaxy of the palpal thumb, lack eyes, and were found associated on the same host. No other species of mites were found on the type host.

This species has been placed in the genus *Geckobiella* because it has dorsal setae which occur in patches, without indication of a transverse setal pattern; long, robust mouthparts; 1 dorsal seta present on palpal segments 2, 3, and 4, with the seta of palpal segment 3 being longest; leg 1 longer than the remaining legs; segments 2, 3, and 4 of all legs with 1 mildly pilose seta above; the body decidedly longer than wide. *G. harrisi* was found on an iguanid lizard as was the type species of the genus.

Key to the Genera of Pterygosomidae

1. Body decidedly longer than wide, coxae not fused, first two pairs of legs pointing anteriorly, last two pairs pointing posteriorly 2
   Body only slightly longer than wide, or as wide or wider than long, coxae I and II fused, coxae III and IV fused, all legs pointing anteriorly 4
2. Setae few, in transverse rows 3
   Setae numerous, not in transverse rows ..... *Geckobiella* Hirst
3. Thirteen pairs of dorsal body setae, duplex setae of Tarsus I of unequal length, palpal thumb short; on arthropods ..... *Pimeliaphilus* Tragardh
   Fourteen pairs of dorsal body setae, duplex setae of Tarsus I of equal length, palpal thumb elongate; on reptiles ..... *Hirstiella* Berlese
4. Hypostome enlarged at apex, more or less parallel sided 5
   Hypostome not enlarged at apex, more or less parallel sided 6
5. Body usually as long as wide, skin leathery; size large ..... *Ixodiderma* Lawrence
   Body much wider than long, skin soft and delicate; size small ..... *Scaphothrix* Lawrence
6. Dorsal setae in two dense patches along the anterior part of lateral margins. Duplex setae of Tarsus I unequal. The anterior seta the shorter ..... *Pterygosoma* Peters
   Dorsal setae not in two dense patches along the anterior part of lateral margins, duplex sensory setae not as above 7
7. Coxae armed with stout setae or spurs, duplex setae or Tarsus I unequal with the posterior seta the shorter ..... *Geckobia* Megnin
   Coxae without spurs, duplex sensory setae of Tarsus I equal ..... *Zonurobia* Lawrence

Acknowledgments

The author wishes to express his appreciation for the interest and suggestions of Dr. E. W. Baker, Insect Identification and Parasite Introduction section, U. S. Department of Agriculture, and Dr. G. W. Wharton, Head, Department of Zoology, University of Maryland, in the study of this species and manuscript preparation.

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A NOTE ON THE IDENTITY OF NERTHRA PLANIFRONS (MELIN)

(HEMIPTERA, GELASTOCORIDAE)

Nerthra planifrons (Melin), Zoologiska Bidrag Fran Uppsala, Band 12, p. 186, figs. 74-76, 1930 (prepublished, 1929), was one of the unrecognized species in my revision of the family, University of Kansas Science Bulletin, vol. 37, pt. 1, No. 11, 1955, pp. 277-475. The type, a unique female, is now before me through the courtesy of S. L. Tuxen, Universitetets Zoologiske Museum, København, Denmark.

The specimen is labeled "Type" and "Mexico, Parzudaki." The size is slightly different than that given in the original description. Length, 10.2 mm.; width of pronotum, 6.6 mm.; and width of abdomen, 7.1 mm. The apex of the head is provided with two minute tubercles which are scarcely larger than the granulations of the body and not visible from a dorsal view. The apex of the head does not project anteriorly. Because the head structure will not satisfy either part of couplet 39 of my key to the species of *Nerthra*, this specimen will run to either *N. lata* (Montandon) or to *N. amplicollis* (Stal) and *N. ecuadorensis* (Melin). All of these are very closely related to if not identical with *planifrons*. This specimen appears to differ from the females of the aforementioned species in that the pronotum is widest near the antero-lateral angle and the median portions of the lateral margins converge posteriorly. The two margins are not quite identical and it therefore is possible that the specimen is but an abberrant individual of one of the other species. There is a possibility that *planifrons* is the female of *N. ater* (Melin). In the absence of conclusive evidence to the contrary, the name *Nertha planifrons* (Melin) should be retained for the present as representing a distinct species.—E. L. TODD, *Falls Church, Virginia.*

STEATONYSSUS FURMANI, A NEW NEARCTIC BAT MITE

(ACARI, MACRONYSSIDAE)

VERNON J. TIPTON, *Captain, MSC,* and JACK L. BOESE, *PFC, Fifth U. S. Army Medical Laboratory, St. Louis 2, Missouri*

A bat (*Lasiurus borealis*) found dead at an Indiana military installation was sent to this laboratory for a postmortem examination. Gross examination revealed an unusually large number of mites in the fur and on the wing membranes. Subsequent study of these mites indicated they represented an undescribed species of the genus *Steatonyssus* Kolenati 1858.

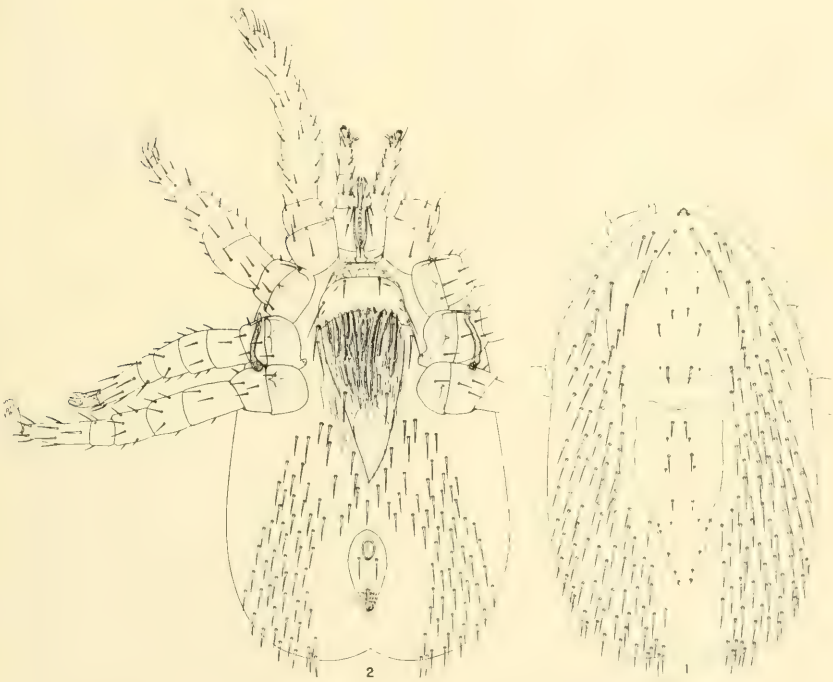
The genus *Steatonyssus* is probably cosmopolitan in distribution although to date no species have been reported from the Australian Zoogeographical Realm. Zumpt and Till (1954) in their treatment of the Ethiopian species of *Steatonyssus* express the opinion that a discussion of host relationships is premature in view of the present state of knowledge of taxonomy and host restrictions of this genus. However, it appears likely that bats are the true hosts of *Steatonyssus* species even though some specimens have been collected from mice, shrews and moles. Clark and Yunker (1956) have placed those species associated with birds in the genus *Pellonyssus* Clark and Yunker 1956. Further, Camin (1949) has furnished evidence that *S. arabicus* (Hirst 1921), described from specimens taken from a lizard, is a synonym of *Ophionyssus natricis* (Gervais 1844).

As now constituted the genus contains twelve species. Five species are represented in the American fauna and of these, three species are nearctic: *S. ceratognathus* (Ewing 1923), *S. occidentalis* (Ewing 1933) and a new species for which we propose the name *Steatonyssus furmani* n. sp. in honor of Dr. Deane P. Furman who is currently contributing so much toward a better understanding of the parasitic mesostigmatid mites.

Steatonyssus furmani Tipton and Boese, sp. n.

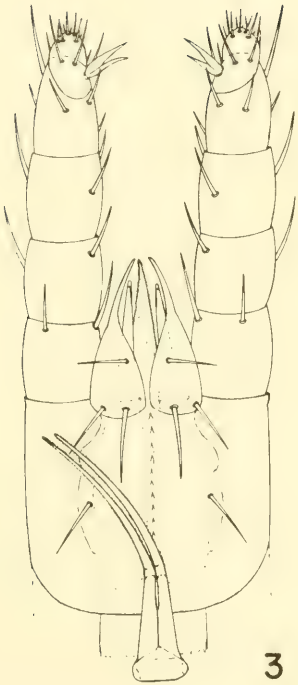
Female.—*Idiosoma:* 770 microns long, 448 microns wide at widest point. Elongate mite, becoming slightly swollen posterior to coxae IV, pronounced invagination of posterior margin at apex of anal plate in unmounted specimens. **Dorsum** (fig. 1): Dorsal plates composed of broad, well developed propodosomal plate; narrowly tapering opisthosomal plate. Prodosomal plate finely reticulate, 10 pairs heavy, sublateral setae; six pairs medial setae exclusive of pair of short setae on anterior margin of plate; anterior most pair minute, 2nd pair very minute, remaining pairs becoming progressively larger from anterior to posterior; pair of minute setae lateral to last pair of medial setae. Opisthosomal plate large (314 microns long), anterior margin deeply concave, lateral margins roughly parallel for approximately ½ their length, then tapering narrowly; On wide anterior portion of plate 2 pairs minute setae lateral to 2 pairs long setae; On tapering posterior portion 1 pair long, medial setae; 1 pair minute medial setae, 5 pairs minute marginal setae. Unsclerotized portion of dorsum wide lateral bands each of which

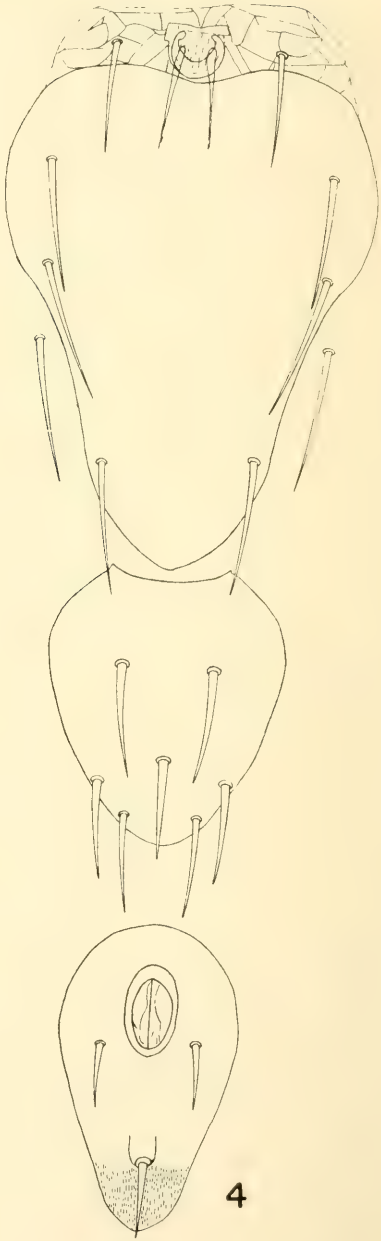
bear approximately 80-90 setae, areas between dorsal plates and posterior to opisthosomal plate without setae. **Venter** (fig. 2): Tritosternum divided from near base, lacinae finely pilose. Presternal area coarsely reticulate. Sternal plate nonreticulate; anterior margin convex, posterior margin concave; 1st pair setae on anterior margin, over ½ length of 2nd and 3rd pairs (30, 46, 50 microns); 1st pair sternal pores roughly at right angles to the longitudinal axis, 2nd pair at approximately 45 degree angle to longitudinal axis of mite. Endapodal plates very small,



Steatonyssus furmani n. sp., female. Fig. 1, dorsum; fig. 2, venter.

with setae of approximately same size as 2nd and 3rd pairs sternal setae. Epigynial plate poorly developed, acutely tapered posteriorly, with one pair setae on genital portion, anterior portion accordion-like to accommodate genital opening. Metapodal plates elongate. Anal plate pyriform; base of adanal setae near posterior margin of anal aperture; adanal setae approximately same length as postanal seta but less robust. Unsclerotized portion of venter with fine lines in area bordering epigynial plate, otherwise coarsely reticulate; approximately 60 pairs setae which become more robust in posterior area. Stigmata located at anterior margin of coxae IV; peritremalia (80 microns) extend to anterior margin of coxae III, extend posteriorly, fused with parapodal plates around coxae IV. **Legs:** First 3 pair coxae





Steatonyssus furmani n. sp. Fig. 3, gnathosoma, female; fig. 4, venter, male.

each with one pair setae, coxae IV with single seta. All legs with caruncles and claws, Tarsi I with fine tactile setae; those of Tarsi II, III & IV somewhat coarser. Legs II & III shorter than I & IV; legs II more robust. **Gnathosoma** (Fig. 3): Deutosternal groove with approximately 10 rows of teeth with 1 tooth per row. Gnathosomal setae small (20 microns), long medial hypostomal setae (34 microns), lateral hypostomal setae small (20 microns), distal hypostomal setae small (14 microns). Hypostomal processes broad at base but taper acutely anterior to distal hypostomal setae. Chelae long, slender, untoothed. Tectum acutely pointed, serrate margin.

Male.—Idiosoma: 480 microns long; 320 microns wide. **Dorsum:** As in female except 45-50 pairs setae on unarmed portion. **Venter** (fig. 4): Ventral plates consist of sternal plate, ventral plate, anal plate. Presternal area with one pair setae. Sternal plate with 3 pairs setae; tapers slightly to rounded posterior margin; gental opening between anterior-most pair of setae. Endapodal plates just off lateral margin of sternal plate at level of coxae III; one seta each, similar to those of sternal plate. Ventral plate short; anterior margin concave; lateral margins rounded then taper abruptly to rounded posterior tip; eight setae. Unarmed venter finely striated; 28 pairs setae. No metapodal plates visible. Anal plate as in female. **Legs:** Aproximately as in female. **Gnathosoma:** Approximately as in female except needle-like chelicerae.

Types.—**Holotype:** A female collected from a bat, *Lasiurus borealis*, collected at Jefferson Proving Grounds, Madison, Indiana, September, 956. Deposited in the Collection of the U. S. National Museum. **Allotype:** A male, same data as above. Deposited in the U. S. National Museum. **Paratypes:** Many females and 1 male, same data as above. Deposited in the British Museum of Natural History (male), University of California Collection and in the Collection of the senior author.

Steatonyssus furmani lacks the heavy sclerotization of the posterior margin of the sternal plate characteristic of other members of the genus with the exception of *S. eos* and *S. natalensis*. *S. furmani* may be differentiated from these two species in possessing the following combination of characters: extremely short peritremalia, sternal plate non-reticulate, the first pair of sernal setae approximately one-half the length of the second pair and a narrowly tapered opisthosomal plate. The description of *S. javensis* (Oudemans 1914) is very short but apparently this species also lacks the heavy sclerotization of the posterior margin of the sternal plate. However, it appears to have peritremalia which extend to the dorsal area. Male distinct in having divided dorsal plate.

ACKNOWLEDGEMENTS

We appreciate the help given us by Dr. Deane P. Furman of the University of California and Dr. Edward W. Baker, Division of Insect Identification, U. S. National Museum, in determining the taxonomic status of this species. We are also grateful to Dr. Paul W. Parmalee, Curator of Zoology at the Illinois State Museum, for identifying the host.

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PYROGLYPHUS MORLANI, A NEW GENUS AND SPECIES OF MITE FORMING A NEW FAMILY, PYROGLYPHIDAE, IN THE ACARIDIAE

ACARINA, SARCOPTIFORMES

By FREDERICK CUNLIFFE, *Columbia College, South Carolina, and Pinellas Foundation, Inc., Tallahassee, Florida.*

As has been noted by many workers the genital opening of the female Acaridiae, both free living and parasitic, are important in family and superfamily diagnosis. Female genitalia of known families range from simple longitudinal or transverse slits to those with lateral and epigynial plates which form an anteriorly pointing triangle. A series of mites with an extreme form of genitalia was discovered some years ago in rodents' nests in New Mexico by H. B. Morlan of the U. S. Public Health Service. The genital opening is bell shaped and is covered by a sclerotized plate which is hinged posteriorly. The shield is similar in appearance and action to those of the uropodid mites. There are no visible lateral plates. The genital plate bears two pairs of setae posteriorly. In other acarids these setae appear to be at the margins of the lateral plates, or slightly off the plates. Their presence on the genital plate indicates that the laterals are not reduced, but may have been large as in *Chortoglyphus*, and have combined with the epigynial to form the single large plate. This species forms a new family in the superfamily Acaroidea.

PYROGLYPHIDAE, new family

This family is distinguished from all others in having a single trapdoor like genital plate, in possessing greatly reduced genital discs, and in lacking copulatory tubes.

Pyroglyphus, new genus

With the characters of the family.

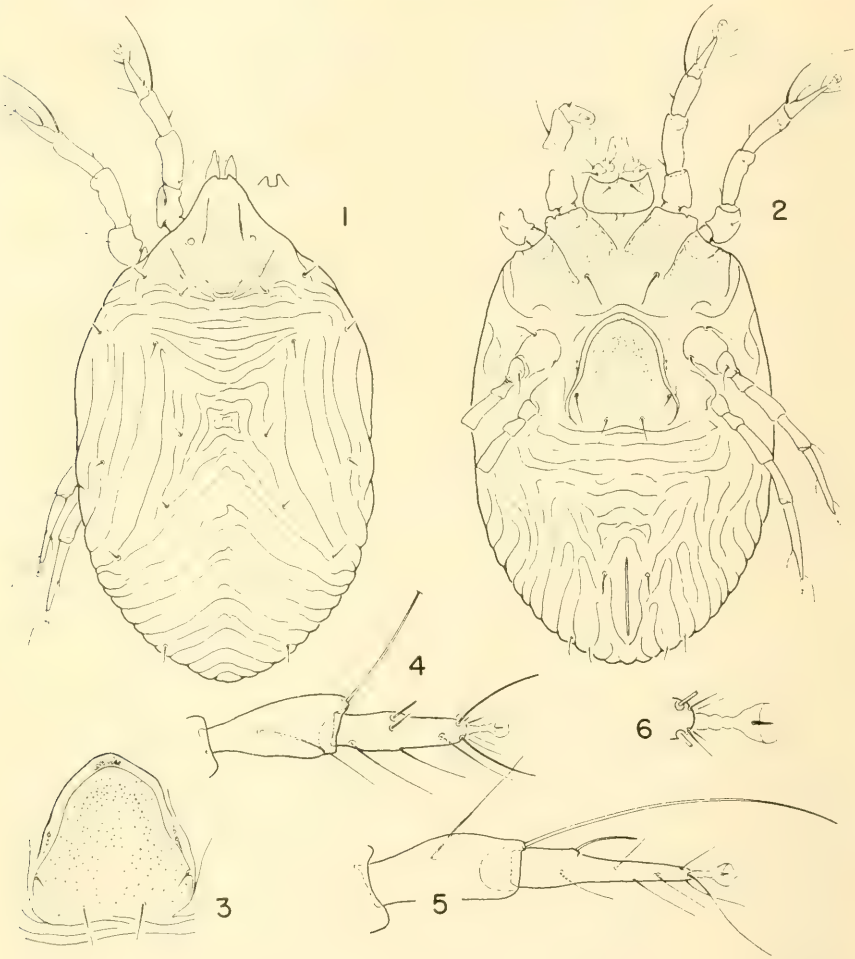
Pyroglyphus morlani, new species

Female.—These are small, rugose, leathery mites. The propodosoma is smoother than the rest of the dorsum, and possesses a sclerotized shield. The body setae are small, simple, and few in number. Coxal plates I and II are sclerotized across the entire venter. Coxae III and IV are only lightly sclerotized. The genital opening is large, bell shaped, and lies between coxae III and IV. The genital plate is sclerotized and possesses two pairs of setae posteriorly. Two pairs of tiny remnants of genital discs are present. Ventral body setae apparently are missing; a single pair of anal setae are present; two pairs of setae are on the posterior margin of the body. No copulatory tube could be found. The legs are simple, with few setae. The tarsal caruncles are expanded, and have tiny empodial claws. Tarsi I and II each has a single rodlike sensory seta. The chelicerae are chelate; the mouthparts are barely visible from above. The body is 414 μ long and 255 μ wide.

Male.—Similar to female. The genitalia lie between coxae III and IV. The body is 319 μ long and 172 μ wide.

Types.—Holotype female, U. S. National Museum No. 2461 was collected in a nest of *Neotoma albigula* Dec. 17, 1951; five female paratypes with the same data; three female paratypes collected in the same habitat Dec. 13, 1951; two female paratypes collected in *Neotoma*

sp. nest Feb. 9, 1953. One male paratype collected in *Neotoma albigula* nest Dec. 13, 1951. Three nymphs collected in the same habitat Jan. 17, 1952. All were collected by H. B. Morlan near Santa Fe, New Mexico.



Pyroglyphus morlani, new species, female: fig. 1, dorsum; fig. 2, venter; fig. 3, genital plate; fig. 4, tarsus I; fig. 5, tarsus II; fig. 6, detail of caruncle.

INA LOUISE HAWES, 1896-1957

The name of Ina Hawes, Bibliographer and Associate Librarian in the Library of the Department of Agriculture, stands on the back of nine volumes of the Index of the Literature of American Economic Entomology from 1940 through 1955, comprising over 4000 pages of bibliography. Besides these volumes there are five other bibliographies, written in collaboration with others, and amounting to 777 pages altogether, of which the Bibliography on Aviation and Economic Entomology won the Oberly Memorial award for the best bibliography in the field of agriculture of the biennium. In truth this is great activity for so tiny a woman as Ina Hawes, especially when one considers that she was always rather frail in health and carried on a rich social life outside of her working days.

When one is gathering up the details of the life of another human being, reviewing that one's preeminence in a chosen field, his quality of work and his relationship with others, there emerges eventually from the many facts, the spirit of the individual, that peculiar essence of his being. In the case of Ina Hawes the essence might be said to be her dedication to service to others, not as a devout religieuse at all, but as a gay, happy woman. One of her fellow librarians summed it up in saying, "Hawsey liked to do things for people."

Her only surviving sister, herself the mother of three daughters whom Ina cherished and helped, has written me of her childhood as follows:

"Ina was born (April 28, 1896) and brought up in the small town of Oxford, Massachusetts. She was the daughter of Marian E. Waite and Charles H. Hawes, the second of the three Hawes girls. We lived on a farm with Mother and Father and Grandmother and Grandfather Waite. The Waites were an old New England family and the Hawes came from the North of Ireland to New York City in the early 1800's. Ina was brought up in the old New England way, with Sunday School in the old North Church (Congregational). In her teens she was active in the Camp Fire Girls, helping put on benefit entertainments in the church. She was gay and jolly and full of fun. She loved poetry and

while doing the dishes she used to recite "The Lady of Shalotte" and parts of "Marmion" and the "Lady of the Lake." She used to read to me a great deal. I think I got a great deal of education from her. She graduated from Oxford High School at seventeen and from there went to Simmons College."

Directly after her graduation from Simmons in June 1917 where she took the course in Library Science, she joined the library staff of the Department of Agriculture as assistant to Mabel Colcord in the Bureau of Entomology. She continued in the Department of Agriculture library for the rest of her life. When I came to the Bureau a year and a half later, I met her in the old red brick building that used to stand next to the marble East Wing of the Agriculture building, in an office adjoining Dr. Howard's front office. She had a desk between Miss Colcord and the silvery haired Mary Champney. Poor Miss Champney had had attacks of petit mal all her life. Often she would say, "I don't know how I ever got here this morning, I have no recollection of it." And Miss Colcord would remark, "Poor Champ, the air is blue with gloom here mornings till she settles down to work." Miss Colcord herself had just taken over after Nathan Banks' departure the work on the Index of Literature of American Economic Entomology, and "Hawsey" as she soon dubbed Ina, was appointed to help her out. It must have been dull work for a young girl, but she was ever a busy wren-like little person, always with a bubble of laughter. This sunny disposition probably came from her Irish inheritance, while from her New England stock she doubtless drew the conscientiousness that enabled her to work on the dullest of chores, climaxed by the Index. Her humor coincided with that of Mabel Colcord, whose sly wit delighted everyone. Together they were a congenial pair with a deep and affectionate understanding of each other that grew with the years. Ina owed much to her training under Mabel Colcord, a training that in the end enabled her to take over after Miss Colcord's retirement and even surpass her in the number of volumes of the Index that she put out.

Outside of office, Ina's interests for many years were centered in the Pierce Hall Players at the Unitarian Church in Washington. She seldom was in the limelight herself in their performances, but she was foremost in organizing and directing them. One of the group told me that there could be no one finer than she at it. She joined this dramatic group in the early 20's when it was first formed and stayed with it till it disbanded in the war years. She was also active in her Simmons College Club. Several of her classmates at Simmons came to Washington at about the same time she did and the girls lived together for a time, till most of them were married, and even afterwards they kept in close touch with each other through the years.

From 1944 through 1948 Ina was recording secretary for the Entomological Society of Washington, the second woman to hold that post. Besides the entomological societies she belonged to the Special Libraries Association.

After Mabel Colcord's retirement in June 1942 the work of the Index was continued by Ina, often with little clerical help, but she carried the burden from then to her death in March 1957. She was largely responsible for the organization of the entomology section of the Bibliography of Agriculture and compiled her two major bibliographies apart from the Index at this time. This is the period in which she did her most constructive work and may well have been her most satisfying. In 1956 she was given the Superior Service Award in recognition of the "intelligent and practical way in which she developed the Indexes of American Economic Entomology." In connection with this award Mr. C. F. W. Muesebeck wrote:

"These Indexes, now published annually, are the main reliance of the applied entomologist for a guide to the literature pertaining to any subject in the broad field of economic entomology. Their usefulness is, of course, dependent on the care and intelligence with which they are prepared. It had become necessary to eliminate certain types of publications and certain types of articles, as well as to sort out and use only what was significant in those publications and articles that might be selected for indexing. This demanded a nice understanding of the needs of the entomologists and an appreciation of the gradual changes of emphasis in the field. It is because of Miss Hawes' exceptional understanding of what is required, her resourcefulness, and her ability to get things done that the Indexes have been ready on time, that they reflect so well the growth and trends in the field covered, and that they have become indispensable tools of the economic entomologist . . . I cannot emphasize too much the intelligent and effective conduct of this important undertaking while Miss Hawes has been in charge of it."

Ina was never very robust in health. She suffered from allergies—in the early days it was called "hay fever." In addition she had numerous operations, some of them major ones, and once she was badly injured when hit by a car. A year or so before her death cancer was discovered, and she had a very serious operation for that. Later the cancer recurred, and she died on March 23, 1957. Her mother, it may be of interest to note, also died of cancer.

She lived up to the tradition of those splendid women, many of them New Englanders like herself, whose conscientious effort and scholarship under the leadership of Claribel Barnett brought the Department of Agriculture Library to its zenith.

DORIS H. BLAKE[1]

PUBLICATIONS OF INA LOUISE HAWES

1. Check list of publications on entomology issued by the United States Department of Agriculture through 1927 with subject index. U. S. Dept. of Agr. Lib. Bibl. Contrib. 20, 261 p., Jan. 1930 (in collaboration with Mabel Colcord and Angelina Carabelli).

[1]I wish to thank Ina's sister, Mrs. John Andrych, Mrs. Ruth Lindley and Mrs. Egbert Walker for help in supplying the facts of her life, and Mrs. Margaret S. Bryant, Miss Mary E. Grinnell, and J. S. Wade for their suggestions and for supplying Ina's bibliography.

2. List of publications on apiculture contained in the U. S. Department of Agriculture, and in part those contained in the Library of Congress. U. S. Dept. of Agr. Lib. Bibl. Contrib. 21, 219 p., May 1930 (in collaboration with Vajen E. Hitz).
3. Index to the literature of American economic entomology, vols. 7, 8, 9, 10, 11, 12, 13, 14, 15. 1940-1955.
4. Bibliography on lice and man with particular reference to wartime conditions. U. S. Dept. of Agr. Bibl. Bull. no. 1, 106 p., 1943 (in collaboration with Mary E. Grinnell).
5. Bibliography on aviation and economic entomology. U. S. Dept. of Agr. Bibl. Bull. No. 8, 185 p., 1947 (in collaboration with Rose Eisenberg).
6. A selected list of publications. U. S. Dept. of Agr. Yearbook, 1952, pp. 732-737 (in collaboration with J. S. Wade).

SOCIETY MEETINGS

The 663rd regular meeting of the Society was called to order by President F. L. Campbell at 8:00 PM, Thursday, May 2, 1957, in Room 43 of the U. S. National Museum, with 37 members and 26 visitors present. The minutes of the previous meeting were read, corrected and approved.

Mr. Rainwater reported that May 18 was selected for the date of the June picnic meeting to be held at the Log Lodge from 2 to 6 PM. The committee consists of Sollers, Walton, Rainwater, Shortino, Gilbert and Sullivan.

New members elected were *Mrs. Helene G. Cushman*, Bibliography Section, Library, U. S. Department of Agriculture, Washington, and *Lt. Dale H. Habeck*, Box 5215, State College Station, Raleigh, N. Car.

Notes and exhibition of specimens were deferred to allow full time to the four students whose Science Fair exhibits provided the principal program of the evening. Elliott S. Krafsur, student of Mrs. Ann Fullerton at Bethesda-Chevy Chase High School, presented his exhibit, ''Hybridization and Classification of Saturniid Moths.'' There were questions and comments on the exhibit by T. L. Bissell, R. H. Nelson, R. T. Mitchell, A. B. Gurney, H. H. Shepard, J. F. G. Clarke, R. I. Sailer, and others. Mr. and Mrs. S. S. Krafsur and Mrs Fullerton were introduced.

Rona Kushner, also a student of Mrs. Fullerton, presented her exhibit, ''The Firefly,'' and answered questins and comments by F. C. Bishopp, Elizabeth Haviland, T. E. Snyder, Mr. Nelson, Mr. Bissell, James Watt, Dixie Krafsur, M. D. Leonard and T. J. Spilman. Mrs. M. Kushner was introduced at the meeting.

Frances Watt, student of Ruth C. Strosnider at Woodrow Wilson High School, presented her exhibit, ''Cockroaches for Nutritional Experiments.'' Questions and comments were offered by Honorary President Snodgrass, F. P. Harrison, Dr. Gurney, R. J. Barker, Mr. Rainwater, Dr. Haviland, Mr. Bissell, Mrs. Fullerton and others.

Judith Wilburn, student of member Howard Owens at Northwest High School, presented her exhibit, ''What Hibernates in a Clump of Broom Sedge?'' raising questions and comments by Dr. Clarke, Mr. Bissell, Dr. Leonard, Mr. Rainwater, Kellie O'Neill, Rose Warner, Dr. Watt, Honorary President R. E. Snodgrass, Mr. Nelson, Dr. Bishopp and others.

A. B. Gurney spoke briefly in praise of the initiative and interest in individual studying which are engendered in many high school students by Science Fairs. At each of the several regional Science Fairs held annually in the Washington Metro-

politan Area there are several hundred entries, many characterized by great merit. For several years the Washington Academy of Sciences has actively encouraged the Science Fairs, and the fine projects displayed this evening demonstrate well what is being accomplished. (Speaker's abstract.)

M. P. Jones added comments and an invitation to the students, their parents, and their teachers to attend the June picnic meeting. Mr. Bissell asked for Howard Owens' comment. Mr. Owens said that this was the 11th annual Fair and the 4th year in which all of the suburban groups had participated. There were 30,000 visitors to the suburban Virginia Fair and 10,000 to that at the University of Maryland, in addition to visitors to Montgomery County and District Fairs, and in all there were 16,000 exhibits in the Washington area—a lot of earthworms in the family refrigerator. Next week the winners are to leave for the national competition.

The meeting was adjourned at 9:45 PM.—KELLIE O'NEILL, *Recording Secretary.*

The 665th regular meeting of the Society was held in room 43 of the U. S. National Museum on Thursday, October 3, 1957, with 61 members and 28 visitors present. President F. L. Campbell called the meeting to order at 8:00 P. M. and the minutes of the May meeting were read and approved.

The name of Arthur B. Gahan was presented in nomination for Honorary Member to succeed the late Dr. A. G. Böving. A. B. Gurney, chairman of the nominating committee, recapitulated Mr. Gahan's life and entomological contributions for the benefit of younger member not acquainted with him. Arthur Burton Gahan was born in Manhattan, Kansas, in 1880, and was trained primarily at Kansas State College and the University of Maryland. He was a staff member at the University of Maryland from 1904 until 1913, when he joined the taxonomic unit of the U. S. Bureau of Entomology. Mr. Gahan became an international authority on the Chalcidoidea, and retired in 1950. As an active member of the Entomological Society of Washington for 50 years, he contributed greatly to the Society's activities, and held various offices, including that of President in 1922. [Author's abstract.] It was voted unanimously to make Mr. Gahan an Honorary Member.

President Campbell reported that revision of the constitution was being discussed by the Executive Committee but the proposal was not yet complete.

New members elected were: *Robert Davis,* 2211 Maxwell Drive, S. W., Atlanta 11, Georgia; *Dr. M. J. Sloan,* Shell Chem. Corp., 1700 K St. ,N. W., Washington, D. C.; *Jerry Mallack,* 303 Leighton Ave., Silver Spring, Md.; *Michael Kostarab,* 12 Merrill Rd., Apt. A, Baltimore 28, Md.; *John A. Fluno,* Entomology Research Div., Plant Industry Station, Beltsville, Md.; *Dr. Thomas H. G. Aitken,* Trinidad Regional Virus Lab., P. O. Box 164, Port-of-Spain, Trinidad, B.W.I.; *James P. Kramer,* Insect Identification and Parasite Introduction Laboratories, U. S. National Museum, Washington 25, D. C.

Following discussion of whether the December meeting should be postponed because of the conflicting Entomological Society of America meeting, it was voted not to postpone the meeting, against some opposition.

President Campbell announced the appointment of C. H. Hoffman to represent the Society at the Pacific Science Congress at Bangkok, November 18 to December 9.

The death of John H. Martin was announced by T. J. Spilman, who recounted a few of the experiences he shared with this friend during his short life and career as an entomologist.

A. B. Gurney announced the death of J. C. Bridwell, noted collector known to many older Society members. Mr. Bridwell's obituary appeared in Vol. 60, No. 1, of the *Proceedings*.

W. E. Bickley called attention to the necessity for having a permit to collect in National Parks; he finds it time-consuming to obtain permits for his students. J. F. Gates explained that the requirement for permits was instituted principally to protect birds and other larger forms of animal life more in danger of extinction than insects. He did not think it likely that the requirement could be changed, or that blanket permits could be obtained, and said that Park police were most assiduous in enforcing the law, so that collectors could expect to be asked to show their permits. He added that he was understandably in favor of the provision that material collected became the property of the National Museum, and went on to tell about a recent acquisition of the Division of Insects, the Tippmann collection. It comprises 97,830 specimens of wood-boring beetles, including 1,415 paratypes and cotypes and 611 holotypes.

T. L. Bissell told about an insect newly a pest in Maryland. *Anticarsia gemmatalis* Hübner, the velvetbean caterpillar, was found damaging soy beans. In answer to E. L. Todd's question, Mr. Bissell said the species was not new to Maryland, but that this was the first record of commercial damage.

President Campbell read a letter of thanks from Miss Lucy Howard for the L. O. Howard dinner. This letter is published here in full:

Onteora Club
September 15, 1957

To the Entomological Society of Washington, D. C.

Dear Entomological Society:

For my sister and myself I want to thank you all for the heart-warming tribute to our Father on his hundredth birthday. All his friends, who to our joy and surprise seem still to be many, were so good in swelling the number who came to that wonderful dinner.

It was particularly gratifying to us to have my sister Candace's son present so that he too could hear the tributes to his grandfather and realize from sources other than the naturally prejudiced opinions of his family, the way people felt about him. I know he will never forget it.

I have always felt as if the Entomological Society were a sort of family connection. Some of my earliest recollections are of meetings held in our house in Georgetown. One especially, when I was awakened by the charming playing of a German member, who after the insects and new discoveroies for their control had been finished with, was soothing his fellow members, or waking them up (?) with Schubert's "Hark, Hark the Lark." I have loved it dearly from that day.

The years when I came to the meetings with Father were particularly happy ones and even though I didn't really understand most of the papers, the feeling of a group of people closely and enthusiastically bound together by their interest in their own work and the discoveries of others along similar lines, was a wonderful experience.

Thank you again for your remembrance and the tribute to Father who would have been so greatly touched by the whole thing.

Signed by
LUCY T. HOWARD

A record of Dr. Howard's voice copied from the original now in Archives was was played to the meeting.

The principal speaker of the evening was Curtis W. Sabrosky, who told about his collecting experiences in the Palau Islands and Yap under the title, "A Visit to Paradise." The program chairman added the subtitle, "Roasting on a Pacific Isle." Mr. Sabrosky's talk was well illustrated with color slides, and he exhibited a number of articles of native handwork.

The meeting was adjourned at 10:10 P. M.—KELLIE O'NEILL, *Recording Secretary.*

The 666th regular meeting of the Society was held in Room 43 of the U. S. National Museum, Thursday, Nov. 7, 1957. President Frank L. Campbell called the meeting to order at 8:00 PM and there were 39 members and 14 visitors present. The minutes of the previous meeting were read and approved.

Dr. Ashly Gurney, chairman of the nominating committee, presented the names of the nominees for offices in 1958 (see inside front cover—ED.).

A new member, Dr. J. T. Medler, Department of Entomology, University of Wisconsin, was elected.

President Campbell read the letter of acceptance of honorary membership by A. B. Gahan and called our attention to the fact that Dr. M. D. Leonard has been elected a member of the Entomological Society of Japan. Dr. Campbell also pointed out that "Preliminary Inventories, Records of the Bureau of Entomology and Plant Quarantine" (No. 94), compiled by Dr. H. T. Pinkett, is now available from the National Archives.

A note concerning the winner of the Joseph Augustin LePrince award was presented by Helen Sollers. This award, consisting of a bronze medal, a certificate and an hononarium of $500, is now presented every three years by the American Society of Tropical Medicine and Hygiene to a person for outstanding accomplishment in the field of malaria. This year the honor was bestowed upon Dr. Louis L. Williams, internationally famous for his work in malaria control. He has become known as the father of malaria eradication in the United States. After his retirement as chief of the International Health Division in 1953, he joined the staff of the Pan American Sanitary Bureau where he is now a consultant.

The principal speaker of the evening, Mr. Morris C. Leikind, had as his subject, "Ronald Ross and Medical Entomology—A Centennial Appraisal." An active discussion followed this talk.

Just after his speech, Mr. Leikind called attention to the Washington History of Science Club whose membership is open to those interested in the history of science.

The following visitors were introduced: *Dr. C. D. Pelekassis,* Benaki Plant Pathology Institute, Athens, Greece; *J. W. Beardsley,* Hawaiian Sugar Planter's Association, Honolulu; *Roy Fritz,* U. S. Public Health Service; *Tom McIntyre, Mrs. Ruth Shechter, Roger Ratcliffe,* and *K. E. Lipinsky,* University of Maryland; and *George E. Bohart,* U. S. Department of Agriculture, Beltsville.

The meeting was adjourned at 9:47 PM.—HELEN SOLLERS, *Acting Recording Secretary.*

The 667th regular meeting of the Society was called to order at 8:04 PM Thursday, December 5, 1957, in Room 43 of the U. S. National Museum, by President F. L. Campbell, with 15 members and 3 visitors present.

Thomas McIntyre, R.D. 2, Bowie Rd., Laurel, Md., was elected to membership.

President Campbell reported on the state of the Society. The report was accepted. There was comment on the $600 deficit in the general fund and on publication of th minutes.

The slate presented by the nominating committee was elected unanimously by voice vote (see inside front cover.—Ed.).

R. I. Sailer reported briefly on Eastern Branch meetings of the Entomological Society of America. T. L. Bissell said that an important omission in the report was Dr. Sailer's election as Vice Chairman of the Branch.

President Campbell reported on the national meetings of the Entomological Society of America at Memphis.

Mr. Bissell exhibited Diplopoda on bark, which looked like carpet beetles when alive.

J. F. G. Clarke announced a meeting of the Lepidoptera Society in the Museum December 27 and 28, 1957. He exhibited two of the original parts of Samuel Scudder's book on North American Lepidoptera, published in 1888. The scheduled speaker of the evening, Major Herbert C. Barnett, could not be present at the meeting, he announced.

President Campbell read a letter written by Michael Kostarab, as follows:

Ladies and Gentlemen!

The picture of the streets in Budapest one year ago is still fresh in my memory. Among the thousands of buildings destroyed or damaged in the fighting of the revolution were the Hungarian National Museum and the Entomological Collection Building near-by. The roof and the fourth floor of the Entomological Collection Building caught fire from a Russian incendiary projectile, which destroyed them. Almost all of the Diptera collection located here was destroyed. The damage is inestimable from the point of view of science.

While the fight was still raging on the streets of Budapest I saw with my own eyes the museum's entomologists carrying the rest of the entomological collection, thru the rain and the snow, to the safety of near by buildings. In the damaged building the ceiling was wet through. The rest of the intact collection faced ruin by water if it stayed where it was.

Even before the revolution several Hungarian entomologists had lost their jobs because they were "politically undependable." The present situation, after the revolution, is even worse.

In the last few months the Austrian entomologists have sent several packages with clothing and food to Hungary, to help the miserable Hungarian entomologists in their enforced retirement.

The entomologists of South America are collecting literature to replace, to some extent, the burned Diptera-library in the Hungarian National Museum.

During the last few months the Hungarian entomologists have enthusiastically collected 50,000 Diptera to replace the destroyed collection. They have a plan for next year to collect 100,000 more. The Diptera mounting work however has stopped within the last few weeks, because of the lack of minuten nadeln. The Russian controlled Hungarian government has never been interested in importing minuten

nadeln from abroad and for this reason in recent years we have always suffered from a want of insect pins.

Ladies and Gentlemen! This letter contains the cry for help of the Hungarian entomologists. It came to my address, but it speaks to all of us. If we do not help soon, the material which was collected with such effort will be ruined. The loss will be our loss too, because science knows no national boundaries. I beg all of you who can help, to please contribute materially to purchase a parcel of minuten nadeln for the Hungarian National Museum. The cost of 10,000 nadeln is $25.00; 50,000 nadeln would cost $125.00. You can help this project. Please put your contribution in this box. This would be the most beautiful Christmas gift we could send to the Hungarian entomologists. I request the president and treasurer of the Entomological Society of Washington to handle this money. Thank you for your cooperation.

A. B. Gurney circulated books by Lindroth on the faunal connections between America and Europe, Darlington on zoogeography, and Jaeger on North American deserts.

Mr. J. W. Beardsley of Hawaii was introduced.

President Campbell exhibited the name tag worn at Memphis. He presented a gavel to Dr. Sailer, which he said was made by Dr. Hough from box elder with evidence of insect damage.

The meeting was adjourned at 9:55 P.M.—KELLIE O'NEILL, *Recording Secretary.*

Date of publication of Vol. 60, No. 1 was March 10, 1958.

A Cyanamid Report

MALATHION
FOR DIRECT APPLICATION ON ANIMALS

With newly-granted residue tolerances, malathion can be applied directly to beef cattle, poultry, and swine. This is the result of three years of extensive research in 11 states. The work proved conclusively the safety and usefulness of malathion as a spray for controlling cattle and poultry lice, poultry mites (northern fowl and chicken red mite), and cattle and poultry ticks. In addition, malathion dust may be applied to nests, litter, and floor space. Roost paints using malathion emulsifiable liquid may also be used in poultry houses. In addition to spraying beef cattle with malathion for lice control, rubbing devices incorporating the product have been most effective in suppressing lice and horn flies.

Do not apply malathion to lactating dairy cows, since it has not yet been accepted for this use, nor should it be used on calves under one month of age.

PROTECTANT FOR STORED GRAIN

With newly-granted residue tolerances for malathion on wheat, barley, oats, rice, rye, corn, grain sorghum, and peanuts (post-harvest), grain handlers storing grain have a method of protecting grain from loss to insects. Malathion, either in dust or spray form, *applied to the grain as it is being loaded into bins,* affords protection against confused flour beetle, rice weevil, granary weevil, saw-toothed grain beetle, flat grain beetle, red flour beetle, rusty grain beetle, lesser grain beetle, and Indian meal moth. It is also suggested as a residual wall, floor, and machinery spray in grain elevators, in treating truck beds, box cars, and ships' holds before loading grain. Where Indian meal moth infestations develop, *surface* applications of malathion dusts or sprays at prescribed intervals afford protection.

NEW USES FOR MALATHION ON CROPS

Tolerances have been established on 37 additional crops, including:

Vegetables	Fruits
Asparagus	Bramble family
Carrots and other root crop	Nectarines
Garlic—Leeks—Shallots	Quinces
Several leaf vegetables	Currants
Pumpkins	Gooseberries

Also, small grains, cotton, mushrooms, peppermint, spearmint, corn and rice. With these additions, malathion is now recommended on 93 crops.

Developers and producers of malathion and parathion

CYANAMID

American Cyanamid Company, Insecticide Department,
30 Rockefeller Plaza, New York 20, N. Y.

Vol. 60 JUNE 1958 No. 3

PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY
of # WASHINGTON

U. S. NATIONAL MUSEUM
WASHINGTON 25, D. C.

PUBLISHED BIMONTHLY

CONTENTS

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 over 18 years of age who have an interest in the science of entomology. Annual dues for members are $4.00; initiation fee is $1.00 (U. S. currency).

PROCEEDINGS

Published bimonthly beginning with February by the Society at Washington, D. C. Members in good standing are entitled to the *Proceedings* free of charge. Non-member subscriptions are $5.00 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 will be published in the order received and will be given precedence over those by non-members. Immediate publication may be obtained at a cost to the author of about $12.00 per printed page, plus cost of *all* engraving. Titles of papers should be concise but comprehensive and should indicate the systematic position of the subject insect. By-lines 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 4-5/16 x 6" (26 x 36 picas); this usually allows explanatory matter to appear on the same page. Cost of illustrations in excess of that for one full-page line cut will be borne by the author.

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JAPANESE BEETLE

Adult beetles feeding on fruit and leaves, about one-half natural size. Insert, adult beetle, about twice natural size. Figures below ground represent seasonal history of the Japanese beetle. Left to right, mature grub (late spring); pupa; beetle laying eggs (summer); developing grubs (late summer and fall); all about twice natural size.

(See other side for life history and control)

Bureau of Entomology and Plant Quarantine
United States Department of Agriculture

Picture Sheet No. 1, revised

JAPANESE BEETLE

(*Popillia japonica* Newman)

Japanese beetles spend about 10 months of the year as grubs in the soil, feeding on the roots of grasses and other plants. Early in June the grubs stop feeding and go through a resting, or pupal, stage, before they become beetles. By the first part of July the beetles are flying about in numbers and feeding extensively on the foliage, fruit, and blossoms of many trees and other plants. In July and August the females go into the ground and lay eggs, which hatch into small grubs. Grubs are usually most abundant in turf.

Control of Beetles

Plants can be protected from beetle attack with the following sprays:

1. DDT (50-percent wettable powder), 3 ounces (20 tablespoonfuls); water, 10 gallons (for fruit and shade trees, shrubs, and flowering plants).
2. Lead arsenate, 10 ounces (30 tablespoonfuls); wheat flour, 6 ounces (24 tablespoonfuls), or light-pressed fish oil, 2½ fluid ounces (5 tablespoonfuls); water, 10 gallons (for shade trees and shrubs).
3. Powdered derris 4-percent rotenone), 5 ounces (30 tablespoonfuls); water, 10 gallons (for apple, plum, cherry, and peach trees, grapes, and small fruits when fruit is about to ripen, and flowering plants).

Where spraying equipment is not available, apply a 5-percent DDT dust or hydrated dusting lime.

Apply the spray or dust when the beetles first appear. Repeat as needed to maintain a protective coating on all parts of the plant subject to attack, until the beetles disappear. Dusts must be applied more often than sprays.

Control of Grubs

Use of Poisons.—Lawns may be protected from injury by Japanese beetle grubs for at least 6 years with one application of DDT and for at least 3 years with one application of chlordane. Use 6 pounds of a 10-percent DDT powder or 2¼ pounds of a 10-percent chlordane powder to each 1,000 square feet of lawn. Mix the material with several times its volume of slightly moist sand, soil, or other suitable material, and apply evenly to the lawn with a garden-type fertilizer distributor or by hand. Wash the material in with a hose.

Use of Milky Disease.—Japanese beetle grubs are subject to a number of diseases, the most important of which is the milky disease. Several dust mixtures containing spores of the organism causing this disease are available commercially. They are preferably applied by community groups, but may be used by individuals. Directions are on the package. The disease usually works slowly, and its full effect may not be evident for several years. Although it kills grubs in the soil, it does not prevent beetles from flying in from untreated areas. It is harmless to all other forms of plant and animal life.

PRECAUTIONS.—DDT, chlordane, and lead arsenate are poisons, but when used as recommended are not likely to injure human beings, pets, wildlife, or vegetation. Avoid inhaling the dust. Protect the hands with leather or rubber gloves. Keep the hands away from the mouth and wash them thoroughly before eating. Do not spray fruits with DDT later than 4 weeks before picking. Wash or peel sprayed or dusted fruits or vegetables before eating them. Keep the poison in plainly labeled closed containers away from food products, and where children or pets cannot reach them. Keep small children and domestic animals away from poisoned turf until it has been watered or rain has fallen.

October 1950 U. S. Government Printing Office

For sale by the Superintendent of Documents, Washington 25, D. C. Price, 5¢

16—54363-2 ☆ U. S. GOVERNMENT PRINTING OFFICE

GLADIOLUS THRIPS

a, Adult thrips; *b*, egg; *c*, larva; *d*, pupa (or resting stage); *e*, foliage and flower spike showing typical feeding injury; *f*, uninjured gladiolus corm; g, corms injured by feeding of thrips, showing characteristic russeted appearance. (*a*, *b*, *c*, and *d* about 20 times natural size; *e*, *f*, and g about one-half natural size.)

(See other side for life history and control)

S. Bureau of Entomology and Plant Quarantine
United States Department of Agriculture

GLADIOLUS THRIPS

(*Taeniothrips simplex* Mor.)

Gladiolus thrips overwinter and may reproduce on the stored gladiolus corms. During the growing season the adults and larvae attack the foliage and flowers of the growing plant. The eggs are inserted into the plant tissue. In the summer a generation of the thrips may be completed in 2 weeks.

The gladiolus thrips can be controlled by applying DDT to the stored corms or the growing plants.

Treatment of the Corms

On dormant corms use a 5-percent DDT dust. Apply 1 ounce of dust per bushel of corms in trays or 1 teaspoonful per 100 corms in paper sacks. Apply the dust with a duster over the top of filled trays soon after the corms are harvested or after cleaning. It is important to destroy the thrips before they penetrate beneath the protecting scales.

Control on the Plants

Watch the growing plants for evidence of thrips feeding. If you observe such feeding, spray or dust with DDT at once and continue at weekly intervals until the flowers appear. If infested plants are not treated until they bloom, the flowers cannot be saved from disfigurement.

Apply the spray as a fine mist, and avoid run-off. For spraying a few plants use 1 ounce, or 6 tablespoonfuls, of 50-percent DDT wettable powder to 3 gallons of water; for larger quantities use 2 pounds to 100 gallons of water.

If you use a dust, it should contain 5 percent of DDT. Apply it lightly and evenly over the plant.

CAUTION.—Insecticides are poisonous and should be handled with care.

16—20760-1

Issued April 1941

Revised June 1950

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For sale by the Superintendent of Documents, Washington, D. C.—Price 5 cents

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 60 JUNE, 1958 NO. 3

BIOLOGICAL NOTES ON SOME WASPS FROM KILL DEVIL HILLS, NORTH CAROLINA, AND ADDITIONS TO THE FAUNAL LIST

(HYMENOPTERA, ACULEATA)

KARL V. KROMBEIN, *Entomology Research Division, A. R. S., U. S. Department of Agriculture, Washington, D. C.*

The present contribution reports some biological observations, principally on ground-nesting wasps, made at Kill Devil Hills, Dare County, North Carolina, during several trips to that area during 1955 and 1956. I include also additions to the list of wasps previously recorded from this area. Much of my time in the field during both years was spent in setting out wooden traps to attract solitary, wood-nesting wasps, and in processing the occupied traps. The voluminous data obtained from this latter project will be considered in a separate contribution, including the results obtained from similar traps set out in other areas from New York to Florida.

The field work during 1955 was made possible by a grant from the American Philosophical Society, to which organization I am indebted also for support of some of the earlier work in this same area (Krombein, 1953a). I spent three periods at Kill Devil Hills during 1955, June 20-24, July 21-27, and September 15-19. My studies during 1956 were made during a family vacation, July 28-August 11, and on official time, September 8-14.

I am greatly indebted to the following specialists for identification of the prey of the wasps discussed below: P. H. Arnaud (Syrphidae, Stratiomyidae), H. W. Capps (lepidopterous larvae), W. L. Downes (Sacrophagidae), A. B. Gurney (Orthoptera), B. J. Kaston (Araneae), Louise Russell (Phylloxeridae), C. W. Sabrosky (Tylidae, Calliphoridae, Larvaevoridae), R. I. Sailer (Pentatomidae, Coreidae), A. Stone (Tabanidae), and G. B. Vogt (Buprestidae).

WASPS NEW TO THE KILL DEVIL HILLS LIST

The following 19 species were not collected in earlier years and bring the total number of species and subspecies recorded from this area to 211 in the families treated in this series of papers. Those new to the North Carolina State List or Supplements thereto (Brimley, 1938, 1942; Wray, 1950) are preceded by an asterisk.

Family **TIPHIIDAE**

**Tiphia jaynesi* Allen. 2 ♂♂; September 13, 1956; on barrens; worn.

Myzinum namea namea (Fabricius). 4 ♀♀, 4 ♂♂; September 10-12, 1956; on barrens on flowers of a white *Eupatorium;* unworn. Recorded in State List as *Myzine propodealis* (Rohwer), a synonym.

Family **MUTILLIDAE**

Pseudomethoca sp. 9 ♂♂; September 16-17, 1955; in woods along sand road. This was formerly thought to be the male of *simillima* (Smith), a supposition demonstrated to be incorrect (Krombein, 1948).

Dasymutilla sp. near *nigripes* (Fabricius). 1 ♂; August 2, 1956; on barrens; worn. This represents either an undescribed species or an extreme variant of *nigripes.*

Family **VESPIDAE**

Ancistrocerus antilope antilope (Panzer). 7 ♂♂; reared from wooden trap nest set out in woods. Recorded in State List as *Ancistrocerus capra* (Saussure), a synonym.

Ancistrocerus tigris tigris (Saussure). 4 ♀♀, 4 ♂♂; reared from wooden trap nests set out in woods.

Family **POMPILIDAE**

Chirodamus maculipennis (Smith). 1 ♀; September 17, 1955; on barrens visiting *Phylloxera* honeydew on foliage of *Quercus falcata;* unworn.

Priocnessus nebulosus (Dahlbom). 1 ♂; August 4, 1956; on barrens visiting *Phylloxera* honeydew on foliage of *Quercus falcata;* unworn. 6 ♀♀, 1 ♂; September 17-18, 1955; on barrens in a similar habitat.

Minagenia julia Brimley. 1 ♀; September 10, 1956; in woods; unworn.

Episyron quinquenotatus quinquenotatus (Say), 1 ♀; June 21, 1956; in woods. 1 ♀; September 12, 1956; on barrens visiting flowers of a white *Eupatorium;* unworn.

*Family **AMPULICIDAE**

**Ampulex (Rhinopsis) canaliculatus* Say. 2 ♀♀ 2 ♂♂, reared from wooden trap nests placed at edge of woods.

Family **SPHECIDAE**

Nitela virginiensis Rohwer. 1 ♀; August 4, 1956; on barrens visiting *Phylloxera* honeydew on *Quercus falcata* foliage; unworn.

Trypoxylon (Trypargilum) politum Say. 1 ♀; July 24, 1955; a sight record in woods. 1 ♀; August 10, 1956; picked up dead on woods road.

Trypoxylon (Trypargilum) tridentatum Packard. 1 ♀, 1 ♂; August 11, 1956. 2 ♂♂; September 9-10, 1956. All on barrens and slightly worn.

Chlorion (Ammobia) nudum (Fernald). 1 ♀; August 3, 1956; visiting flowers of *Monarda punctata* at edge of woods; unworn.

Chlorion (Isodontia) harrisi Fernald. 1 ♂; August 4, 1956; on barrens on needles of *Pinus serotina;* worn.

Sphex urnarius (Dahlbom). 1 ♂; September 10, 1956; on barrens; unworn.

Philanthus lepidus Cresson. 1 ♂; September 13, 1956 (coll. T. B. Mitchell). Recorded in State List as *P. carolinensis* Banks and *P. carolinensis reductus* Banks, both synonyms.

Cerceris fumipennis Say. 3 ♀♀, 2 ♂♂; August 2-10, 1956; on barrens and at edge of woods road; males visiting *Quercus virginiana* foliage; mostly worn. 1 ♀; September 8, 1956; at edge of woods road; worn.

Changes in Earlier Papers

A few of the species recorded in earlier papers were identified to genus only. Some of them represented new species which have now been described, and others represented species which it has been impossible to determine until just recently. Consequently, the following changes should be made on the previous lists. *Tiphia* spp. 1 and 2 (1953b) and *Tachysphex* spp. 1 and 2 (1950, 1953a, 1953b) are as yet undescribed.

Family **MUTILLIDAE**

Ephuta scrupea (Say) = *Ephuta* sp. 2 (1950)
Ephuta spinifera Schuster = *Ephuta* sp. 1 (1950)
Ephuta tentativa Schuster = *Ephuta* sp. 1 (1953b)

Family **VESPIDAE**

Stenodynerus (*Stenodynerus*) *krombeini* Bohart = *Stenodynerus* sp (1950, 1953a, 1953b)

Family **POMPILIDAE**

Ageniella (*Ageniella*) *vogeli* Townes = *Ageniella* (*Ageniella*) sp. (1953a, 1953b)
Evagetes asignus Dreisbach = *Evagetes* sp. (1953a, 1953b)
Anoplius (*Pompilinus*) *krombeini* Evans = *Anoplius* (*Pompilinus*) sp. (1950)

Family **SPHECIDAE**

Cerceris floridensis Banks = *Cerceris* sp. (1953a)

The Late-Season Wasp Fauna

The earlier papers in this series (Krombein, 1950, 1953a, 1953b, 1955) listed the wasp fauna found early in the season and during mid-summer. My two late-season trips, September 15-19, 1955, and September 8-14, 1956, showed that not only far fewer species are active at this time than during mid-summer, but also that many of the species present are still nesting. Below I am listing the 87 species which were collected or seen during these two late-season collecting trips. All these species have an extended seasonal flight period except *Myzinum n. namea* (F.), which is definitely an autumnal species, and *Philanthus lepidus* Cr., which is probably autumnal.

Family **TIPHIIDAE**

♀ ♂ *Tiphia dryophila*
♀ ♂ *Tiphia floridana*
♂ *Tiphia subcarinata*
♀ *Myzinum c. carolinianum*
♂ *Myzinum dubiosum*
♀ ♂ *Myzinum maculatum*
♀ ♂ *Myzinum n. namea*

Family **MUTILLIDAE**

♀ ♂ *Pseudomethoca sanbornii aeetis*
♂ *Pseudomethoca* sp.
♀ ♂ *Dasymutilla lepeletierii*
♀ ♂ *Dasymutilla mutata*
♀ ♂ *Dasymutilla nigripes*
♀ *Dasymutilla o. occidentalis*
♀ *Dasymutilla v. vesta*
♀ ♂ *Timulla d. dubitata*
♀ *Timulla ferrugata*
♀ ♂ *Timulla ornatipennis*
♀ *Timulla rufosignata*

Family **SCOLIIDAE**

♂ *Campsomeris plumipes fossulana*
♀ ♂ *Scolia bicincta*

Family **VESPIDAE**

☿ *Vespula maculifrons*
☿ *Vespula squamosa*
♀ *Polistes annularis*
♀ *Polistes e. exclamans*
♀ *Polistes metricus*
♂ *Eumenes fraternus*
♀ *Monobia quadridens*
♀ *Rygchium megaera*
♀ *Rygchium molestum*
♀ *Ancistrocerus campestris*
♀ ♂ *Leptochilus tylocephalus monotylus*
♀ ♂ *Stenodynerus ammonia histrionalis*
♀ *Stenodynerus krombeini*
♀ ♂ *Stenodynerus f. fulvipes*
♀ *Stenodynerus p. pedestris*
♀ *Stenodynerus p. perennis*
♀ ♂ *Stenodynerus s. saecularis*

Family **POMPILIDAE**

♀ *Chirodamus maculipennis*
♀ ♂ *Priocnessus nebulosus*
♀ *Ageniella vogeli*
♀ *Minagenia julia*
♀ *Psorthaspis mariae*
♀ ♂ *Evagetes asignus*
♀ *Evagetes mohave*
♀ *Evagetes padrinus minusculus*
♀ *Sericopompilus apicalis*
♀ ♂ *Episyron posterus*
♀ *Episyron q. quinquenotatus*
♀ ♂ *Anoplius cleora*
♀ ♂ *Anoplius amethystinus atramentarius*
♀ ♂ *Anoplius apiculatus pretiosus*
♂ *Anoplius semirufus*
♀ ♂ *Anoplius cylindricus*
♀ ♂ *Anoplius marginatus*
♂ *Anoplius rectangularis gillaspyi*
♀ ♂ *Anoplius splendens*
♀ *Aporinellus fasciatus*
♀ *Aporinellus t. taeniatus*
♀ ♂ *Paracyphononyx funereus*

Family **SPHECIDAE**

♀ *Miscophus americanus*
♀ ♂ *Tachytes e. elongatus*
♀ *Tachytes mandibularis*
♂ *Tachysphex terminatus*
♂ *Motes aequalis*
♂ *Podalonia violaceipennis*
♀ ♂ *Sceliphron caementarium*
♂ *Nysson aequalis*
Sphecius speciosus
♂ *Psammaecius denticulatus*

♀ ♂ *Motes argentata*
♀ ♂ *Trypoxylon clavatum*
♂ *Trypoxylon tridentatum*
♀ *Chlorion aztecum*
♀ ♂ *Chlorion pubidorsum*
Chlorion aerarium
♀ *Sphex aureonotatus*
♀ ♂ *Sphex procerus*
♂ *Sphex urnarius*
♀ ♂ *Bicyrtes quadrifasciata*
♀ *Microbembex monodonta*
♂ *Philanthus lepidus*
♀ *Cerceris b. bicornuta*
♀ *Cerceris blakei*
♀ *Cerceris fumipennis*
♀ ♂ *Crabro hilaris*
♀ ♂ *Crabo argus*
♀ ♂ *Oxybelus emarginatum*

Many of the species listed above were attracted to honeydew secretions of a species of *Phylloxera* on foliage of a scrubby *Quercus falcata*. Miss Russell believes that this is probably an undescribed species close to *querceti* Pergande. The *Phylloxera* occurred on the underside of the foliage along the main veins. Most of them were in the various nymphal instars, but one egg and three adults were seen on the limited number of leaves subjected to close scrutiny. The *Phylloxera* nymphs varied from 0.30 to 0.75 mm. in length, and the adults were 1.0 mm. long. About 235 specimens of wasps were collected during 2 hours on a sunny day, and about 73 specimens during a similar period on a cloudy day.

Biological Notes

Family **VESPIDAE**

Monobia quadridens (Linnaeus)

One female (81056 A) was caught while flying along a sand road through the woods at 1345 hours on August 10, 1956. She was transporting a small, paralyzed lepidopterous larva, 12 mm. long, which was identified subsequently as "doubtfully a species of Stenomidae."

Rygchium molestum (Saussure)

A female (8456 A) of this wood-nesting species was collected near her burrow entrance in a thick plank along a sand road at the entrance to the woods at 1320 hours on August 4, 1956. She was flying with a paralyzed lepidopterous larva, 15 mm. long, which was determined later as the pyraustid *Desmia funeralis* (Hübner).

Family **POMPILIDAE**

Sericopompilus apicalis (Say)

An unworn female (8556 A), 12.5 mm. long, was captured on the barrens at 1100 on August 5, 1956. She was walking backward over the sand, dragging her paralyzed spider prey behind her. The latter was an adult female salticid, *Phidippus audax* var. *bryantae* Kaston, 12.5 mm. long.

Episyron posterus (Fox)

I found a female (62355 A) just beginning to excavate her burrow between the ruts of a sand road through the woods at 1245 on June 23, 1955. The digging of the burrow required 15 minutes. Several times during the excavation of the burrow the wasp visited her paralyzed spider prey which was lying in a wheel rut 60 cm. from the burrow entrance. A small specimen of *Evagetes* investigated the burrow during one of these absences. The female *Episyron* was scared away from her prey several times by my attempts to take pictures or by being followed too closely by an inquilinous miltogrammine fly, and finally she abandoned her prey and burrow. The spider was identified as an araneid from a colored photograph.

A second worn female (91256 B), 8.5 mm. long, was captured just as she started to excavate a burrow on the barrens at 1510 on September 12, 1956. Her paralyzed spider prey was lodged in the crotch of a plant 7.5 cm. above the ground and 60 cm. from the burrow entrance. The spider was an adult female araneid, *Gea heptagon* (Hentz), 4.5 mm. long.

Episyron quinquenotatus quinquenotatus (Say)

An unworn female (62155 A), 11 mm. long, was captured on the barrens at 1040 on June 21, 1955, while she was dragging her paralyzed spider prey over the ground. The spider was an adult female araneid, *Metazygia wittfeldae* (McCook), 9 mm. long.

Anoplius (Lophopompilus) cleora (Banks)

An unworn female (9856 A), 14.5 mm. long, was collected along the beach of Albermarle Sound at 1530 on September 8, 1956, while she was dragging her paralyzed spider prey over the sand. The wasp was walking backward and grasped the spider's hind coaxe in her mandibles. The spider was a penultimate-instar female of the lycosid *Arctosa littoralis* (Hentz), 13 mm. long.

Anoplius (Arachnophroctonus) marginalis (Banks)

Apparently this species always preys upon burrowing spiders at Kill Devil Hills. I followed a hunting female from 0905 to 0945, July 27, 1955, on the barrens. During that period she traversed some 225 feet, mostly on foot. Most of her hunting was done in the open and around grass tufts; she did not climb onto any vegetation. She investigated a couple of ant burrows, and dug for a few seconds at several places on bare sand. Finally, at 0945 she made an extensive flight and disappeared.

I found a second hunting female (72755 A) at 0948 on the same day, while I was trying to relocate the first wasp. She was digging at an angle of 60° into the side of a burrow next to a grass tuft. The sand was quite dry and loose at ground level; so she had made a wide excavation in order to follow the burrow. She continued to dig until 1036, when she flew to a blade of grass 30 cm. away and cleaned her antennae and legs thoroughly for 2 minutes. I had been taking a series of close-up pictures of the excavating, and while she was perched on the grass blade I could see that her fore-tarsi were almost entirely lacking, which explains the slowness of the digging. She returned to her digging, took fright at my proximity after a few minutes, and flew off to a pine tree several meters

distant. She returned to the burrow on foot at 1108, and again flew off when I frightened her several minutes later. When she did not return, I excavated the burrow at 1325. It was perpendicular and 10 cm. deep. At the bottom was a lively, penultimate-instar female of the lycosid *Geolycosa pikei* (Marx), 12 mm. long.

Anoplius (Arachnophroctonus) semirufus (Cresson)

A worn female (72655 C), 8.5 mm. long, was excavating a burrow at the edge of a wheel rut on a sand road through the woods at 1410 on July 26, 1955. The burrow began from a flat surface and entered the ground at an angle of 45°. As the excavation deepened the wasp disappeared from view and pushed up rather large masses of damp sand. From time to time she backed out of the burrow, pushing this damp sand out with her abdomen and hind legs, and then spreading it out over the adjacent ground. Twice, at 1428 and 1437, she left the burrow to visit her paralyzed spider prey which was cached on a leaf of a low plant 4 cm. above the ground and 45 cm. from the burrow entrance. Each time that she returned from visiting the spider she stopped first at an abandoned burrow which she apparently had started earlier. At 1440 she got the spider from the leaf and dragged it to within 3 cm. of the burrow entrance. She left it on the ground, visited the burrow, then returned to the spider and dragged it to the entrance. She went in again head first, reappeared at the entrance head first, reached out and grasped the spider by the spinnerets, and pulled it in. In a few seconds she began to fill in the burrow and was just smoothing sand over the entrance when I captured her at 1510. The spider was in a more or less spherical cell in damp sand 6.4 cm. below the surface. It was lying on its venter, and the wasp egg was attached longitudinally to the right of the midline anteriorly on the abdominal dorsum. The spider had recovered entirely from its paralysis by 1945 that evening. The wasp egg hatched and the larva was full grown and ready to spin on August 2. Dr. Kaston identified the spider as a lycosid from several colored pictures which I had taken.

I found a second female (8356 B) excavating a burrow and interring her spider prey during the afternoon of August 3, 1956, along a sand road through the woods. I tried to locate this nest on the following day, but was unable to do so. However, I had taken a series of pictures of the provisioning of the nest, and Dr. Kaston was able to identify the spider as a lycosid.

I captured a third unworn female (8856 C), 8.5 mm. long, at 1350 on August 8, 1956, while she was dragging her paralyzed spider prey along a sand road through the woods. The spider was a half-grown lycosid, *Lycosa* sp., 6.5 mm. long.

Family **SPHECIDAE**

Motes argentata (Beauvais)

I captured an unworn female (8856 A), 10 mm. long, at 0950 on August 8, 1956, while she was flying over the barrens a few centimeters above the ground with her paralyzed cricket prey. The cricket was a nymph of *Orocharis saltator* Uhler, 11 mm. long.

Chlorion (Chlorion) aerarium Patton

A female (72655 A) flew out of her burrow on the barrens at 1015 on July 26, 1955. Apparently she had just completed the excavation and was ready to make a temporary closure. She returned at 1020 with a lizard dropping, which she dropped on the sand near the burrow entrance when I scared her away by trying to take a picture. She did not return again, so I excavated the burrow half an hour later. It was begun from a flat surface, went into the sand toward the south-south-east at an angle of 30°, and terminated in a cell 7.5 cm. below the surface.

Sphex aureonotatus (Cameron)

On September 16, 1955, at 1335 I found a worn female (91655 B), 24 mm. long, dragging a paralyzed, pale-green caterpillar, 38 mm. long (distended in alcohol), between the ruts of a sand road through the woods. During prey transport the wasp carried the larva beneath her, venter to venter, clutching the head end with her mandibles and forelegs. She carried the larva to the burrow entrance at the edge of the road. The temporary closure at the burrow entrance consisted of sand interspersed with various kinds of litter, such as bits of grass stems and seeds. The wasp disposed of some of this material by flying backwards with it and dropping it a few centimeters from the entrance, but some of the material was left close to the entrance. At 1353 she backed into the burrow, grasped the caterpillar near the head end with her mandibles and pulled it into the burrow head first. A minute later she emerged and commenced to fill in the burrow with sand and a little debris. She scratched the sand in with her forelegs and then tamped it firm with the under side of her head holding her mandibles open. This process could be seen very plainly through the telephoto lens of a reflex camera when the level of the closure reached the top of the burrow. The wasp completed the closure at 1405 and was then captured. Upon excavation I found that the burrow was almost perpendicular, about 5 cm. deep, and terminated in a more or less horizontal ovoidal cell about 20 mm. long. The caterpillar was lying on its right side with its head at the inner end of the cell. The wasp egg was on the left side of the second segment bearing prolegs. The egg was shriveled the next day, so the caterpillar was preserved for identification. It was a last instar larva of the notodontid *Heterocampa guttivitta* (Walker).

Sphex procerus (Dahlbom)

I found an unworn female (72355 A), 29 mm. long, at the edge of a sand road through the woods at 1245 on July 23, 1955. She was running rapidly over the sand carrying a large, paralyzed, pale green caterpillar. She was being chased by a miltogrammine fly which hovered several centimeters behind her. Shortly she pulled the caterpillar into a low plant and cached it in a crotch 15 cm. above the ground, and then flew off. The miltogrammine fly disappeared at this time. In a few minutes the wasp returned, pulled the caterpillar down, carried it to the already opened burrow entrance, and left it there while she went inside. She came immediately to the entrance, and pulled in the caterpillar head first. In a few seconds she came out, and began to fill in the burrow with sand interspersed with debris. I captured her at 1310 before the burrow was completely filled. I found that the burrow went down at an angle of 75° to the north-northwest, and

ended in a horizontal, ovoid cell 3.8 cm. below the surface. The caterpillar was lying on its left side in the cell. The wasp egg was attached obliquely on the right side of the third abdominal segment, its tail end downward and backward. The caterpillar was a last-instar notodontid, *Schizura ipomoeae* (Doubleday).

The caterpillar voided about a dozen pellets of frass on July 24. The egg had not hatched by 0800 on July 25, but the abdominal segmentation was visible through the delicate chorion. The eggshell began to split from the rear end by 1100. By 1400 there was still only a narrow split in the chorion exposing part of the abdomen, but the abdomen was now pulsating, indicating that feeding had commenced. By 2000 on July 25 the abdomen was quite swollen, but the head end was still narrow and enclosed in the chorion. By 1930 on July 27, the wasp larva was half as large as the somewhat shrunken prey, and was still feeding with its head inside the caterpillar's abdomen. By 0700 on the 28th it was twice as large as the even more shrunken caterpillar, and by 2000 it had completely devoured the prey. It was spinning its cocoon by 0700 on the 29th, but died in the cocoon some days later.

Another worn female (91056 A), 28 mm. long, was captured along the side of a sand road in the open woods at 1540 on September 10, 1956. She was transporting a paralyzed, notodontid caterpillar, *Heterocampa manteo* (Doubleday), 38 mm. long.

Bicyrtes quadrifasciata (Say)

A detailed report on the nesting behavior and life history of this species has been published (Krombein 1955). The following observations made during 1955 and 1956 supplement that account:

In the five nests that I dug up, the burrow began on a flat surface and went downward at an angle of 30° to 45° to the horizontal. In four of these nests there was but a single cell at the end of the burrow. In the fifth nest (72455 B) there were two cells; the cell constructed first was at the end of a burrow 12.7 cm. long and contained 9 specimens of prey with the wasp egg on the first specimen of prey brought in; a lateral burrow branched downward at right angles to the main burrow 7.5 cm. from the entrance, and terminated in a cell at a distance of 3.8 cm. which contained a single specimen of prey bearing the wasp egg. The four cells provisioned during July and August (72455 A, 72455 B—two cells, 8356 A) were 7.6 to 10.2 cm. below the ground surface; I was not successful in rearing any of the inhabitants, but presumably adults from these cells would have emerged within several weeks. The two cells provisioned during September (91256 A, 91655 A) were 11.4 to 12.7 cm. below the surface; these cells may have been deeper because the occupants presumably would not emerge until the following summer.

The actual excavation and temporary closure of the burrows did not differ from the details reported earlier. The total elapsed time for this phase of the nesting cycle was not observed. Only one provisioning flight was timed; in this case the wasp (72555 A) completed the burrow excavation and temporary closure by 1200 on July 25 and returned with the first specimen of prey at 1235.

Only two of the cells that I dug up were completely provisioned. One (72455 B, first cell), excavated on July 25, 1955, contained nine nymphs of the pentatomid *Brochymena carolinensis* (Westwood), probably in the fifth instar. The

other (91655 A), excavated on September 16, 1955, after the wasp made a final type closure, contained seven nymphs, three in the fifth instar of the pentatomid *Stethaulax marmoratus* (Say), and one possibly in the fourth instar and three possibly in the fifth instar of the coreid *Leptoglossus* probably *oppositus* (Say). Additional prey records are as follows: a partially stocked cell (72455 A) containing seven pale-green nymphs on July 25, 1955, identified from color photographs as including at least two nymphs of the coreid *Archimerus alternatus* (Say), possibly two fifth-instar nymphs of the pentatomid *Thyanta custator* F., and a nymph of a second species of pentatomid; the second cell of 72455 B containing a single nymph of *Brochymena carolinensis* on July 25, 1955, and the mother wasp brought in a fourth-instar nymph of the same species at 1215 on that date while I was excavating the burrow; a fourth- or fifth-instar nymph of *Brochymena* probably *carolinensis* being transported by an unworn female (8856 B) on the barrens at 1025 on August 8, 1956; and a partially stocked cell (91256 A) which contained three fifth-instar nymphs of *Leptoglossus* probably *oppositus* on September 12, 1956, which had been brought in by a worn female.

One observation indicates that the duration of the egg stage may be from 32 to 44 hours. The second cell of 72455 B contained a single specimen of prey and the wasp egg when I dug up the nest at 1215 on July 25. The mother wasp brought in a second specimen of prey at this time; so in all probability the first was brought in and the egg laid not much earlier than 1130 on the same date. This egg hatched between 1945 on July 26 and 0730 on July 27. The duration of the larval feeding period was 4 days plus or minus a few hours in the two examples observed (72455 A and 72455 B, second cell).

From June 20 to 24, 1955, I saw several males flying to and fro along a sunny stretch of a sand road through the woods, but no females. Males exhibiting similar behavior may be seen through the rest of the flight range of the species until at least mid-September.

Stictia carolina (Fabricius)

Some fragmentary observations were made on a worn female (8156 B) that I found a short time after she had begun excavation of a burrow on the barrens. This burrow was begun on bare sand having a slope of about 15°, and was several centimeters deep at 1100 on August 1, 1956. The burrow went in toward the north at an angle of 35° to the slope. The excavated sand was flung out behind the wasp and formed a spoil heap about 15 cm. long below the burrow entrance. I took a series of pictures of the excavating and then left at 1230 while the wasp was still digging. When I returned at 1315 the entrance was plugged with sand. Half an hour later the wasp was again digging out sand, and continued to do so until 1530, when she again constructed a temporary closure by backing into the burrow and scraping sand down from the sides of the entrance. The camouflaging of the burrow entrance required half an hour, the sand forming the spoil heap being flung toward the entrance until the entire area below the entrance had been leveled. The wasp departed after this camouflaging and had not returned by 1630 when I left the area.

There was a heavy rain the night of August 1, and there was no activity at the burrow on the following day. On the 3rd there was no activity until 1115,

when the wasp was found excavating more sand. At 1123 she again made a temporary closure at the entrance.

I made no further intensive observations, though I saw the wasp bring in a fly at 1545 on August 7, and another at 1630 on August 8 after a short, very gentle rain which had ended an hour earlier.

I dug up the nest of this individual at 0845 on August 9. The burrow went down at an angle of 35° to the slope for 16 cm., then toward the northeast at the same angle for another 15 cm., and then to the east almost horizontally for 7.5 cm., where it terminated in a large horizontal ovoid cell 3.8 cm. long by 2.5 cm. wide at the greatest diameter and 20 cm. below the surface. It contained a partially grown wasp larva and a multitude of flies, some whole and some partially or almost entirely eaten. The mother wasp was captured as she flew into the burrow at 0905 without prey.

I preserved all the flies found in the cell and reared the wasp larva to maturity on fresh flies, which I caught and immobilized by decapitation. The wasp larva reached maturity on August 11, at which time it was preserved for taxonomic study.

The fly remains found in the cell were identified as follows:

Tabanidae—*Tabanus* sp.—1 ♀

Calliphoridae—*Callitroga macellaria* (F.)—5 complete specimens and parts of 11 more (11 thoraces found)—16

Larvaevoridae—thoraces of 2 specimens—2

Sarcophagidae—larva of Miltogrammini—1

Amobia erythrura Wulp (1 ♂ terminalia and 1 thorax probably belongs)—1 ♂

Sarcophaga (Ravinia) ochracea Ald. (♂ terminalia and thorax wing probably and head)—1 ♂

Sarcophaga sarracenioides Ald. (♀ terminalia, and 1 thorax probably belongs)—1 ♀

Sarcophaga bullata Park. (3 ♂ terminalia and 3 heads)—3 ♂ ♂

A second female (8556 B), not captured, was observed as she began excavating a burrow on the barrens on a 45° slope of pure sand at 1615 on August 5, 1956.

I did not observe any wasps actually hunting flies but the following observations possibly indicates where this might be done. The stems of certain bunch grasses growing on the barrens are very attractive to wasps and flies, and I saw quite a few specimens of sarcophagids and calliphorids which were used as prey by 8156 B visiting the stems of this grass. I also saw several *Stictia* females on these stems.

Bembix texana Cresson

A limited number of observations were made on a small colony of about half a dozen individuals between August 8 and 11, 1956. This nesting site was in a roughly triangular, flat area of about 14 square meters located along a sand road through the woods. The ground consisted of rather loose dry sand at the surface with very sparse vegetation. It was shaded most of the day except for approximately 4 hours, from 1100 to 1500. Most of the individuals were nesting females in rather worn condition, but one worn male was taken flying to and fro in the nesting area on August 11.

I first observed nesting activities in this area on August 8. Between 1410 and 1530 five females (8856 D-H) were observed either digging burrows or opening pre-existing burrows. The actual selection of a nesting site may be a difficult matter. On August 9 at 1355 I saw a female (8956 B) beginning to dig a burrow at the edge of the sand road. She abandoned this in a few minutes and began another between the wheel ruts. She abandoned this in turn in a few more minutes, revisited the first site, and then began a third burrow between the wheel ruts. At 1420 she had left the third and had begun a fourth burrow. By 1545, when the ground was shaded, she had thrown up a plug of sand from the inside of this last burrow.

Two (8856 E, G) of the six burrows that I dug up on August 9 contained nearly full-grown larvae and several whole or partially eaten flies. The architecture of these two nests was identical. The burrows went in toward the southeast at an angle of 30°, had a diameter of 9.6 mm., and were 11.5 cm. long. They terminated in horizontal (8856 G) or subhorizontal (8856 E) ovoid cells 9 cm. below the ground surface, and measured 38 mm. long by 13 mm. in greatest diameter. There was no sign of a subsidiary burrow. The burrow of 8856 G had only a temporary closure of sand a few millimeters long at the entrance, but the burrow of 8856 E was full of sand, this wasp having made a permanent closure the preceding afternoon.

The other four burrows (8856 D, F, H, and 8956 B) consisted of oblique tunnels without terminal cells. They went in toward the east or southeast at an angle of 30° to 45° and ranged in length from 11.4 to 15.2 cm. One of them (8856 D) was begun at 1410 on August 8. This wasp continued to excavate sand until 1600 even though a gentle rain had been falling for 10 minutes. She then threw up a sand plug from inside. This burrow was still plugged from the inside at 0845 on August 9 and was dug up at 1515—there was a temporary closure at the entrance but no wasp. Another wasp (8856 H) began digging a burrow at 1530 on August 8—she dug for 20 minutes until the rain began, and then threw up a sand plug from inside. This burrow was also still plugged from the inside at 0845 on August 9. When I dug it up at 1530 on August 9, the wasp was at the bottom. Another burrow without terminal cell was that of 8856 F—the mother was captured at 1505 on August 8 when she emerged from this burrow which she had entered 3 minutes earlier. The fourth burrow without terminal cell was that of 8956 B, whose construction was described above. This burrow was dug up at 1300 on August 11—there was a temporary closure at the entrance but no wasp inside. The function of this type of burrow is a mystery. Perhaps it is dug to serve as a shelter only, or perhaps a brood cell is added at a later stage, but its explanation will require additional observations begun at an earlier stage in the colony development. The afternoon of August 8 was the only time when several individuals were active; on the 9th I saw only two females in the afternoon; no additional females were seen on the next 2 days, but one male was captured on the 11th. No specimens were seen during several inspections of the nesting area between September 8 and 14, 1956. The species is active earlier in the season, for I caught two unworn males on June 27, 1950, one unworn and one very worn male on June 23, 1954, and a worn male on June 29, 1954.

Final closure of the burrow was witnessed on one occasion. This female (8856 E) was found excavating a burrow at 1410 on August 8. She had pro-

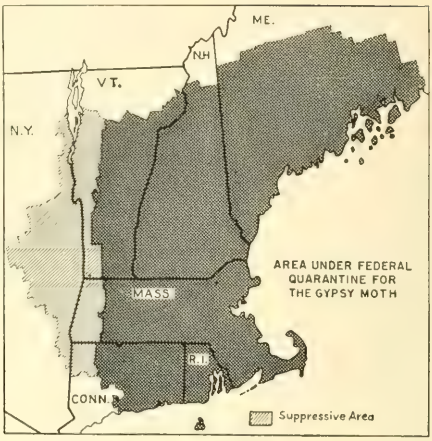
Close-up of *a*, ovipositing female; *b*, male; *c*, female pupa; *d*, male pupa; *e*, old egg mass. Larvae on oak leaf: *f*, first instar; *g*, second instar; *h*, fourth instar; *i*, sixth instar or mature larva. Egg masses, *k*, under branches and on rock; *l*, young larvae spinning down. *a* to *i* about natural size; *k* and *l* reduced. (See other side for life history and control.)

Picture Sheet No. 26

reau of Entomology and Plant Quarantine, Agricultural Research Administration,
United St

THE GYPSY MOTH

(*Porthetria dispar* (L.))



The gypsy moth is a serious pest of forest and shade trees in New England and eastern New York State. The caterpillars, or larvae, of these moths eat the leaves. The defoliation retards the growth and otherwise weakens the trees, and repeated complete defoliation will permanently injure or even kill them.

This moth was accidentally introduced into this country near Medford, Mass., in 1869. It spread rapidly through several of the Northeastern States. For many years the infested area has been under Federal quarantine. In part of this regulated area suppressive measures are being carried out in cooperation with State and local agencies.

The gypsy moth larvae usually appear about the first of May. They increase in size until by the middle of June they are 1½ to 2 inches long. They can then be recognized by several pairs of red and blue dots on their backs. Late in June or early in July they become mature and seek shady places, such as on trees or rocks, in which to pupate, or transform into moths. The moths emerge about a month later. The males are strong daytime fliers, but the females cannot fly and so lay their eggs close to the place where they issued as moths. The eggs are laid in clusters of 400 or more, which are covered with brownish hairs. The winter is passed in the egg stage.

Control

The gypsy moth can be controlled most effectively with DDT. An oil solution or an emulsion containing this insecticide is applied as a spray while the insect is in the caterpillar stage. Large forested areas are usually sprayed from aircraft. For use along highways and residential areas either mist blowers or hydraulic sprayers are suitable, and for treating low growth along stone walls and fences sprayers of the knapsack type can be employed. Early in the season the spray should be applied at the rate of 1 pound of actual DDT per acre, but after the foliage has developed ¾ pound per acre is sufficient. Information on formulations and dilutions to use with each type of equipment may be obtained from the Division of Gypsy Moth Control, Bureau of Entomology and Plant Quarantine, Greenfield, Mass.

CAUTION.—DDT is poisonous and should be handled with care. Store in a dry place where children and animals will not have access to it.

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POTATO LEAFHOPPER

MARY F. BENSON

a, Adult leafhopper; *b,* nymphs; *c,* potato leaflets, showing upcurled brown tips and margins, known as hopperburn, caused by the feeding of leafhoppers. (*a* and *b* about 14 times natural size; *c* about ¾ natural size.)

(See other side for life history and control)

Bureau of Entomology and Plant Quarantine
Agricultural Research Administration
United States Department of Agriculture

POTATO LEAFHOPPER

(*Empoasca fabae* (Harr.))

Injury and Life History

The potato leafhopper is an injurious pest of potato and beans in the Eastern States. It also attacks many other plants. Both the young forms, known as nymphs, and the adults feed upon the under surface of the leaves by sucking the plant juices. The adults fly when disturbed and the tiny nymphs scamper for cover, traveling sidewise. Besides sucking the plant juices, this leafhopper transmits to the plant a substance that causes a disease condition known as hopperburn. The first symptom of this disease is a triangular brown spot at the tips of the leaflets. Later the entire margins may curl upward and turn brown as though scorched. Badly affected plants die early and the yield of potatoes is reduced.

In Florida and other Gulf States the leafhopper breeds throughout the year. In the North the adults appear in April or May. Since they have never been found there in the winter, they probably migrate from the South. Early in June they move in large numbers to potato fields and deposit eggs in the tissue of the plants. In about a week these eggs hatch into wingless nymphs. The nymphs pass through five stages and become winged adults in 10 to 14 days. They begin laying eggs 5 or 6 days later. The period from egg to adult is about 1 month.

Control

Dust the foliage thoroughly with a 3-percent DDT dust.

If you prefer a spray to a dust, use 2 level tablespoonfuls of 50-percent DDT wettable powder or 2 level teaspoonfuls of 25-percent DDT emulsion concentrate per gallon of water. Apply with a good sprayer that throws a fine mist. To make 100 gallons of spray use either 2 pounds of the 50-percent wettable powder or 2 pints of the 25-percent DDT emulsion concentrate. If spray is to be used for disease control, add either of these DDT preparations to the fungicidal spray rather than to water, and apply at once.

Begin spraying or dusting when the insects first appear and repeat the treatment as often as necessary.

CAUTION.—Insecticides are poisonous and should be handled with care. Store in a dry place where children and animals will not have access to them.

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gressed a little farther with her excavation than had 8856 D, which I first saw digging at the same time. The spoil heap behind the entrance of 8856 E was about 13 cm. long and fanned out to a width of 5 cm. In leveling the sand of this spoil heap, the wasp went to the back of the heap and scattered the sand behind her as she walked forward toward the entrance in a zigzag path from side to side. At 1430 she backed into the burrow and began to rake in sand from the sides of the entrance and the front of the burrow. She backed down into the burrow out of sight after raking in some sand, and then came to the surace and raked in some more sand, continuing this process until the burrow was completely filled at 1500. After smoothing the sand immediately around the burrow entrance, she flew for 5 minutes over an area about 4 meters in diameter around the entrance at a distance of 2 to 6 cm. from the ground, and then disappeared.

There are certain anomalies in this above account which require additional investigation. Is such an amount of excavation normal just before final closure? Is the zigzag type of leveling of the spoil heap normal? The latter question is posed by the behavior of 8856 D. This wasp was digging what turned out to be a burrow without terminal cell at the same time. However, she just pushed and raked the excavated sand behind her into a narrow strip about 5 cm. long, and did not exhibit any zigzag leveling motions.

The two larvae that I obtained from digging up nests on August 9 were almost full grown. The flies recovered from their cells were preserved, and I fed the larvae on freshly caught, immobilized flies. One of the larva (8856 E) reached maturity the evening of August 9 and was preserved for taxonomic study. The other (8856 G) began to spin its cocoon at 0800 on August 10.

The prey remains in these two cells were identified as follows: 8856 E—1 wing of a muscoid, 1 wing of a tylid (= micropezid), 2 specimens of *Tubifera* sp. (a syrphid), and parts of 2 stratiomyids; 8856 G—1 specimen of *Callitroga macellaria* (F.) (a calliphorid), parts of 3 specimens of larvaevorids, and 1 specimen of *Odontomyia* sp. (a stratiomyid).

Two points about these prey records require comment. One is the very few specimens of prey found in the cells, certainly far fewer than would be required to bring one of these large wasps from egg to mature larva. H. E. Evans has observed a colony of *texana* in Florida and advises me (*in litt.*) that he also has found very few fly remains in the cells. I did not notice any fly fragments near the burrow entrances, but the finding of so few remains in the cells certainly offers strong circumstantial evidence that the female of this species removes prey fragments at the time fresh prey is brought in. The other point that needs emphasizing is that this species, like all our other North American species whose prey preferences are known, feeds only flies to its young. The record in the Synoptic Catalog of North American Hymenoptera (Burks 1951) of *texana* using the immature hemipteron *Euthochtha galeator* (F.), as prey is based on a specimen of *texana* in the U.S. National Museum collection with a nymph of this bug pinned beneath it. The label data are Orlando, Fla., April 26 (year illegible), E. A. Back. I feel certain that this association is erroneous, and that the hemipteron, if it had any association with a bembicine wasp at all, was probably the prey of a specimen of *Bicyrtes* taken at the same time, and that

in some manner the two wasps were mixed and the prey associated with the wrong specimen. There is only one specimen of *Bicyrtes, insidiatrix* (Handlirsch) collected by E. A. Back in the Museum collection—it bears the additional label data, Orlando, Fla., August 7, 1907. However, *texana* and *insidiatrix* are not at all similar in size or coloration, and these two specimens were taken in different months. H. E. Evans also has found *texana* provisioning with Diptera only.

Cerceris fumipennis Say

I discovered several females nesting in rather hard-packed soil along the sides of a road at the entrance to the woods August 9 to 11, 1956.

One female (8956 A) flew into her open burrow at 1125 on August 9. On August 10 the entrance was closed from within at 1100, and open at both 1315 and 1530. I dug up this burrow at 1345 on August 11 and found that it curved downward to the west at an angle of approximately 30°. There was one adult buprestid, *Chrysobothris femorata* (Oliv.), at the bottom of the burrow. I was unable to find a continuation of this burrow, but a *Cerceris cocoon,* bearing buprestid remains on the outside and a live prepupa inside, was found a few centimeters away at 5 cm. below the ground level.

A second female (81056 B) had her burrow just across the road from that of 8956 A. She flew in preyless at 1555 on August 10, was captured, released, and flew away. I dug up her burrow at 1600. For 8 cm. it was almost perpendicular, curving slightly to the south. There were three paralyzed buprestids, *Dicerca lurida* (F.), at the bottom of this perpendicular section. The burrow then curved rather sharply, running downward at an angle of about 15°, and terminated in an empty ovoid cell at the end of 5 cm. I could find no traces of an additional burrow either laterally or at lower levels. The wasp was captured when she flew back to the burrow at 1615.

Another burrow (81156 A) was found and dug up at 1400 on August 11. It went straight down for 5 cm. and then obliquely at an angle of 20° toward the southwest for another 5 cm., where there were two paralyzed buprestids, *Dicerca lurida* (F.).

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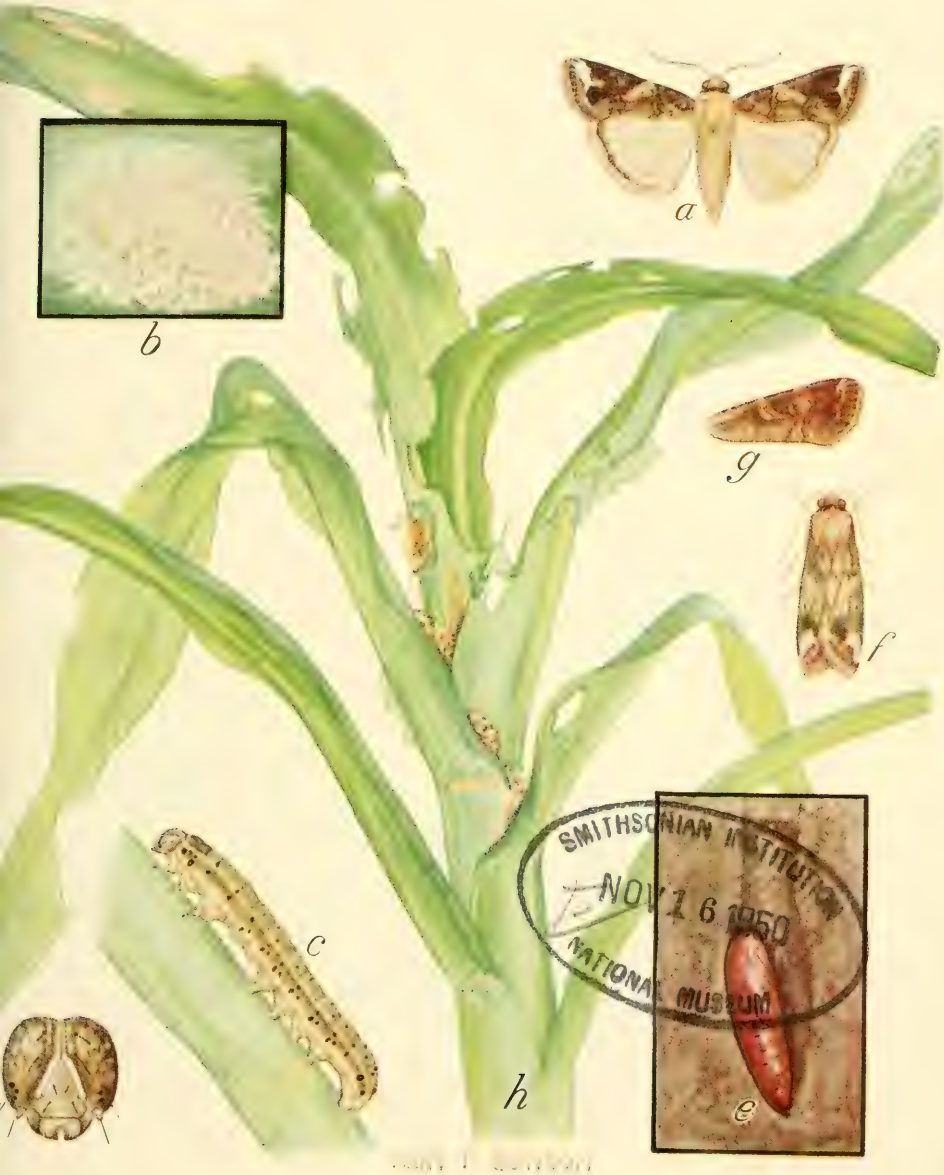
FALL ARMYWORM



a, Male moth (or adult); *b*, eggs; *c*, larva; *d*, face of larva; *e*, pupa in a cell; *f*, moth in resting posture; g, wing of female moth; *h*, feeding injury to corn plant. (*a*, *c*, *e*, *f*, g, *h* about $1\frac{1}{3}$ times natural size; *b* twice natural size; *d* 8 times natural size.)

(See other side for life history and control)

Bureau of Entomology and Plant Quarantine
United States Department of Agriculture

Picture Sheet No. 12

FALL ARMYWORM

(*Laphygma frugiperda* (A. and S.))

The fall armyworm, known principally as an enemy of growing corn, feeds on many other cultivated crops, such as alfalfa, cotton, peanuts, and grasses, and also on wild plants. The eggs are laid at night on grasses or other plants and hatch in about 5 days. The young larvae (caterpillars, or "worms") feed at first in concealment near the ground, become full grown in about 20 days, and then enter the soil for a few inches and change into pupae. The inactive pupal stage lasts about 10 days. After the moths emerge from the pupal cases they often fly many miles before the females lay eggs. The fall armyworm may have as many as six generations a year in the Gulf States, but does not survive the winter farther north. In addition to eating the blades of corn and boring into the stalks, the larvae may bore into the ears, particularly the shanks of the ears, and feed extensively therein.

Control

The fall armyworm can be controlled with the following sprays: (1) 2 pounds per acre of a wettable powder containing 50 percent of either DDT or TDE, mixed with 40 gallons of water. (2) A toxaphene emulsifiable concentrate, applied by aircraft at the rate of 1½ to 2 pounds of toxaphene in 2 gallons of spray per acre.

The application of a dust containing 5 percent of DDT, toxaphene, or TDE, at the rate of 40 pounds per acre, or a 20-percent toxaphene dust at 10 to 15 pounds per acre, has also been reported to give good control.

To control so-called "budworm" damage in sweet corn, caused by the feeding of this worm deep in the whorls of the corn plant, spray with an emulsion made with 3 quarts of a 25-percent DDT emulsifiable concentrate, 5 quarts of a white mineral oil of 50 to 95 seconds Saybolt viscosity, and enough water to make 25 gallons of spray. Apply the spray at the rate of 25 gallons per acre.

When the worms are crawling over the ground in large numbers they may be destroyed by broadcasting a poisoned bait thinly over the infested fields, and moderate infestations in corn may sometimes be controlled by light sprinklings of the bait in the leaf whorls. To prepare this bait mix 50 pounds of wheat bran with 2 pounds of paris green, and then add 6 gallons of water to make a damp mash. This quantity is enough for 2 to 3 acres.

Warning: All these insecticides are poisons. They must be kept out of reach of children or animals and must be handled with care, according to directions on the containers. Because the residue of DDT, TDE, or toxaphene may be dangerous to humans and livestock, hay or forage that has been treated with these insecticides should not be fed to dairy animals or to meat animals being finished for slaughter. Paris green is a strong poison. Thoroughly wash out containers that have been used for mixing bait. Dispose of surplus bait by broadcasting it thinly on the ground in a field.

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CORN EARWORM

a, Moth (or adult), and eggs on silks; *b*, eggs; *c*, earworm feeding in ear of corn; *d*, pupa in a cell; *e*, color phases of the earworm. (All except *b* about $1\frac{1}{3}$ times natural size; *b* $5\frac{1}{2}$ times natural size.)

(See other side for life history and control)

Bureau of Entomology and Plant Quarantine
United States Department of Agriculture

CORN EARWORM

(*Heliothis armigera* (Hbn.))

Although the corn earworm attacks many cultivated crops, it is dealt with here only as an enemy of corn. The eggs are laid by the moth, usually on the corn silks. These eggs hatch in from 2 to 8 days, and the tiny larvae or caterpillars feed downward, following the silks into the ear tip. Serious damage to the ear frequently results from their feeding and from the fermentation or molds which follow. When full-grown, the larva leaves the ear, enters the soil, and becomes a pupa, and from this the moth emerges. About 30 days are required in midsummer for complete development from egg to adult. Pupae produced late in the summer or in the fall may pass the winter in the soil and become moths the following spring or early in the summer. Usually two complete generations are developed annually in the North, but in the South there may be as many as five or more generations.

Control

Injury to field corn can be reduced by growing strains with long, tight husks and, in the South, by planting early.

Sweet corn can be protected by spraying. Prepare an emulsion by mixing 3 quarts of 25-percent DDT emulsifiable concentrate (obtainable commercially) and 2½ gallons of white mineral oil of 65 to 95 seconds Saybolt viscosity thoroughly with water to make 25 gallons. For a smaller quantity use ¼ pint of the DDT emulsifiable concentrate and ¾ pint of the oil with water to make 1 gallon of spray. Apply the spray to the ears 1 day after silks appear in the field and again 2 days later. A third application 2 days after the second usually increases the control. Spray only enough of the mixture onto the silks to wet them. Twenty-five gallons of the spray is enough for 1 acre of corn, and 1 gallon will take care of a plot about 17 by 100 feet.

A spray similarly prepared, but including only 1¼ gallons of mineral oil in a 25-gallon lot, can be applied to the entire plant to reduce "budworm" damage by the earworm to sweet corn before tasseling and silking.

Any good hand sprayer is satisfactory for treating garden plots of sweet corn. For commercial acreage use a high-clearance power sprayer with hollow-cone nozzles adjusted to give adequate but not excessive coverage of the ears. Shake the emulsion well so that the oil will not separate.

The earworm can also be controlled in small plantings of sweet corn by injecting into the silk at the tip of each ear about ¼ teaspoonful of refined white mineral oil. If obtainable, use a ready-mixed oil containing 0.2 percent of pyrethrins. Apply with a pump-type, long-spouted oilcan, or use a glass medicine dropper filled about half full of oil for a small ear and three-fourths full for a large ear. Do not apply until the silks have wilted and have begun to turn brown at the tips. Earlier treatment will interfere with pollination and result in poorly filled ears.

WARNING. Because of the danger of poisonous residues, husks or other parts of corn plants treated with DDT should not be fed to dairy animals or to meat animals being finished for slaughter.

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STRIPED CUCUMBER BEETLE

a, Adult beetle; *b*, underground stem of cucumber seedling cut open to show larva (grub, or "worm") feeding within; *c*, small cucumber plants showing characteristic feeding by adult beetles on leaves and stems. (*a* about 8 times natural size; *b* about twice natural size; *c* about three-fourths natural size.)

(See other side for control measures)

Bureau of Entomology and Plant Quarantine
United States Department of Agriculture

Picture Sheet No. 7

STRIPED CUCUMBER BEETLE

(*Acalymma vittata* (F.))

The striped cucumber beetle is one of the most familiar insects to gardeners in the Eastern and Central States. It is also one of the most troublesome. The beetles invade cucumber, squash, and melon plantings almost overnight, and often destroy tiny seedlings before they push through the soil. They girdle stems of older plants, and eat portions of the leaves. They also transmit bacterial wilt and mosaic disease from plant to plant. The grubs, or larvae, live on the roots and reduce the vitality of the plants.

The adult beetles spend the winter in uncultivated areas, protected by plant debris. In the spring they become active, feeding on some wild plants about the time apple trees are in bloom. As soon as the first melon, cucumber, squash, or pumpkin seedlings push through the soil, the beetles attack them. Here they feed first on the stems and cotyledons, oftentimes killing the plants. There may be an influx of beetles into the field for several weeks. As the plants grow, the beetles collect under the vines and feed on the lower surfaces of the plants. Females crawl into cracks in the soil and deposit eggs. The young larvae, or grubs, that hatch from these eggs feed on the plant roots for about a month, pupate in the soil, and emerge as adults of the next generation.

Control

Several insecticides are effective, however, provided they reach the beetles in time. Derris or cube and cryolite are recommended for this purpose. They may be applied either as dusts or as sprays to prevent plants from becoming infected by wilt.

The derris or cube dust should contain 0.75 to 1 percent of rotenone, and the cryolite dust 40 to 50 percent of sodium fluoaluminate. They are usually obtainable at these strengths from local dealers.

Sprays can be prepared from undiluted powdered derris or cube, which contains from 3 to 5 percent of rotenone, or from a rotenone-containing extract. Use enough of the powder to give a spray containing 0.02 percent of rotenone. This requires 5½ pounds of a powder containing 3 percent of rotenone, or 4 pounds of one containing 4 percent, in 100 gallons of water. Use the rotenone-containing extract at the strength recommended by the manufacturer. To prepare a cryolite spray use 5 pounds of cryolite containing 90 percent of sodium fluoaluminate or its equivalent in 100 gallons of water.

Apply the dusts at 15 to 30 pounds per acre and the sprays at 75 to 100 gallons per acre, the rate depending on the size of the plants. To be effective the applications must be timely, thorough, and frequent. Keep in mind the following points:

(1) Protect the young seedlings.

(2) Apply the dust or spray to the plants as soon as the beetles appear.

(3) Apply a light, even coating over the entire plant, especially at the point where the stems emerge from the soil.

(4) Repeat the applications after rains and as often as necessary to keep the plants free from the beetles.

CAUTION.—Insecticides are poisonous and should be handled with care.

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TWO NEW SPECIES OF METAPONE FROM MADAGASCAR

(HYMENOPTERA: FORMICIDAE)

ROBERT E. GREGG, *Department of Biology, University of Colorado*

The two species herewith described belong to an interesting and bizarre genus of ants comprising a distinct tribe, the *Metaponini*, of the subfamily Myrmicinae. Up to 1953 (Smith), 13 species of *Metapone* had been described, and though these ants have a wide distribution in the Oriental and Australian Regions, they seem to be sporadic in occurrence and very rare. It is with considerable significance then that the group should turn up on the Island of Madagascar, and not surprising that it should be represented there by completely new species. A list of the known forms, with the localities from which they were first collected, appears at the end of this paper. The specimens upon which this report is based were obtained from Dr. Alfred E. Emerson, in whose collection of termites they were residing. The ants are said to be associated at times with termites in rotting wood, and presumably the individuals in this sample were collected in such a situation. It is a pleasure to acknowledge my indebtedness to Dr. Emerson as the source of this material.

Metapone madagascarica sp. nov.

Worker.—Length, 6.91 mm.; head length (excluding mandibles), 1.50 mm.; head width, 1.08 mm.; head index, 0.72; thorax length, 1.83 mm.

Head, even without the mandibles, distinctly longer than broad (about 1 and ⅓ times longer than broad), widest in the occipital region and tapering concavely to the mandibular insertions where it is narrowest; occipital margin broadly and shallowly excavated, and concave. Head decidedly convex antero-posteriorly as well as transversely; gula convex; median cephalic groove very weakly indicated, becoming obsolete on the clypeus where it is replaced by a low, rounded carina, posterad. Frontal area absent, its position taken by a broad, curved epistomal suture which delimits the posterior border of the clypeus, and extends between the widely separated frontal carinae. The carinae are straight, parallel, and prominent where they cross the clypeus as trenchant ridges to its anterior margin, abruptly divergent and almost transverse at the antennal insertions, and again turning sharply backward through right angles, and continuing posteriorly to the region of the vertex, flaring slightly. The surfaces of the head below the carinae are broadly concave, forming shallow but distinct antennal scrobes, bounded and overhung by the carinae, though open ventrally. Median lobe of clypeus nearly quadrate, weakly and concavely truncate anterior to its small carina, and bidentate, that is, armed with two, small, blunt teeth projecting forward, and separated by a distance equal to the base of either. Lateral clypeal lobes narrow, sinuate, convex, and separated from the genae by faint lines continous with the median portion of the epistomal suture. Ocelli absent; no ocellar pits. Compound eyes reduced to mere vestiges composed of 6 to 8 very minute and indistinct ommatidia; located on the sides of the head, at a point barely

past the center as measured from the mandibles to the occiput, and on the edge of the scrobe. Mandibles stout, convex, anterior margins feebly curved to nearly straight, the masticatory border bearing five, heavy, blunt teeth, the apical ones best developed and the others diminishing slightly in size. Antennae 11-segmented; scapes short, flat, about 2½ times as long as wide, with convex anterior and straight posterior margins; scapes almost fill the upper and deeper portions of the cephalic scrobes where they are overarched by the facial carinae. Funiculi longer than the scapes, decidedly flattened, but with the upper surface weakly convex and the lower surface flat to almost imperceptibly concave; funicular segments 2 to 7 much broader than long and gradually increasing in size; last three segments much larger, forming a spatulate club, the penultimate and antepenultimate members of which are nearly as broad as long, the terminal segment longer than broad and twice the length of the penultimate.

Thorax long and narrow, about 2½ times as long as broad, and narrower than the head; humeri well-developed, pro- and mesonotum fused with no trace of dorsal sutures; meso-epinotal suture distinct and slightly impressed, especially laterad. Entire thorax including epinotum, marginate to submarginate laterally, the bordering ridge continuing transversely across the front of the pronotum, setting off a distinct collar which joins the head at a low level. The margins continue also to the epinotal angles which then terminate in broad, dentate processes at the same level as the thorax, and finally turn ventrally to border the declivious face of the epinotum. Dorsum of the thorax moderately convex from side to side, feebly from anterior to posterior ends; basal face of epinotum nearly horizontal, but passing through an abrupt, slightly concave angle to the vertical declivity; basal face twice as long as the declivious face. Thoracic pleurae and epinotal sides vertical but noticeably concave. Petiole almost flat dorsally, subquadrate except that the postero-lateral corners are divergent and produced into prominent teeth; the posterior border is broadly excised. The dorsum is separated from the sides, front, and back walls by marginate borders, the walls concave in each case, descending and converging mesially toward the midline, thus producing the appearance of a flaring, cuneate, petiolar node. Anterior peduncle short and constricted; posterior peduncle hardly more than an acetabulum for the condyle of the postpetiole. Petiole armed with a thin, translucent, median, ventral, blade-like keel, pointed at its middle. Postpetiole 2/5 wider than long, almost flat dorsally, marginate on all borders, but the ridge more rounded than the corresponding one on the petiole; anterior and lateral walls vertical and not tapering mesially, the post-petiolar node being thus no broader than the body of the segment. Anterior peduncle short, posterior peduncle obsolete, the postpetiole joined to the gaster by a wide face, though leaving a deep constriction between the two. Ventral surface of postpetiole produced into a short, triangular, transverse tooth, as a ventral extension of the anterior wall. Mesothoracic spiracles appear to be covered by backward extending flaps developed from the tops of the pro-mesothoracic pleural sutures. Epinotal spiracles large and easily visible. Petiolar spiracles located at the base of the anterior peduncle, postpetiolar spiracles laterally on the node of this segment. Spiracles present on the first three gastric segments.

Gaster elongate, about as long as the combined lengths of the thorax, petiole and postpetiole, or a little shorter; elliptical, rounded and convex in all directions, the anterior border blunt while the posterior end terminates in a somewhat pointed pygidium that is faintly concave on its dorsal aspect, but deflected ventrad. Abdomen furnished with a small sting, partly concealed.

Coxae stout and bulbous. Femora inflated, especially of the meso- and metathoracic legs (about 1⅓ times as long as broad), and laterally compressed, their ventral surfaces longitudinally grooved for the reception of the tibiae. Tibiae stout and partly compressed but less so than the femora. Foretibia armed with one small spine and a large, pectinate spur; the lower side of the fore basitarsus pectinate for its full length, its apex ending in three stout teeth. Mesotibia provided with a small, barely pectinate spur, and three, stout apical teeth, two of them approximated; meso-basitarsus armed with three terminal teeth. Metatibia and meta-basitarsus idential with those of the middle leg, though more strongly developed. All tarsi equipped with large claws.

Sculpture—Clypeus, frons, genae, and antennal scrobes covered with fine, longitudinal striae, essentially parallel, but which fade out posteriorly, leaving the vertex, occiput, and posterior part of the genae, smooth and very shining, interrupted only by piligerous punctures. Anterior third of the gula similarly striate, posterior portion smooth and shining. Mandibles longitudinally striate and punctate. Entire dorsum and pleurae of thorax, including the epinotum, longitudinally striate (somewhat oblique on the pleurae), but the striations slightly finer than that of the cephalic sculpture, and diverging to the epinotal corners. Top of the petiole showing well-separated, hair-bearing punctures, its sides striate. Postpetiole and gaster with similar but finer punctures, and a faintly coriaceous texture. All areas of the body, even where most heavily striated, bright and shining due to absence of inter-strial sculpture. Legs and antennae also smooth and shining.

Pilosity: Short, scattered, yellow hairs on all surfaces of the head and thorax, many of them arising from discernible punctures especially on the vertex, occiput, and petiole. Hairs are longer and more readily visible on the mandibles, front margin of the clypeus, gula, coxae, lateral surfaces of the legs, and particularly the lower surface of the petiole and gaster. Pubescence limited to the funiculi, postpetiole, and gaster, on which areas it merges with the erect hairs so that it is difficult to distinguish one from the other. Pilosity is most abundant on the gaster.

Color: Head, including the mandibles, dark red-brown to blackish brown, the frons, center lobe of clypeus, anterior genae, and center of the occiput, lighter in color; thorax, petiole, and postpetiole red-brown; gaster, legs, and antennae partly yellowish brown.

Holotype: Worker; collected 15 km. east of Tulear, Madagascar, on June 7, 1935 by Harold Kirby (?). Collection notes accompanying it state that the ants were found in a stump and associated with T —[termites?] 4403. Deposited in the author's collection.

Paratypes: Eight other specimens; 4 workers, 1 female (see below), and 3 winged female pupae (1 pigmented), collected from the same nest as the holotype.

Female: Length, 9.09 mm.; head length (excluding mandibles), 1.54 mm.; head width, 1.12 mm.; head index, 0.73; thorax length, 2.67 mm. (deälated).

The female caste is so similar in many ways to the worker in this genus that one is reminded of the parallel situation in ponerine genera. It is, therefore, necessary to point out only the salient features of the queen which separates it from the worker caste. There follows a brief diagnosis.

The female is winged, although the single adult specimen before me had become deälate, so fully expanded wings for description are lacking. Three pupae, however, have well-developed wing sacs. The female caste differs from the worker by its overall large size, the cephalic and thoracic striae or rugules which are a trifle coarser, the presence of large, flat, oval, compound eyes at the middle of the sides of the head, composed of a great number of ommatidia (longest diameter of the eye slightly less than the distance from its anterior edge to the insertion of the mandible), three distinct ocelli on the vertex, and the anterior clypeal teeth which are smaller and blunter. A pronounced, arcuate pro-mesonotal suture is present, the mesoscutum has distinct parapsidal furrows, the scutellum is separated by a well-marked suture, and the metanotum is distinguished by deeply impressed boundaries. The epinotum shows the posterior corners rounded (denticles reduced to slight carinae), and the basal face is rounded, passing gradually into the declivity without an angle, the whole segment narrower than in the worker. Petiole and postpetiole are smaller and both are more quadrate than the corresponding segments of the worker, where they are slightly transverse. Dorsal surfaces of both are furnished with fine, curved, transverse striae. The pleurae, and sides of the petiole and postpetiole have enough minute interstrial sculpture to cause a faint dullness to the otherwise shining surface. Pilosity over most of the body is sparser, especially on the gaster. Whether this is natural or due to a worn specimen, it is impossible to tell at present.

In Wheeler's key to the species of *Metapone* (1919), this ant runs to couplet 5 because of the bluntly bidentate clypeus. At the time this key was produced, there were two species known having the character mentioned, and *madagascarica* may be distinguished from them in the following manner.

From *tillyardi* it differs by larger size (6.91 vs. 5.5-6 mm.), a more quadrate petiole which is somewhat more excavated behind, by a rectangular and transverse (rather than oval) postpetiole, and in color which is dark reddish brown to black on thorax and head in contrast to castaneous brown of *tillyardi*. The head is proportionately longer also (1.38 vs. about 1.25 times as long as broad).

From *bakeri* it can be separated by a relatively longer head (1.38 vs. less than 1.25 times as long as broad), the presence of five rather than four mandibular teeth, a posterior clypeal suture, striate sculpture of the body (in contrast to smooth), petiole less deeply excised behind, shorter and stouter legs with more inflated femora, red-brown color instead of black, and a difference in size, which is indeed very notable (9.1 vs. 6.4 mm.). It should be stated that these comparisons are between the females of the two species owing to absence of the worker of *bakeri* which has yet to be discovered. The differences in

dentition and in body sculpture however, leave no doubt of the distinctness of these forms.

M. madagascarica is to be distinguished from *gracilis*, a species which Wheeler described in 1935, again on the basis of the females. It has larger size (9.1 vs. 7 mm.), the ocelli are all nearly the same size, the anterior one being only slightly larger than the laterals in contrast to that of *gracilis*, antennal scapes almost 3 times as long as broad (not 4 times), and the petiolar node has a concave anterior surface, the dorsal surface weakly convex and from above subquadrate, being only minutely wider than long (1 and ⅓ times longer than broad in *gracilis*).

From *jacobsoni*, it differs in larger size (9.1 vs. 6.4 mm.; only the female of *jacobsoni* has been described), head 1¼ times as long as broad instead of 1½, clypeal suture visible, eyes almost in the exact middle of the head, epinotum more than one-half as wide at the rear as at the front, petiolar node 1¼ times wider than long (*jacobsoni* about 1⅓ longer than wide), anterior wall of petiole concave, peduncle less than one-half as long as the node, postpetiole a little wider than long (not fully quadrate), and postpetiole with curved, transverse striae rather than shagreened. In many respects the two ants are very similar, to judge from Crawley's description, but the above differences appear to hold and should serve to distinguish them.

From *johni* it may be told by the shape of the antennal scapes which are broadest in the middle, whereas in *johni* they are predunculate at the base, broadening apically (or as Karawajew puts it, "ham-shaped"—schinkenartige Form). This situation obtains also in *M. greeni*. Mandibles have 5 teeth instead of 4, the clypeus is bidentate rather than truncate and feebly concave, and the petiole is less convex dorsally and lacks a tooth posteriorly following the ventral lamella, but the node has sharper and more tooth-like posterior corners. The postpetiole displays a pointed transverse process instead of three, rounded transverse ridges.

Metapone emersoni sp. nov.

WORKER: Length, 8.33 mm.; head length (excluding mandibles), 1.58 mm.; head width, 1.25 mm.; head index 0.79; thorax length, 2.33 mm.

This species has many similarities to *M. madagascarica*, but as these traits are common to the genus *Metapone* and are given in detail in the foregoing description, they will not be repeated here. The most important features of this ant are as follows. Head about 1¼ times longer than broad, tapering slightly from the rear to the mandibular insertions, very convex both longitudinally and transversely, occipital border only weakly and broadly excised. Clypeus separated from the frons by a definite suture, subquadrate, though narrowing slightly at the anterior end, its median lobe projecting as a very short, anterior process, transversely truncated in front but not bidentate, with blunt but distinct anterolateral angles and notably concave lateral edges. The median lobe stands quite high above the lateral lobes, and is bordered by anterior extensions of the frontal

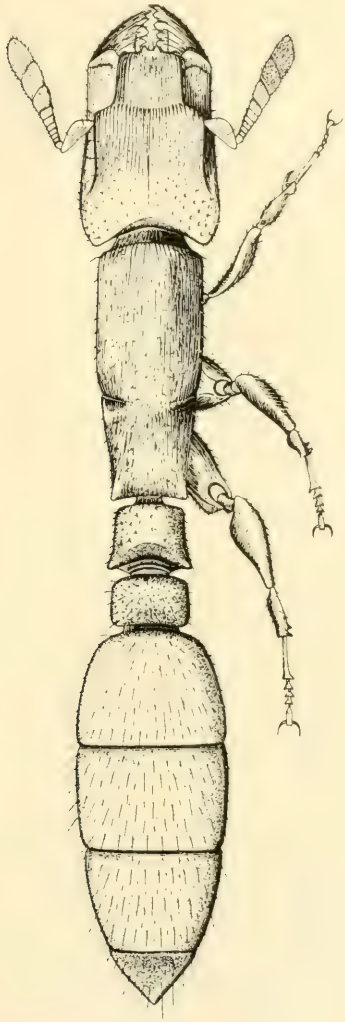
carinae flush with its dorsal surface. At the antennal insertions, the carinae diverge sharply and then extend backward as strong ridges overarching rather deep facial scrobes which receive the antennae. Scapes fairly slender at the base and widening to broad, flattened expansions distally. Funiculus with joints 2 to 7 wider than long and gradually expanding in size toward the apex; club composed of the last three segments which are spatulate and concavo-convex as in *madagascarica*. Eyes reduced to a group of 8 to 10 minute, flat ommatidia at the posteroventral border of the scrobe, and ⅔ the distance from mandibles to occiput. Mandibles narrow, masticatory border rounded, bearing 7 weak teeth (approaching denticles), and without any trace of a basal lobe. Ocelli and ocellar pits absent. Frontal groove distinct.

Thorax subrectangular, exactly twice as long as wide, humeri well-developed, and the epinotum tapering slightly to its posterior border. Pro-mesonotal suture absent; meso-epinotal suture distinct and somewhat impressed. Dorsum of thorax straight longitudinally, convex transversely, with vertical, concave pleurae; strongly margined at the sides, and across the anterior border of the pronotum. Epinotal teeth reduced to rather sharp ridges; basal face of the epinotum a little longer than the declivity, and joining the latter through a rounded angle; posterior border of the epinotum transverse and slightly excavated. Petiolar node from above strongly transverse, exactly twice as wide as long; anterior border faintly excised, lateral borders diverging posteriorly to well-marked, but rounded and backward-pointing lobes, and the posterior border deeply excised; the whole structure subtrapezoidal in shape, and strongly margined on the front and sides; antero-posteriorly convex. In profile, the petiole has a short anterior peduncle, a thin, translucent, longitudinal, ventral plate or keel with a rounded edge, the anterior and posterior faces of the node concave, the entire node rising and flaring laterally through concave sidewalls to the flat summit that expands into wing-like lateral lobes. From before, the node is decidedly cuneate in shape. Postpetiole also strongly transverse, but barely twice as wide as long (slightly narrower than the petiole); subrectangular in outline, the anterior border straight, posterior border weakly convex, and the sides diverging noticeably to the rear; summit of node nearly flat; sides tapering ventrally but not concave, converging obliquely to the petiole-postpetiolar joint, and continuing into a stout, ventrally directed spine, which curves slightly backward.

Gaster of the usual shape in these ants, rounded anteriorly and sloping to a rather narrow point apically. First segment exactly twice as long as either the petiole or the postpetiole. Sting well-developed, protruding.

Legs similar to those of *madagascarica*. Femora moderately inflated, tibiae stout, but metatarsi slender.

Sculpture.—Entire head, including scrobes, longitudinally striate, except for the occiput; striae very fine on the clypeus and mandibles, heavier elsewhere on the cephalic dorsum and genae, coarse over the entire gula. Thorax longitudinally striate on the dorsum and pleurae, the sculpture of about the same texture as on the head. Head and thorax with scattered, hair-bearing punctures, and brightly shining. Petiole and postpetiole plentifully supplied with piligerous punctures, dorsally; shining. Gaster likewise punctate and shining, faintly shagreened or coriaceous.



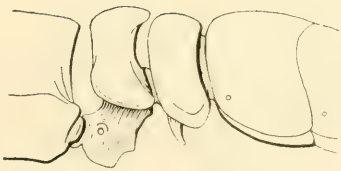


Fig. 1. Dorsal view of the worker of *Metapone madagascarica* sp. nov.
Fig. 2. Petiole and postpetiole of *Metapone emersoni* sp. nov. (worker)

Pilosity.—Very similar to that of the previously described species.

Color.—Reddish brown, the head and antennae darker, mandibles black; gaster lighter, yellow-brown toward the tip.

Holotype.—Worker; collected 12 miles from Perinet, Madagascar, on June 28, 1935, by Harold Kirby(?). As with the preceding species, they were recorded under a field number, T-4503, and presumably were associated with termites. Deposited in the author's collection.

Paratype.—One worker bearing the same collection data as the holotype.

In Wheeler's key, this species goes to couplet 5 because of the scarcely projecting median lobe of the clypeus, and thence to *tillyardi* because the petiole is broadly excised behind and the body is longitudinally striate. Though *emersoni* in morphology resembles *tillyardi* most closely, it can be distinguished from that species by lacking the small, blunt clypeal teeth, by the presence of 7 mandibular teeth instead of 5, a postpetiole which is virtualy as broad as the petiole (more transverse and less elliptical) and which has one stout, curved spine (instead of two transverse processes), and by its larger size (8.33 mm. vs. 5.5–6 mm.).

From *bakeri* it is easily separated by having 7 instead of 4 mandibular teeth, by the longitudinal striation of the head and thorax (*bakeri* is very smooth and shining except for dense sculpture in the scrobes), the very broad petiole (petiole longer than broad and narrower than the postpetiole in *bakeri*), and by its larger size (worker of *emersoni* 8.33 mm.; female of *bakeri* 6.4 mm.).

Metapone gracilis differs from *emersoni* by its 5-toothed mandibular dentition, but especially by its petiole which is about 1⅓ times as long as broad, somewhat longer than high, and the anterior face of the node which is straight and perpendicular.

From *jacobsoni*, the new species can be recognized by its shorter and stouter head (1¼ longer than broad rather than 1½), 7 instead of 5 mandibular teeth, and by its very broad petiolar node (twice as wide as long in contrast to 1⅓ times as long as wide).

To distinguish it from *johni*, it is necessary only to compare the form and proportions of the petiole and postpetiole, both of which are strongly transverse and twice as wide as long in contrast to the petiole of *johni* which is trapezoidal, and the postpetiole which is transversely oval and about 1.6 times as wide as long; it also lacks the prominent ventral spine.

Finally, the two new species can be readily differentiated by the form of the anterior clypeal margin, the shape of the scapes, the epinotum, and particularly the petiole and postpetiole which are strikingly unlike in these ants.

It will be noticed that *madagascarica* and *emersoni* belong to that division of the genus in which the anterior clypeal lobe is short, only slightly produced over the mandibular bases, and either somewhat truncate or else bidentate. The preceding comparisons have all

concerned other members of this group, while the remaining species of *Metapone* are in another division, represented by *M. greeni*, etc., and agree in having the clypeus notably extended, truncated in front, and furnished with sharp, tooth-like lateral corners.

A list of the known species of *Metapone* will serve to summarize the taxonomy of this group, and also to give some conception of its distribution so far as present information allows.

Metapone greeni Forel

Forel, Rev. Suisse Zool., 1911, 19, p. 449, Pl. 14, ☿, ♀, ♂ and larva; Emery, Ann. Soc. Ent. Belg., 1912, 56, p. 95, Fig. 1, larva; Wheeler, Ann. Ent. Soc. Amer., 1919, 12, p. 179, ☿, ♀, ♂, Fig. 1, 2; Emery, Genera Insect., 1921, Fasc. 174, p. 20.

Type locality: Peradenyia, Ceylon (E. E. Green)

Metapone mjoebergi Forel

Forel, Ark. f. Zool., 1915, 9, p. 36, ☿, ♀; Wheeler, Ann. Ent. Soc. Amer., 1919, 12, p. 181, ☿, ♀; *M. mjöbergi* Emery, Genera Insect., 1921, Fasc. 174, p. 20.

Type locality: Malanda, Queensland (E. Mjöberg)

Metapone sauteri Forel

Forel, Arch. f. Naturg., 1913, 79, p. 189, Fig. ♀; Wheeler, Ann. Ent. Soc. Amer., 1919, 12, p. 182, ♀; Emery, Genera Insect., 1921, Fasc. 174, p. 20.

Type locality: Sokutsu, Banshoryo District, Formosa (Hans Sauter)

Metapone leae Wheeler

Wheeler, Ann. Ent. Soc. Amer., 1919, 12, p. 183, ♀, Figs. 3, 4.

Type locality: Mt. Tambourine, Queensland (A. M. Lea)

Metapone bakeri Wheeler

Wheeler, Proc. New Eng. Zool. Club, 1916, 6, p. 10, ♀, Fig. 1; Wheeler, Ann. Ent. Soc. Amer., 1919, 12, p. 186, ♀. Fig. 5; Emery, Gen. Insect., 1921, Fasc. 174, p. 20.

Type locality: Mt. Banahao, Luzon Island, Philippines (C. F. Baker)

Metapone tillyardi Wheeler

Wheeler, Ann. Ent. Soc. Amer., 1919, 12, p. 187, ☿, Fig. 6.

Type locality: Dorrigo, New South Wales

Metapone hewitti Wheeler

Wheeler. Bull. Mus. Comp. Zool., 1919, 63, p. 62, ♂; Wheeler, Ann. Ent. Soc. Amer., 1919, 12, p. 189, ♂, Fig. 7.

Type locality: Kuching, Borneo (John Hewitt)

Metapone jacobsoni Crawley

Crawley, Ann. Mag. Nat. Hist., 1924, 13, p. 389, ♀.

Type locality: Fort de Kock, Sumatra (E. Jacobson)

Metapone johni Karawajew

Karawajew, Konowia, 1933, 12 (1-2), p. 115, ☿, ♀, ♂.
Type locality: Hantana, Ceylon, 3000-4000′ (O. John)

Metapone gracilis Wheeler

Wheeler, Psyche, 1935, 42, p. 38, ♀.
Type locality: Dapitan, Mindanao Island, Philippines (C. F. Baker)

Metapone krombeini M. R. Smith

M. R. Smith, Proc. Ent. Soc. Wash., 1947, 49, p. 76, ♀.
Type locality: K. B. Mission, Milne Bay, New Guinea (K. V. Krombein)

Metapone tricolor McAreavey

McAreavey, Proc. Linn. Soc. N. S. Wales, 1949, 74, p. 4, ♀.
Type locality: Nyngan, New South Wales (J. W. T. Armstrong)

Metapone truki M. R. Smith

M. R. Smith, Jour. N. Y. Ent. Soc., 1953, 61, p. 135, ☿.
Type locality: Truk Island; North Basin of Mount Chukumong, Moen (R. W. L. Potts)

Metapone madagascarica sp. nov.

Type locality: Tulear, Madagascar (H. Kirby)

Metapone emersoni sp. nov.

Type locality: Perinet, Madagascar (H. Kirby)

At the present time, 15 species of *Metapone* have been described, and until the publication of this report, they have all come from the Indo-Australian portion of the globe. Four are known in Australia, 2 in the Philippines, 2 in Ceylon, and 1 each on Borneo, Sumatra, Formosa, New Guinea, and Truk (in the Caroline Islands). The 2 new species herein described from Madagascar extend the known distribution of the group far to the west of its previously understood limits. It is tempting to suppose that the genus may yet be found on the continent of Africa or southeastern Asia, but the fact of its proximity to these places does not justify such a prediction. The present range is very wide, but it is characteristically disjunctive, sporadic, and decidedly insular, with the exception of the Australian species which are the only ones found in a continental area. Coupled with these facts is the extreme rarity of both species and individuals, and the primitiveness of the genus. It has certain specialized features which seem to be correlated with life possibly in termite nests, but the general morphology places *Metapone* among the primitive myrmicines so far as our knowledge now permits. It seems safe to conclude that these ants form a relict group which may have been at one time much more extensively distributed, including continental areas of

the Old World. I have been unable, however, to find any mention of the genus by Wheeler (1914) in his exhaustive treatment of the ants in the Baltic Amber, nor in Carpenter's study (1930) of the Florissant Ant Fauna. The absence of these ants from Eurasia and from North America during mid-Tertiary times, as far as the record indicates, is suggestive but not conclusive. It is still possible they may have inhabited the area in question, but owing to peculiar and secretive behavior (perhaps associated with termites and not given to strong nuptial flights), they avoided the amber when it was forming from sticky resin, and the fine, volcanic ash sediments that were accumulating in the ancient lake bed at Florissant.

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Wheeler, W. M. 1916. Four new and interesting ants from the mountains of Borneo and Luzon. Proc. N. Eng. Zool. Club 6:9-18.

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ANNOUNCEMENT

Short scientific articles, not illustrated, two double-spaced typewritten pages in length, are welcome and will usually receive prompt publication. References to literature should be included in the text, and the author's name should appear at the end of the article.

A NORTH AMERICAN SPECIES OF THE GENUS PROSOPIGASTRA

(HYMENOPTERA, SPHECIDAE)

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University of California, Davis

During a visit to the U. S. National Museum, I was advised by K. V. Krombein that specimens in my collection labeled as a possible new subgenus of *Tachysphex* were in reality *Prosopigastra* Kohl, a genus previously thought to be exclusively Palearctic and Ethiopian. Although similar to *Tachysphex*, the abdominal puncturation of *Prosopigastra* is coarse, and the second tergite is rather sharply rounded laterally. Dr. Krombein has loaned three species for comparison—*P.* (*Prosopigastra*) *orientalis* de Beaumont from Cyprus, *P.* (*Prosopigastra*) *neavei* Turner from southern Rhodesia, and *P.* (*Homogambrus*) *cimicivora cypriaca* de Beaumont from Cyprus. In details of wing venation, mandibular and clypeal structure, and general body form, the Californian species is remarkably like the others, particularly those in the typical subgenus. *Homogambrus* Kohl, in which the male is holoptic or nearly so, is somewhat less closely related. However, all of the exotic species seem to have a prominent hump between the antennal insertions and the median ocellus. This area is merely convex in our species, and this circumstance may indicate a new subgenus. As only the one Nearctic species is known, I prefer to retain it in the typical subgenus at least temporarily. It occurs over a variety of life zones from boreal to lower sonoran and has been found nearly the length of the state, but always in dry, sandy terrain. Adults have been collected lighting on the ground after the fashion of *Tachysphex*, and in one instance on flowers of *Phacelia*.

The holotype will be deposited in the California Academy of Sciences and paratypes in the U. S. National Museum, California Insect Survey, and University of California at Davis.

Prosopigastra nearctica, new species

Male.—Length 6.0 mm., length of forewing 3.5 mm. Black with orange red markings as follows: mandible mostly, tegula and wing base, knee spots, tibiae distally, tarsi, tergites I-II entirely, III basally, sternite II. Abdominal segment VII and mouth parts brownish. Wings lightly stained, median cell of forewing

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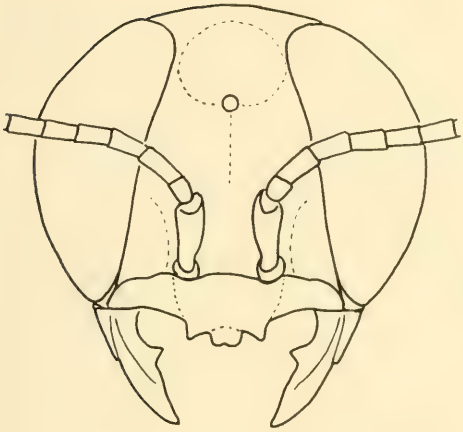
Prosopigastra nearctica Bohart, n. sp. Fig. 1, front view of holotype head; fig. 2, pygidium of female paratype; fig. 3, clypeus of female paratype; fig. 4, enlarged profile of one lobe of holotype aedeagus; fig. 5, distal one-half of holotype forewing; fig. 6, ventral view of flattened holotype genitalia (aedeagus split and volsella removed from one side).



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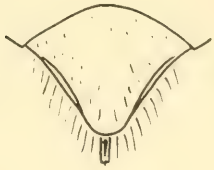

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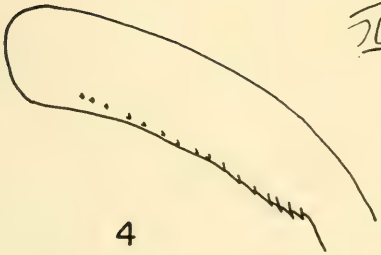

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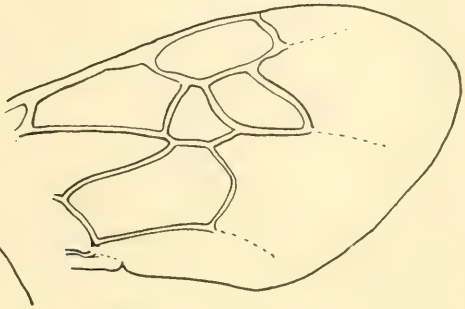

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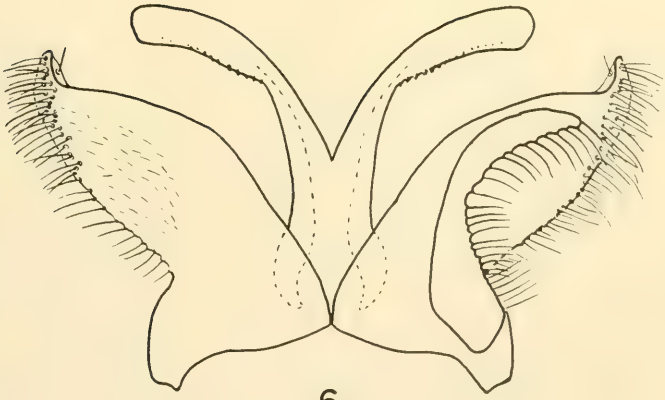

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sparsely setose, practically bare toward center. Pubescence moderate, dull silvery, rather coarse, appressed, covering most of face below ocelli, upper mesopleuron, mesonotum posteriorly, postscutellum, propodeum laterally, and apical margins of tergites, otherwise well distributed but scanty; some erect hair along apical margins of sternites, thickest and about as long as last tarsal segment on V and VI; tarsi with slender to stout pale spines. Puncturation of body rather coarse, punctures mostly separated by about a puncture diameter, about 2 diameters or more toward rear of mesonotum; scutellum, pronotal lobe and tegula mostly polished as are distal margins of tergites IV and following; sternites II and following with irregular puncturation, III-IV traversed by smooth welts. Head a little broader than long, eye as broad as middle of frons in front view, least interocular distance equal to lengths of pedical and first two flagellar segments; median apex of clypeus as in figure 1; flagellar segments somewhat flattened, not convex beneath, first one about twice as broad as long, others progressively slightly shorter except last which is also twice as broad as long; frons gently swollen toward middle; ocellar area strongly but evenly convex, not shiny, backed by a deep V on the vertex. Propodeal enclosure about as long as scutellum, with oblique striae which are partially broken up into areolae, posterior face rough and with oblique striae continued around sides to a basal shiny area; mesosternum with a small, blunt tooth halfway between anterior margin and precoxal transverse ridge. Last sternite shallowly excavated at apex, genitalia as in figures 4 and 6.

Female.—About as in male except as follows: mandible, pronotal lobe, tibiae, and tergite III with reddish areas more restricted, sternite II with a lateral dark spot. Sternites V and VI with only a row of erect hairs. Eye in front view about as broad as least interocular distance which about equals length of pedicel and first three flagellar segments. Median apex of clypeus with a pair of small approximate teeth flanked at some distance by a tooth directly below antennal insertion (fig. 2), clypeal bevel broad, triangular, sparsely punctured. Fore tarsal comb of long, slender, black bristles. No mesosternal tooth. Tarsi with stout dark spines, especially on two more basal segments. Pygidium flattened, broadly rounded at tip, lateral margins distinct (fig. 2).

Types.—**Holotype male**: Brockway Summit, Placer Co., California, on flowers of *Phacelia*, July 25, 1957 (R. M. Bohart). **Paratypes** (all from California); 2 males, 1 female, same data as type; 2 males, 3 females, Carnelian Bay, Lake Tahoe, Placer Co., Aug. 22, 1955, and July 22, 1957 (R. M. Bohart); 1 male, Sagehen Creek, Nevada Co., July 25, 1956 (R. M. Bohart); 2 males, Cassel, Shasta Co., July 15, 1955 (R. M. Bohart); 1 female, Yuba Pass, Sierra Co., Aug. 20, 1955 (E. I. Schlinger); 1 male, 1 female, Strawberry, Tuolumne Co., July 15, 1951 (J. W. MacSwain); 1 male, Boca, Nevada Co., July 25, 1957; 4 males, Hallalujah Junction, Lassen Co., July 4-15, 1951-57 (E. I. Schlinger, R. C. Bechtel, R. M. Bohart). **Metatypes**: 7 males, 4 females, Borrego Valley, San Diego Co., Calif., sand dunes, April 19, 1957 (R. C. Bechtel, H. R. Moffitt, E. I. Schlinger, R. M. Bohart); 1 male, San Diego Co., Calif. ("thru C. V. Riley," U.S.N.M.).

THE MITE DERMATOPHAGOIDES SCHEREMETEWSKYI BOGDANOV AND ITS CONTROL IN RUSSIA

(*Acarina, Psoroptidae*)

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In 1951 Jay Traver of the University of Massachusetts published a detailed account of a persistent and annoying infestation of *Dermatophagoides scheremetewskyi* Bogdanov on humans.[1] Methods of control used for other mites were found to be inadequate. In the same year A. A. Fisher et al (1951), of the New York University Post-Graduate Medical School published another account of the same mite infesting man. Sasa previously (1950) had reported on *Dermatophagoides* found in three cases of human acariasis in Japan. In 1956 V. B. Dubinin and coworkers of the Zoological Institute of the Academy of Sciences, Russia, published another paper which contains descriptions and photographs of cases found in that country. The Russian workers have developed a control for these mites, and their methods should be of interest. Except for some corrected typographical errors and changes made in the interest of clarity, the authors' English summary reads as follows:

The mite *Dermatophagoides scheremetewskyi* has often been found on man in many countries, but was not subjected to research until now. In the winter of 1955 we examined for mites 78 patients suffering from seborrhea (no mites found on 64 patients), seborrheal eczema (7 out of 8 patients infested), and chronic diffused neurodermatitis (mites found on 2 out of 6 patients examined). The parasites were collected by scraping them off the patients' skin, and were prepared for study by placing them in a gum mixture.

D. scheremetewskyi mites settle first on the hairy part of the head, but after an unsuccessful treatment they may spread over the entire body. The mites settle on the surfaces of the epidermis, and creep into the tiny follicles at the base of the hairs, and under the scales and edges of crusts which form from dried papulae and as a result of scratching. Because of the destruction of epidermal cells by the chelicerae and irritation of the nerve endings in the skin, the patient suffers from a constant unbearable itch which increases somewhat at

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[1] Reprints of the valuable Traver paper may be obtained from the Custodian, Entomological Society of Washington (see inside front cover) at $.50 each. Reprints of the present article at $.25 are also available from the Custodian.—Ed.

night. The histological symptoms noted are moderately manifested acanthosis, parakeratosis, and in places a slight hyperkeratosis; the blood vessels of the skin are dilated, and around the vessels there is a slight infiltration with lymphoid cells. The article describes eleven cases of seborrheal eczema due to these mites.

All the patients whose cases were investigated by us had been ill for 2 to 7 years, and had previously undergone repeated hospital treatment; yet every winter there was a recurrence of the disease. The treatment applied by us consisted of disinfecting the patient's whole body once with a 60-percent solution of hyposulphite and then several times with a 6-percent solution of hydrochloric acid (Demyanovich method). This treatment was repeated a day later. After each treatment the patient was wrapped in a sheet so as to obtain a maximum concentration of hydrogen sulfide gas fumes around the body. On following days only the centers of infection were treated with Wilkinson's[2] formula. As a result of this treatment all clinical symptoms disappeared in all the patients, and no more mites were found in the course of numerous, frequently repeated examinations. The patients were kept under observation for 18 months.

Future research on control should be directed towards determining whether cats, dogs, and rodents in the homes are hosts of this mite. Also the conditions and times which the mites can survive away from the human hosts should be studied.

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[2] Wilkinson's ointment is a combination of precipitated calcium carbonate, sublimed sulfur, juniper tar, soft soap, and solid petroxolin (The National Formulary, VI, 1936, The American Pharmaceutical Association, Washington, D. C.). Castellani's paint consists of basic fuchsin in a mixture of acetone and alcohol, boric acid, phenol, resorcinol, and water (A. Osol, and G. Farrar, 1955, The Dispensatory of the United States of America, 25th Ed., L. B. Lippincott, Philadelphia). No information on the Demyanovitch method was found. I wish to thank Dr. R. P. Fischelis, American Pharmaceutical Association, for help in obtaining this information.

LOBOGYNIELLA TRAGARDHI, A NEW GENUS AND SPECIES OF DIPLOGYNIID MITE ASSOCIATED WITH DAMPWOOD TERMITES IN OREGON

(ACARINA, DIPLOGYNIIDAE)

GERALD W. KRANTZ, *Oregon State College, Corvallis.*

While examining specimens of *Zootermopsis angusticollis* (Hagen) collected from a tree stump near Corvallis, Oregon, a number of mites were recovered, one of which was identified as belonging to the family Diplogyniidae Tragardh 1941. Further observation revealed the mite to be a representative of a new genus of the subfamily Diplogyniinae. The new genus resembles both *Lobogynium* Tragardh 1950 and *Lobogynioides* Tragardh 1950, but may be separated from the above mentioned genera through the use of the following key adapted from Tragardh:

1. Ventral marginal shields meet the tip of the ventri-anal shield at the posterior end of the hysterosoma ..... *Lobogynioides* Tragardh 1950
   Ventri-anal shield triangular, apparently not extending to the posterior margin of the body 2
2. Sternal hairs II and III inserted near the posterior margin of the sternal shield, flanking sternal hair IV ..... *Lobogynium* Tragardh 1950
   Sternal hairs II and III well removed from posterior edge of sternal shield and anterior to sternal hair IV ..... *Lobogyniella* nov. gen.

Lobogyniella, nov. gen.

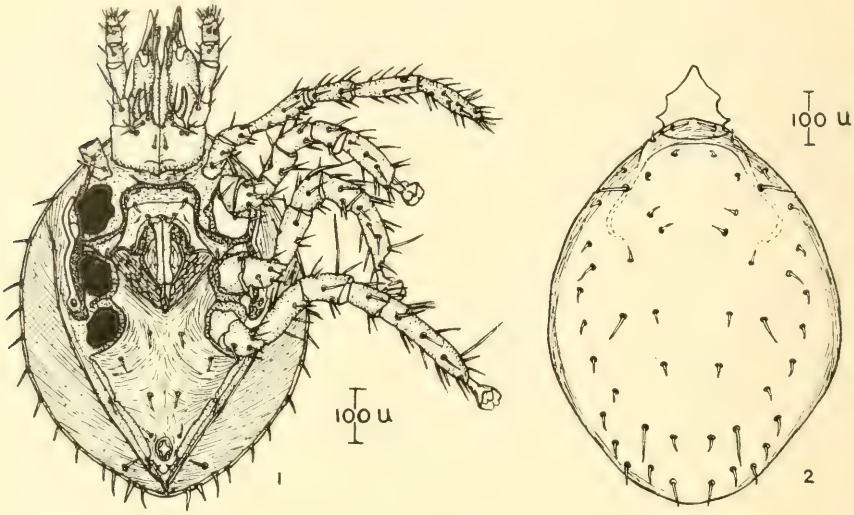
Metasternal shields with only the anterior and posterior extremities visible from beneath the lateral shields (Fig. 4). Posterior extremities of metasternal shields with a terminal hair and an adjacent pore. Lateral shields with large lateral lobes. Sternal hairs II and III not in a transverse line, well removed from posterior edge of sternal shield. Ventri-anal shield triangular and apparently not extending to the posterior margin of the hysterosoma.

Type species: *L. tragardhi*, n. sp.

Lobogyniella tragardhi, n. sp.

Female.—Idiosoma: length = 718 microns; width at insertions of coxae IV = 543 microns; idiosoma ovoid-elongate, its widest point being at the insertions of coxae IV. **Dorsal shield** (fig. 2) with 26 pairs of setae, most of which are quite short. Three pairs of setae are noticeably longer than the rest, these being the shoulder setae and two pairs of latero-interior hysterosomal setae. The shield is weakly striated over its entire surface but only obviously so along the lateral margin. Ventral side with coalesced anal, ventral, sternal and metasternal shields which, except for the placement of the sternal hairs and the striation patterns, are quite similar to Tragardh's *Lobogynium rotundatum* (Tragardh 1950). **Sternal shield** (fig. 4) with anterior projections, between which the two-tined **tritosternum** is inserted. Sternal hairs I are inserted on the anterior edge of the sternal shield near the median area of the forward projections. A pair of pores, opening exteriorly and adjacent to the setae, are placed on a small defined area with the latter. Sternal hairs II are inserted behind and

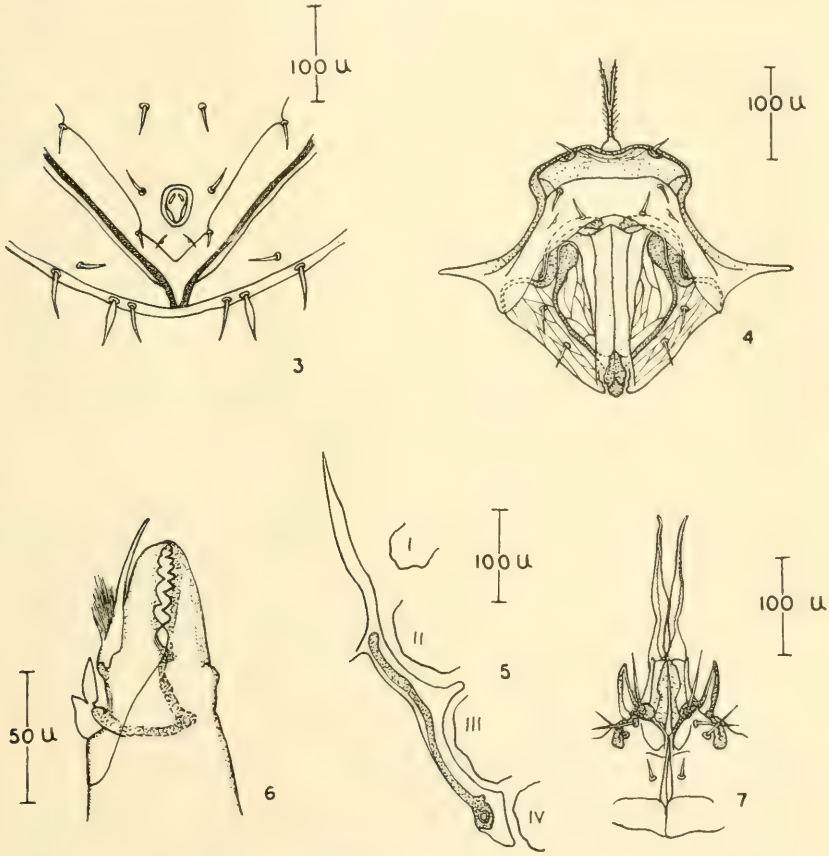
somewhat exteriorly to sternal hairs I. A pair of pores are located either in a direct line behind sternal hairs I and II, or interiorly to sternal hairs II. These pores are not located symmetrically on one of the specimens examined. Sternal hairs III are situated near the posterior edge of the sternal shield and are interior to sternal hairs II. Laterally, the shield is elongated into two blade-like



Lobogyniella tragardhi, n.sp., female. Fig. 1, ventral aspect; fig. 2, dorsal aspect.

prominences which extend between coxae II and III. Posteriorly the shield is deeply excavated, its lateral concavities all but covering the metasternal shields. **Metasternal shields** not fused at the midline, angling exteriorly and posteriorly to a narrow band. The sternal shield covers all but the anterior and posterior ends of the metasternals. A terminal seta and an adjacent pore are located at the widened posterior ends of the latter. The **lateral shields** (fig. 4) are bilobate, having both a lateral and an anterior protuberance. Two pairs of hairs are inserted on the posterior part of the shield, well away from the posterior margin. The anterior pair is located interiorly to the lateral lobes while the second pair is inserted midway between the first pair and the epgynial shield. The **epigynial shield** is triangular, the base being as wide as the two sides. The **ventri-anal shield** (fig. 1) is triangular, with its base extending toward, but not reaching, the end of the hysterosoma. The apex of the triangle has a pair of pores and a pair of short setae which are inserted on lateral prominences of the apex. Five additional pairs of setae are located on the ventri-anal plate, all of which are noticeably longer than those on the apex. One pair is lateral in position and is inserted on prominences which are nearer the base than the apex of the shield. The anal opening lies a little in front of the apex and is oblong in shape. The **ventral marginal shields** (fig. 1) are

separated from the ventri-anal shield by a wide groove toward the posterior end and a narrow cuticular fold anteriorly. The fold is a flap of cuticle extending the entire interior length of the marginal shield, ending just short of the margin of the body at the level of coxa II. The posterior grooves appear to be nothing more than the deeply infolded lateral edges of the ventri-anal shield



Lobogyniella tragardhi, n.sp., female. Fig. 3, ventral aspect of posterior portion; fig. 4, sternal, lateral, metasternal and epigynal plates; fig. 5, peritreme and peritremal plate; fig. 6, lateral aspect of chela; fig. 7, hypostome.

which, under phase contrast, extend to the posterior margin of the body (fig. 3). The ventral marginals have one pair of setae which are lateral and posterior to the anal opening. The **stigmata** (figs. 1 and 5) are located exterior to a point between the insertions of coxae III and IV. The **peritreme** extends only as far as the middle of coxae II. A **peritremal plate** (fig. 5), on or near which the peritreme is located, extends anteriorly to a point in front of coxae I. **Legs I** are antenniform and are somewhat longer than legs II, III, and IV. Coxa II are

larger than those of the other legs. The claws and pulvilli of all but legs I are large and well developed. The **epistome** (fig. 1) is triangular, with two sets of projections on the lateral edges. The base is broadly joined to the propodosoma, attached well behind the anterior margin of the body. A flap or fold of cuticle appears to extend from the propodosoma over the base of the epistome, forming a partial hood. The latter may be either a natural development or the result of pressure exerted on the cover slip during mounting. The **chelicera** (fig. 6) bears, on the ventral side of the movable digit, a slender, slightly curved appendage which is somewhat longer than the chela. Attached to it are a series of hairs divided into three groups of three or four hairs each, the whole series being united toward the basal part of the appendage. Behind the articulating membrane is a second, shorter appendage, ovate-lanceolate in outline and resting on a broad base to which it is narrowly attached. The movable digit is armed with seven teeth, the basal one being very large and wedge-shaped. Its three distal teeth are small and inconspicuous. The immovable digit has eight teeth, with the basal three longer than those distal to them. Teeth 6 and 8 are very small, flanking tooth 7 which is of a size comparable to that of the other terminal teeth. The **hypostome** (fig. 7) has a pair of pointed, slightly curved maxillary lobes which are inserted on the weakly projecting maxillae. Opposed to the maxillary lobes and inserted on the maxillae are a pair of hyaline secondary appendages which exceed the primary maxillary lobes in length. The maxillary plates are without fringes but have a pair of curved narrow terminal appendages extending forward under the chelicerae.

Male.—Not known.

Type Specimens.—Holotype female and paratype female on slides numbered 56415-1 and 2 respectively. Excised mandible in lateral position on slide No. 56415-2a. The holotype female will be deposited in the collection of the U. S. National Museum, Washington, D. C. Collecting data are as follows: McDonald Forest, near Corvallis, Oregon: Ex *Zootermopsis angusticollis* (Hagen); April 15, 1956, Collector Norman Tonks. Slides numbered 56415-2 and 2a will be placed in the collection at Oregon State College, Corvallis, Oregon.

Type Host.—Zootermopsis angusticollis (Hagen).

Type Locality.—McDonald Forest, near Corvallis, Oregon.

Optical Equipment.—Drawings were made and morphological data were collected with the aid of a Spencer phase contrast microscope equipped with dark medium contrast objectives and illuminated by a Spencer advanced laboratory illuminator.

Systematic Position of Lobogyniella

The similarity between this genus and *Lobogynium* Tragardh is striking. Not only do the lateral shields of *Lobogyniella* possess the ear-like lateral lobes but the arrangement and number of setae on the sternal and ventri-anal shields agree quite closely with those of *Lobogynium*. As regards the true nature of the ventri-anal and ventral marginal shield structure of *Lobogyniella* (Fig. 3)—that Tragardh's

Lobogynium rotundatum is not similar to *Lobogyniella* in shield morphology is questionable since the two genera agree in many other details. The structure of the lateral plates of *Lobogynioides* Tragardh places this genus in close association with both *Lobogynium* and *Lobogyniella*. *Lobogynioides,* however, has only a narrow suture separating the ventri-anal from the ventral marginal shields. In addition, the posterior ends of the ventral marginals are pointed and joined at the terminus, whereas the ventral marginals are rounded and do not meet in *Lobogyniella* or *Lobogynium*. The metasternal plates of *Lobogyniella* resemble those of *Lobogynioides* but not those of *Lobogynium* which, in addition to the sclerotized bar-like condition of the shield (Fig. 4), has a pair of anterior triangular areas which meet at the midline. However, *Lobogynioides* has two pairs of metasternal pores rather than one pair of pores and a pair of setae such as found in both *Lobogyniella* and *Lobogynium*. From the various differences and resemblances noted between these three genera, it appears to the author that *Lobogynium* and *Lobogyniella* represent a more primitive condition than that of *Lobogynioides*. One could arrive at such an assumption by considering only the presence or absence of the metasternal hair, and the extent of separation of the ventri-anal and ventral marginal plates. The presence of the metasternal hair in place of a second pore, as found in *Lobogyniella,* indicates an earlier stage of development than noted in those forms where the hair has been lost. A more advanced condition may be assumed in those forms having closely coalesced plates than those with plates widely separated.

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NOTES ON ALLODAMAEUS EWINGI BANKS

(Acarina: Oribatei: Belbidae)

Harold G. Higgins and Stanley B. Mulaik
Dept. of Biology, University of Utah

The genus *Allodamaeus* was described by Banks (1947) from specimens taken from the forest of Duke University, Durham, North Carolina. This genus was placed in the family Belbidae near the genus *Gymnodamaeus*, and *Allodamaeus ewingi* was designated as the type species.

In 1952 the junior author collected some mites from Duke Forest, among which were several adult and immature specimens of this species. Inasmuch as Banks did not completely figure either adult or immature specimens, additional figures and notes based on topotypical specimens are presented in this paper.

Allodamaeus Banks

Type: *Allodamaeus ewingi* Banks, 1947, Psyche 54(2):118-119, Figs. 6, 13, 44.

Diagnostic characters.—Body egg-shaped; division between hysterosoma and propodosoma distinct; hysterosoma nearly as broad as long with rounded sides; tectopedia I large, heavy, with a strong forward projecting point; tectopedia II large, blunt, and located under legs II; genital and anal plates separated from each other and of approximately equal size; legs of moderate length, relatively stout, most joints without huge swollen parts; tibia of leg I extends over the tarsus, claws born on a stalk.

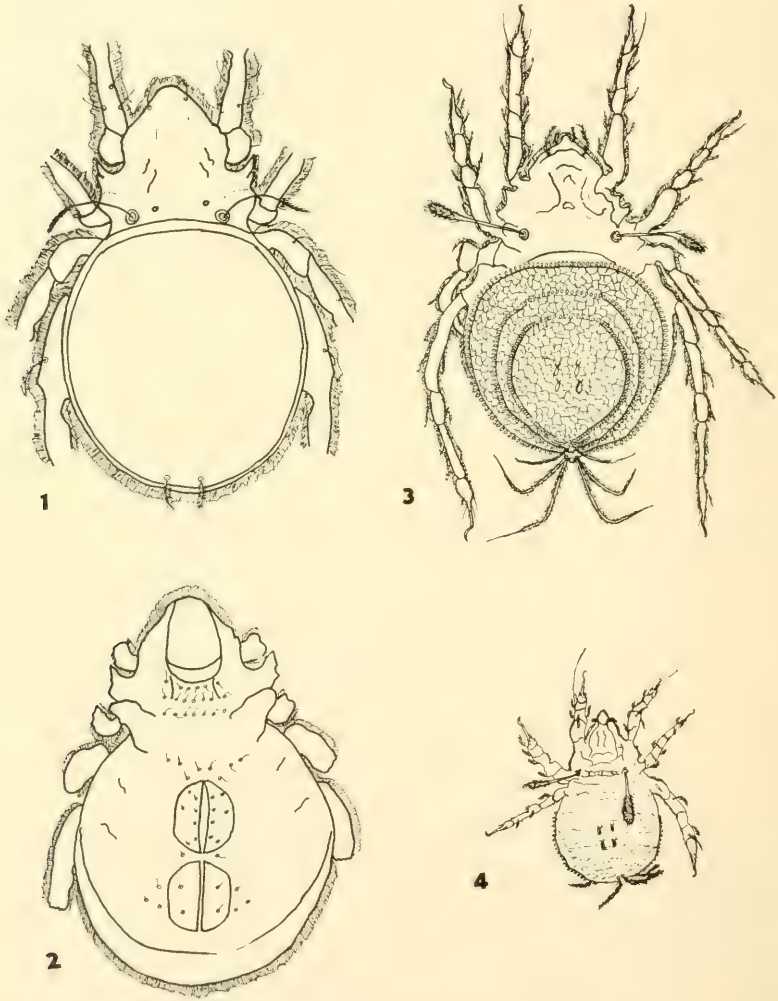

FIG. 1. *Allodamaeus ewingi* Banks, dorsal view; fig. 2, ventral view; fig. 3, dorsal view of nymph; fig. 4, dorsal view of larva.

Allodamaeus ewingi Banks

Diagnosis.—Body and legs heavy; pseudostigmatic organs slightly shorter than the distance between them and with a barbed, clavate tip; body and legs bordered with a heavy, erect, platelike secretion which is ridged and so appears rodlike.

Description.—Color deep reddish brown. Body, body setae, and legs covered with a heavy veil of secretion that gives the appearance of stiff, short rods. Propodosoma wider than long with a pair of long, inward curving setae that are located some distance from the edge of the rostrom. Rostral setae curved inward, and nearly invisible in the secretion that covers the anterior edge of the body. Tectopedia I heavy, toothed near the middle, with a strong forward projecting point. Tectopedia II blunt, massive, and located under legs II. Pseudostigmata short, cuplike. Pseudostigmatic organs slightly shorter than distance between them with a barbed, clavate tip. Interlamellar hairs absent or cannot be seen, although there is a spot for their attachment.

Hysterosoma distinctly separated from the prodosoma and approximately the same length as width; dorsal surface rather smooth and devoid of setae except for a single pair near the posterior edge.

Camerostome egg-shape; mandibles, chelate.

Genital and anal plates of nearly equal size and separated from each other by a distinct piece of the ventral plate. Genital plates with seven pairs of setae; anal plates with two pairs of setae.

Legs moderately heavy without huge swollen joints. Leg I nearly as long as body is wide; tibia I extends over the tarsus and bears a long bristle that extends beyond the claws. Legs IV longer than all others, but shorter than body. The three claws are born on a stalk, the stalk of which is nearly as long as the rest of the tarsus. Setae on legs, long, slender, and simple.

Three specimens from Duke Forest have the following average measurements: Length, 0.68 mm.; width of hysterosoma, 0.45 mm.; length of leg I, 0.42 mm.; length of leg IV, 0.59 mm.

Discussion.—All specimens of *Allodamaeus ewingi* Banks were taken from decaying leaves under trees in Duke Forest. This species, up to the present time, has been reported only from the type locality.

The adult specimens, and to a lesser extent the immatures, show considerable individual variation. The relative size and shape of the anal covers appear to be the most variable character. For example, some species have nearly round anal plates, whereas in other specimens these plates have flattened sides.

ANOTHER OLD RECORD OF APHOTAENIUS CAROLINUS (VAN DYKE)

(COLEOPTERA, SCARABEIDAE)

Recently, while examining Scarabaeidae in the Charles Dury Collection in the Cincinnati Museum of Natural History, I was fortunate in finding the specimen reported by Mr. Dury as *Ataenius lecontei* Harold in his "Additions to hte list of Cincinnati Coleoptera" (1906, Journ. Cincinnati Soc. Nat. Hist., vol. 20, p. 257). The label data reads, "Cin. O., v. 26.5., Dury." The specimen proves to be *Aphotaenius carolinus* (aVn Dyke)

A record of *Ataenius lecontei* Harold (synonym of *ovatulus* Horn) from Ohio would have been of considerable interest, since I have seen no Ohio specimens of that species; but ths old record of *Aphotaenius carolinus* was of even more interest. Except for recent collections in the mountains of North Carolina, South Carolina and Georgia, all specimens which I have seen previously were also collected over fifty years ago: "Key West, Fla.," label very old, brown and brittle; "Marlboro, Md., May 13. H. S. Barber," collected between 1898 and 1901; and "Crawford County, Indiana, May 19, 1903, W. S. Blatchley."

Evidently *Aphotaenius carolinus* once had a fairly wide distribution—Indiana to Maryland to Florida—but it now seems confined to the Carolinas and Georgia. I have searched carefully for it in Virginia, West Virginia and Pennsylvania without success. It is usually found in and under deer droppings in shady woods, April to September. Perhaps the virtual extinction of deer over most of eastern North America eliminated this small dung-feeding scarab and accounts for no recent records over most of the previous range. I would be grateful for additional records, old and new, for this species. —O. L. CARTWRIGHT, *Smithsonian Institution, U. S. Nat. Museum, Washington, D. C.*

AN OVERLOOKED NAME IN "MUSCA"

(DIPTERA)

A long overooked name in the genus *Musca* recently came to my attention in correspondence with Mr. J. W. W. Loose, of Lancaster, Pennsylvania, who is interested in 19th century history, and to whom I am indebted for the reference to the publication containing the name.

In 1855, Mr. J. Franklin Reigert of Lancaster published a small, 15-page pamphlet, "A treatise on the cause of cholera, an interesting discovery," in which he propounded the theory that swarms of a small yellow fly composed the "Cholera Miasmae," the cause of cholera. This was indeed an early suggestion of the relation of insects to disease, but it was undoubtedly based on miscellaneous and incorrectly associated bits of data, including the presence of this small yellow fly. Some of these, captured on a window sill in his house, were sent to Dr. John G. Morris of Baltimore and Mr. S. S. Rathvon of Lancaster. Both men placed it in the genus *Musca* of Linnaeus.

Mr. Rathvon noted that that genus had been greatly subdivided, and he could not place the species definitely, but suggested (p. 9) that it be called "Musca Ochrapesus." On p. 10 is quoted a 14-line description furnished by Rathvon, and a frontispiece to the pamphlet shows 3 colored figures of the fly.

The description is extremely generalized, but gives the concrete facts that the species is 3/16 inch long, the color "dull ochery yellow," and the "thorax sparsely covered with long brownish spines or stiff hairs." The wings were said to have "fine longitudinal nervures their whole length," and the figures clearly show that the second longitudinal vein (R_{2+3}) is very long, ending nearly at the apex of the wing. Taken together, the various items indicate that the species was *Chyromya flava* (Linnaeus) (Chyromyidae). This species has sometimes been recorded as occurring in numbers on windows. I have no hesitation in referring *Musca Ochrapesus* Rathvon to the synonymy of *C. flava*.

—CURTIS W. SABROSKY, *Entomology Research Division, A. R. S., U. S. Department of Agriculture, Washington, D. C.*

THE TYPES OF WYEOMYIA (WYEOMYIA) DYARI LANE & CERQUEIRA, 1942

(DIPTERA, CULICIDAE)

A mistake was made by Lane & Cerqueira (1942 in "Os Sabetíneos da América" pg. 581), when a new name was given and the species called *Wyeomyia* (*Wyeomyia*) *dyari* n. n. Actually this was proposed for what we believed to be a misidentification by Dyar of the larva of *Phoniomyia quasilongirostris* Theobald, and was not a substitute name for a homonym. It should, therefore, have been treated as a new species and type material selected.

Such being the case, we take this opportunity, at the suggestion of Dr. Alan Stone, to choose type material for this species. When our study of the Sabethini was concluded the material was divided, one part remaining with the Servico Nacional de Fébre Amarela and the other with the Faculdade de Higiene da Universidade de S. Paulo. In the Faculdade de Higiene there are seven specimens in perfect condition and which are here selected as type material for this species. *Type material.*—BRASIL. Male lectotype, State of Rio de Janeiro, Petrópolis, V.1938 (R. C. Shannon col.) (genitalia mounted on a slide and a midleg on another slide). Allotype female, State of Rio de Janeiro, Terezópolis, V.1938 (R. C. Shannon col.). Paralectotypes: State of Rio de Janeiro, Mangaratibe, IX.1939 and Cachoeira, Faz. Martinez, V.1938—two males with uncut genitalia; Federal District, V.1938 and XII.1936 (R. C. Shannon col.)—three females. Lectotype registered in our collection under n. 1363c allotype n. 1366, male paralectotypes ns. 1364 and 1365 and female paralectotypes under ns. 1367, 1368 and 1369.

—J. LANE, *Faculdade de Higiene e Saúde Pública da Universidade de S. Paulo, and* N. L. CERQUEIRA, *Serviço Nacional de Fébre Amarela, Rio de Janeiro, both Brazil.*

JOSEPH M. DAVIS

1909-1957

Joseph M. Davis, entomologist of the Forest Insect Laboratory, Forest Service, Beltsville, Maryland, died on December 30, 1957, following an illness of several months.

Mr. Davis, the son of Charles W. and Margaret (Puhr) Davis, was born on May 17, 1909, at Noonan, North Dakota. He grew up there on the family farm and then attended the University of North Dakota where he received a BS degree in 1935 and an MS degree in 1937. Later, he took additional graduate work at the University of Wisconsin and the University of Utah. Although his training was primarily in entomology and the biological sciences, he acquired a considerable background in mathematics, physics, and chemistry as well.

After receiving his Master's degree, Mr. Davis was appointed instructor at the North Dakota School of Forestry where he taught courses in mathematics and physics. He left there in 1941 to accept a position as research biologist with the North Dakota Game and Fish Department.

In 1942, he came to the National Bureau of Standards, Washington, D. C., as a research physicist, working on special aviation equipment for the Armed Forces. When the war ended, he was engaged for a short while in federal plant quarantine work in Washington.

In 1946, Mr. Davis joined the Forest Insect Laboratory at Beltsville Research Center as a research entomologist. His principal fields of investigation were in aerial spraying for controlling forest defoliators, particularly studies on spray distribution and atomization. He also pioneered in the use of radioisotopes for studying the dispersal habits of various forest insects. He published several papers on these subjects.

He was a member of the American Association for the Advancement of Science, the Entomological Society of America, the Entomological Society of Washington, the Insecticide Society of Washington, Phi Delta Kappa honorary education society, Sigma Xi, and the Masonic order.

He is survived by his wife, the former Miss Evelyn Johnson of Fargo, North Dakota, whom he married in 1941, and by three sons—Bryan, 15; Allan, 12; and Darrell, 9 years old.

In many respects, Joe Davis was an unusual man. Probably his most outstanding trait was his broad range of interests and abilities. Not only a well rounded entomologist, he also had a strong bent for mathematics and approached a research problem with the keen analysis of a mathematical mind. He was a stimulating idea man, a skilled technician, and a leader of team research. In addition to his profession, Davis had several avocations. Over a period of years he built a spider collection, numbering some 3700 specimens, which he presented to the Smithsonian Institution. He had a great love for

music, and not only played the clarinet and viola, but at one time was director of the civic orchestra in Bottineau, North Dakota. He was highly skilled in photography and liked to take both still and motion pictures of many of the insects he encountered such as walkingsticks, pine saw-flies, and the spruce budworm. Being especially ingenious, he built a special box for field use in taking pictures of insects which approximated dark room conditions. This was only one example of several pieces of equipment he made to facilitate his research work in the field of forest insects.

In his death, his profession lost an exceptional scientist—his associates, a highly valued friend.

R. A. St. George
J. S. Yuill

SUMMARY REPORTS OF SOCIETY OFFICERS FOR 1957

CORRESPONDING SECRETARY

Membership as of January 1, 1957			509
Reductions:			
Resigned	14		
Dropped	17		
Deceased	4		
Total		35	
Elected to membership		23	
Reinstated		2	
Net loss in membership		10	
Total membership—December 31, 1957			499

Classes of membership:		
Dues paying	476	
Life	5	
Retired	14	
Honorary	4	
Total		499

The membership is distributed among 44 States, 4 Territories, the District of Columbia, and 24 foreign countries.

Circulation of Proceedings (October 1957 issue)		
Unstamped, poundage rate:		
States	410	
District of Col.	38	
U. S. Possessions	13	
Total		461
Stamped foreign countries		198
Chain mail		112
Total		771
Distribution:		
To members		491
To subscribers		280
Total		771

The Proceedings go to members and subscribers in 48 States, the District of Columbia, 4 territories, and 48 foreign countries.

Respectfully submitted, KELVIN DORWARD, *Corresponding Secretary.*

TREASURER

General Fund

Cash on hand, January 1, 1957	$ 268.20	
Receipts during 1957	4,185.04	
Total		$4,453.24

Cash on hand, December 31, 1957	8.57	
Expenditures during 1957	4,444.67	
Total		$4,453.24

Publication Fund

Cash and securities on hand, January 1, 1957	$6,724.98	
Receipts and earnings during 1957	2,107.54	
Total		$8,832.52
Cash on hand, December 31, 1957	4,778.55	
Expenditures during 1957	4,053.97	
Total		$8,832.52

Copies of the complete Treasurer's report, approved by the Auditing Committee, are on file with the Corresponding Secretary and Treasurer.

Respectfully submitted, FLOYD P. HARRISON, *Treasurer.*

CUSTODIAN

The Custodian is happy to report a considerable increase in the amount of sales during 1957 over each of the previous three years. The average for the three years 1954, 1955, and 1956 was $596 while in 1957 items to the amount of nearly $1,409 were sold. That makes 1957 the biggest year since 1953, the first year the "Chigger Manual" was on sale when over $1,900 worth of items were sold. Most of the increase in 1957 was accounted for by sales of Memoir No. 5, or 44 books for a total of $390.80. In addition, 3 complete sets of the "Proceedings" were sold for a total amount of $523.80.

Copies of a complete, detailed report are on file with the Recording Secretary and Treasurer.

Respectfully submitted, H. J. CONKLE, *Custodian.*

EDITOR

Six numbers of volume 59 of the Proceedings were published in 1957. Of the 304 pages printed, 16 were devoted to advertising (exclusive of back covers) and 288 to scientific papers, notes, book reviews, obituaries, and minutes of meetings. These figures are in contrast to 368 pages published in 1956, 294 of which were devoted to scientific papers, notes, etc. Because of the increase in printing costs at the end of 1956, each number of the Proceedings for 1957 (except one) contained only 48 pages as compared with 64 in 1956. Volme 59 contained 54 original contributions averaging 5½ pages in length.

Respectfully submitted, ALICE V. RENK, *Editor.*

SOCIETY MEETINGS

Held in the U. S. National Museum

668th Meeting, January 2, 1958—

Although the officers for 1958 were unanimously elected at the December 5 meeting, it was later discovered that a quorum was not present. For this reason,

the members present at the January 2 meeting ratified the action taken at the previous meeting; the officers are now in orbit.

President Sailer announced the death of Mr. Joseph Davis (Division of Forest Insects Investigation) and appointed Mr. J. S. Yuill and Mr. R. A. St. George as a committee to write the obituary. Mr. Yuill is chairman. Dr. Sailer also commented on the death of Prof. Teiso Esaki on December 14. Dr. Esaki had written Dr. Campbell on December 11 thanking him for the cordial message sent the Entomological Society of Japan and noted the hospitality which has been accorded the many Japanese entomologists who have visited the United States.

As a result of Dr. Kostarab's plea for contributions to buy minuten pins for the Hungarian National Museum, a total of $21.40 was collected from members of our Society.

Dr. W. E. Bickley reported that 23 new members joined the Society in 1957. A new member, Talmadge J. Neal, Dept. of Ent. at Walter Reed Army Inst. of Research, was elected unanimously.

Dr. Willis Wirth showed 3 slides of *Phasmidohelea crudelis* sucking blood from the knee joint of a phasmid. Dr. R. I. Sailer exhibited specimens of *Edessa florida* Barber. These were collected early in October by T. H. Bissell in Virginia and represent one of the most northerly records for any members of this large neotropical genus. The specimens had lived for 3 months on a diet of green beans. With the stink bugs was a specimen of *Leptoglossus oppositus* (Say) of local origin. This was thriving on the same diet. Dr. John Fales gave a few highlights of a recent Lepidopterist's Society meeting.

The featured paper of the evening, "The Incrimination of Arthropods as Vectors of Pathogenic Agents," was delivered by Major Herbert C. Barnett, Chief, Department of Entomology, Walter Reed Army Institute of Research. He gave an informative talk on Japanese B encephalitis. An active discussion followed.

The following visitors were introduced: W. E. McCauley, Carlyle Nibley, Jr., Tom Haines, Philip Garman, Donald P. Donwell and W. D. Kundin.

669th Meeting, February 6, 1958—

The annual reports of the treasurer, corresponding secretary, custodian and editor were read and approved. Dr. Sailer appointed the chairmen and members of the following committees for 1958: **Advertising**—Price P. Piquett, chairman, and B. App; **Auditing**—L. B. Reed, chairman, and Paul X. Peltier; **Membership**—A. B. Gurney, chairman, H. S. Fuller and G. E. Bohart; **Notes and Exhibition of Specimens**—John Fales; **Program**—J. Rosen (previously elected as chairman), Frank L. Campbell and Howard Baker; **Reserve Stock**—H. J. Conkle and L. G. Davis; **Joint Board on Science Education**—H. B. Owens; **Constitution and By-laws**—H. H. Shepard, Chairman, W. H. Anderson and E. F. Knipling; **Nominating Committee**—Alan Stone, chairman, W. E. Bickley and Fred Poos; **Memoirs**—G. H. Wharton, chairman, R. H. Foote (ex officio), C. F. W Muesebeck, J. Rosen and Phyllis Johnson.

Pictures of some of the plant and animal life on Barro Colorado Island were shown by Dr. Phyllis Johnson, who also gave interesting notes on the laboratory located on the island.

A. B. Gurney noted that during the past few years the egg laying habits of several grasshoppers which do not follow the usual habit of depositing egg pods in soil have been reported. He mentioned in particular the recent discovery, reported by Dr. C. S. Carbonell of Uruguay in 1957, that the semi-aquatic grasshopper, *Marellia remipes*, attaches its eggs to the lower surfaces of the floating leaves of certain aquatic plants. Several other grasshoppers with specialized egg laying habits were mentioned, and the considerable progress made by Russian entomologists in acquiring a broad knowledge of the egg pods of their native grasshoppers was noted.

Dr. F. L. Campbell called attention to Dr. Alvah Peterson's "five-year plan" for the study of the eggs of all orders of insects. Dr. Campbell also reported the action taken by AIBS and ESA on the resent discriminatory action of the Civil Service Commission in refusing to recognize biological scientists as scientists at all.

"Entsocology" was the subject of the address of the retiring President, Dr. Frank L. Campbell, who revealed the secret of his title to be "the study of the Entomological Society of Washington." In a clever fashion he gave the Society a good look at itself by bringing to light some of the archaic rules under whch we now operate and by offering a number of concrete suggestions for the improvement of the Society.

Our new honorary member, Mr. A. B. Gahan, thanked the Society in person for conferring upon him this type of membership and recalled some of the earlier meetings of the Society.

Two visitors were introduced: Mrs. Adam Bøving and Mr. William S. Murray.

700th Meeting, March 6, 1958—

The report of the Auditing Committee was presented by Mr. Paul X. Peltier and approved by the Society. Two new members—Dr. Bernard Brookman, Div. of Research Grants, NIH and Lt. Alexander A. Hubert of Walter Reed Army Inst. of Research—were elected to the Society.

Rose Ella Warner commented briefly on the death of L. L. Buchanan who for many years was a well-known taxonomist of Curculionidae and other coleopterous families. President Sailer appointed a committee consisting of Bernard Burks, chairman, Miss Warner and W. S. Fisher to write the obituary.

There was an unusual number of interesting notes and exhibitions of specimens. Dr. F. L. Campbell described the origin and preparation of "Laboratory and Field Studies in Biology: A Sourcebook for Secondary Schools." He pointed out that only 6 of 153 exercises made use of insects, which in view of the availability of insects for demonstrating biological principles seemed too few. There was no entomologist in the group of 30 biology teachers who compiled these exercises. Moral: entomologists should take a greater interest in bringing insects to the attention of high school students.

Curtis Sabrosky exhibited a 15-page pamphlet published in 1855 by J. Franklin Reigert, "A Treatise on the Cause of Cholera, an Interesting Discovery." Reigert attempted to link cholera to small yellow flies which he found in the area just prior to cases of cholera. (See p. 134 for a note by Mr. Sabrosky on the flies.—Ed.)

J. H. Fales gave a summary of his paper, "Spring Occurrence of the Monarch Butterfly in Maryland." Information obtained over a period of 20 years on the return flight to the North was given. Faded and worn spring specimens of this migrant insect were exhibited.

A rather comprehensive account of character displacement in speciation in the tenebrionid genus *Helops* was presented by T. J. Spilman.

George Vogt discussed in detail the comparison of the biology of 3 species of leaf-mining buprestid beetles of the genus *Pachyschelus*. One of the species is from Southeast Asia and the other 2 are from the vicinity of Washington, D. C.

A series of pictures relating to the work on bee culture was displayed and explained by George E. Bohart.

The speaker of the evening, Dr. Willis W. Wirth, showed us Kodachrome slides of a number of entomologists in Australia as well as interesting scenes taken in connection with his study of sand fly research in that country. The title of his talk was "Fulbrighters and Cobbers Down Under."

In addiiton to the new members who were introduced, the following visitors were presented: Mrs. A. A. Hubert, Paul H. Freytag, Arthur H. Mason, Paul L. Rice and Dr. Clare R. Baltazar.—HELEN SOLLERS, *Recording Secretary.*

The date of publication of Vol. 60, No. 2, was April 18, 1958.

A Cyanamid Report

MALATHION
FOR DIRECT APPLICATION ON ANIMALS

With newly-granted residue tolerances, malathion can be applied directly to beef cattle, poultry, and swine. This is the result of three years of extensive research in 11 states. The work proved conclusively the safety and usefulness of malathion as a spray for controlling cattle and poultry lice, poultry mites (northern fowl and chicken red mite), and cattle and poultry ticks. In addition, malathion dust may be applied to nests, litter, and floor space. Roost paints using malathion emulsifiable liquid may also be used in poultry houses. In addition to spraying beef cattle with malathion for lice control, rubbing devices incorporating the product have been most effective in suppressing lice and horn flies.

Do not apply malathion to lactating dairy cows, since it has not yet been accepted for this use, nor should it be used on calves under one month of age.

PROTECTANT FOR STORED GRAIN

With newly-granted residue tolerances for malathion on wheat, barley, oats, rice, rye, corn, grain sorghum, and peanuts (post-harvest), grain handlers storing grain have a method of protecting grain from loss to insects. Malathion, either in dust or spray form, *applied to the grain as it is being loaded into bins,* affords protection against confused flour beetle, rice weevil, granary weevil, saw-toothed grain beetle, flat grain beetle, red flour beetle, rusty grain beetle, lesser grain beetle, and Indian meal moth. It is also suggested as a residual wall, floor, and machinery spray in grain elevators, in treating truck beds, box cars, and ships' holds before loading grain. Where Indian meal moth infestations develop, *surface* applications of malathion dusts or sprays at prescribed intervals afford protection.

NEW USES FOR MALATHION ON CROPS

Tolerances have been established on 37 additional crops, including:

Vegetables	Fruits
Asparagus	Bramble family
Carrots and other root crop	Nectarines
Garlic—Leeks—Shallots	Quinces
Several leaf vegetables	Currants
Pumpkins	Gooseberries

Also, small grains, cotton, mushrooms, peppermint, spearmint, corn and rice. With these additions, malathion is now recommended on 93 crops.

Developers and producers of malathion and parathion

CYANAMID

American Cyanamid Company, Insecticide Department,
30 Rockefeller Plaza, New York 20, N. Y.

Vol. 60 AUGUST, 1958 No. 4

PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY
of
WASHINGTON

U. S. NATIONAL MUSEUM
WASHINGTON 25, D. C.

PUBLISHED BIMONTHLY

CONTENTS

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 over 18 years of age who have an interest in the science of entomology. Annual dues for members are $4.00; initiation fee is $1.00 (U. S. currency).

PROCEEDINGS

Published bimonthly beginning with February by the Society at Washington, D. C. Members in good standing are entitled to the *Proceedings* free of charge. Non-member subscriptions are $5.00 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 will be published in the order received and will be given precedence over those by non-members. Immediate publication may be obtained at a cost to the author of about $12.00 per printed page, plus cost of *all* engraving. Titles of papers should be concise but comprehensive and should indicate the systematic position of the subject insect. By-lines 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 4-5/16 x 6" (26 x 36 picas); this usually allows explanatory matter to appear on the same page. Cost of illustrations in excess of that for one full-page line cut will be borne by the author.

Reprints of published papers may be obtained at the following costs plus postage and insurance, provided that a statement of the number desired accompanies the returned proofs:

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Entered as second-class matter at the Post Office at Washington, D. C.

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 60 AUGUST, 1958 No. 4

NEW SPECIES OF CHIGGERS FROM KOREA

(ACARINA, TROMBICULIDAE)[1]

ROBERT TRAUB[2], MARY LOU MORROW[3], and LOUIS J. LIPOVSKY[4]

During studies on the possible etiology and transmission of hemorrhagic fever in Korea, an intensive collection of chiggers was made from small mammals, primarily rodents, by the Field Unit of the Commission on Hemorrhagic Fever of the Armed Forces Epidemiological Board in 1953 and 1954, and by its predecessor in 1952, a special Research Team of the Armed Forces Epidemiological Board. As a result of these investigations, eight new species of trombiculid mites were discovered and the larvae of these are described and illustrated in this paper. The possible role of these chiggers in the epidemiology of hemorrhagic fever, and observations on the host relationships and seasonal variations in incidence, are presented elsewhere (Traub *et al.*, 1954).

Trombicula (Leptotrombidium) gemiticula, n. sp.

(Figs. 1-7)

Diagnosis.—Nearest to *T.* (*L.*) *palpalis* Nagayo *et al.*, 1919, and *T.* (*L.*) *orientalis* Schluger, 1948, in general shape of scutum and in having both the dorsal and ventral tibial setae branched. Separable from *T.* (*L.*) *palpalis* in that it has a larger scutum, *i.e.*, *PW* [5] about 80 instead of 65 microns, and longer scutal setae (*i.e. PL* 52 instead of 47 microns). Differs from *T.* (*L.*) *orientalis* in having more dorsal setae, about 45 instead of 28-32, and these setae, as well as the scutal setae, are shorter and less bushy.

Description.—**Body:** Ovate to subovate, 357 x 224 microns in fairly engorged holotype. Eyes paired, subequal, and at level of insertion of *PLs*. **Gnathosoma:** Chelicerae about 4 times as long as broad at base, with apical tricuspid cap.

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[1]This project was supported in part by funds from the Research and Development Division, Office of the Surgeon General, Department of the Army, Washington, D. C.

[2]U. S. Army Medical Research Unit (Malaya), Kuala Lumpur, Malaya.

[3]Department of Entomology, Walter Reed Army Institute of Research.

[4]Field Unit of the Commission on Hemorrhagic Fever, Armed Forces Epidemiological Board, Washington, D. C.

[5]A key to the abbreviations used in this paper appears in "A Manual of the Chiggers" by G. W. Wharton (1952, Memoir No. 4, Entomological Society of Washington).

Cheliceral bases, palpal coxa and femora punctate. Setae on palpal femur and genu nude; the dorsal and ventral setae on palpal tibia branched; lateral seta nude. Palpal formula therefore *N/N/BNB*. Galeal and maxillary (palpal coxa) setae branched, pectinate. Palpal tarsus with 6, at times 7, branched setae and a basal striated rod. Palpal claw 3-pronged. **Scutum:** About 1¾ to twice as broad as long. Anterior margin relatively straight. Lateral margins concave between insertions of *ALs* and *PLs*. Some specimens, where *A-P* is larger, with lateral margins almost straight. Posterior margin slightly sinuate, appearing almost evenly and shallowly convex. With *PLs* set well anterior on rounded shoulders, at level with sensillae bases. Scutum lightly micropunctate except around insertion of *AM*. Scutal setae fairly stout with conspicuous barbs. Sensillae flagellate, with very minute barbs for proximal ⅓ to ½, and then distally conspicuously branched. A darkened ridge contiguous and anterior to each sensillae base.

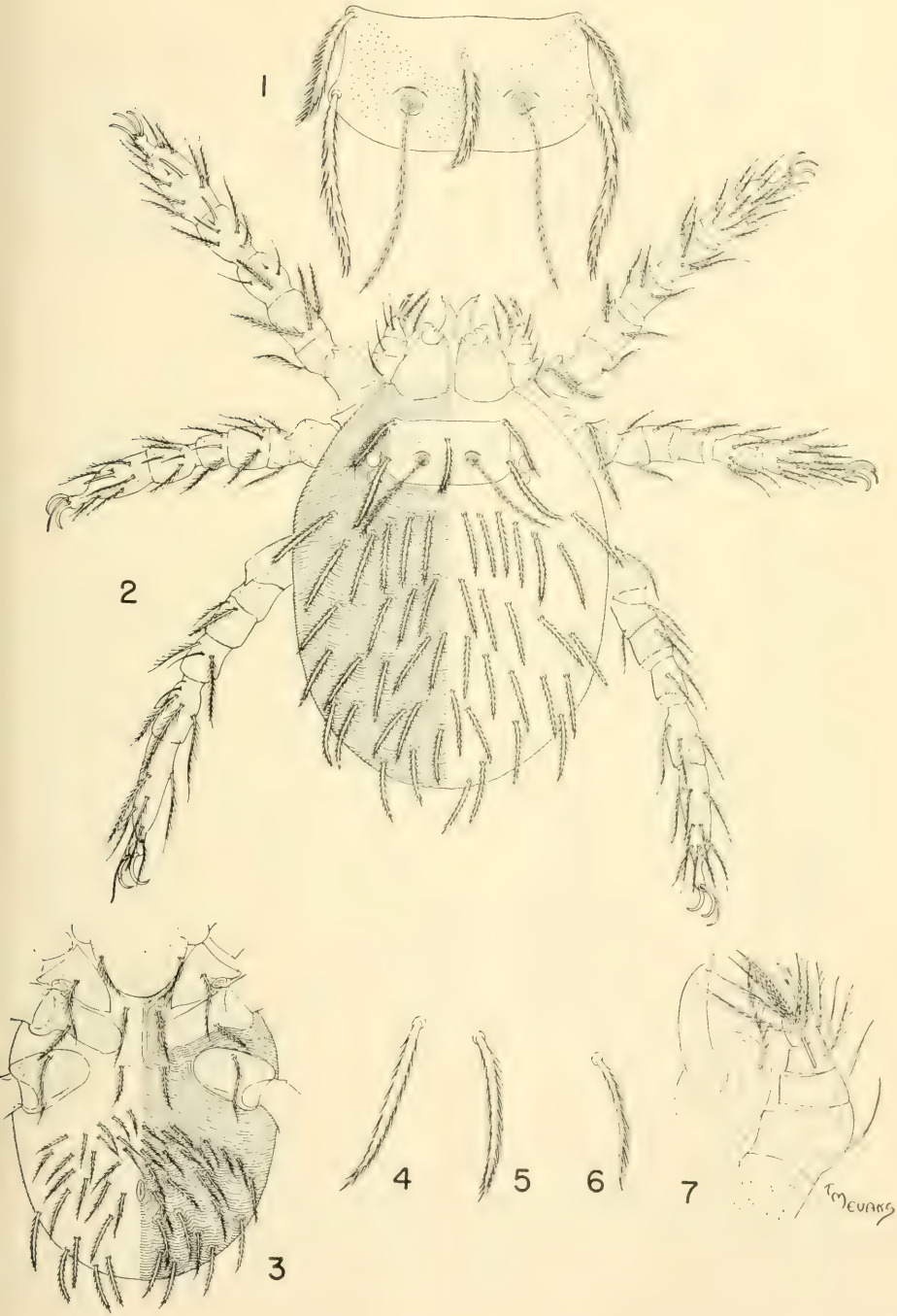
STANDARD MEASUREMENTS IN MICRONS

	AW	PW	SB	ASB	PSB	A-P	AM	AL	PL	DS	PW/Cox. II	PW/SD	PW/ASB	PW/Tars. III
Holotype (RT B-25912-1)	69	79	34	25	16	20	44	39	53	39-54	79/58 =1.36	79/41 =1.93	3.16	1.18
Paratypes (20) Mean	70	80	33	28	17	23	47	39	52	38-54	1.32	1.85	2.91	1.18
Range (+or—)	3	3	3	3	2	4	5	3	3		0.13	0.22	0.28	0.07

Body Setae: Dorsal setae resemble those of scutum; 43 to 49 in number; somewhat irregular in arrangement but rows frequently 2-12-8-10-8-4-2. Two pairs of pectinate sternal setae; one pair between coxae I and second pair between coxae III. Ventral setae about 46 in number, of which about 12 are postanals. True ventrals 30 microns long; subpectinate. **Legs:** Coxae and legs punctate dorsally and ventrally. All coxae unisetose; on coxa I, seta median; on coxa II, ventromarginal; on coxa III anteromarginal or slightly submarginal. Sensory setae as follows: Leg I with 2 genualae, a microgenuala, 2 stout tibiala, a microtibiala, tarsal spur, microspur, a subterminala, a parasubterminala, and a pretarsala. Leg II with a genuala, 2 tibiala, a tarsal spur and microspur, a pretarsala. Leg III with a genuala and a tibiala.

Type Material.—Holotype (RT B-25912) *ex Apodemus peninsulae*, Korea, Munsan-ni, 6 November 1953, coll. by Field Unit of the Commission on Hemorrhagic Fever. The following paratypes and other collections all from same source in Korea: *ibid*, but *ex Apodemus agrarius;* 48 *ex Apodemus agrarius*, Yangwon -ni, 30 miles N. of Seoul (Commonwealth Division Area)—of these, 29 on 17 October 1953, 17 on 7 November 1953, 1 on 17 February 1954, and 1 on 29 April 1953.

T.(L.) gemiticula, n. sp. Fig. 1, scutum; fig. 2, dorsal view of chigger (with ventral aspect of legs); fig. 3, ventral view of chigger (with ventral aspect of legs); fig. 4, humeral seta; fig. 5, dorsal seta; fig. 6, ventral seta; fig. 7, ventral view of gnathosoma.


1
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T M EVANS

Holotype (U.S.N.M. No. 2230), and 7 paratypes in collections of U. S. National Museum, remaining paratypes distributed amongst: British Museum (Natural History), the South Australian Museum at Adelaide, the Rocky Mountain Laboratory of the U. S. Public Health Service, the Chicago Natural History Museum, the Colonial Office Research Unit at Kuala Lumpur, the Department of Entomology at the University of Kansas, the Department of Zoology at the University of Maryland, the Muséum Nationale d'Histoire Naturelle at Paris, the Department of Parasitology, Institute for Infectious Diseases of the University of Tokyo, and the collections of Dr. E. W. Jameson, Dr. Charles Radford, and the authors.

Trombicula (Leptotrombidium) zeta, n. sp.
(Figs. 8-16)

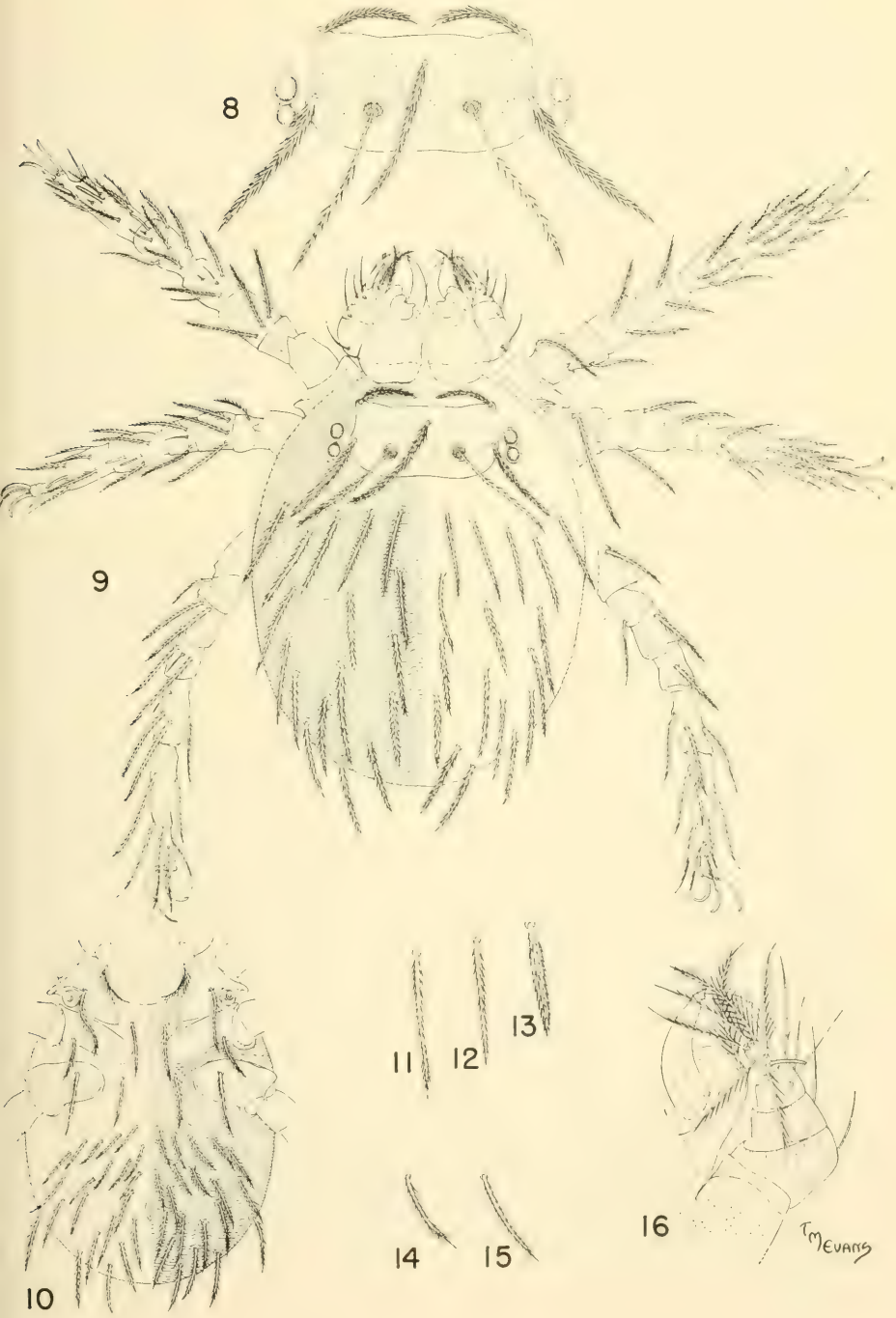
Diagnosis.—Agrees with *T.* (*L.*) *subintermedia* Jameson and Toshioka, 1954, regarding number of dorsal setae (32-36), palpal setal formula (*N/N/bNN*), and submedian insertion of seta on coxa III. Separable in that the scutum is consistently broader—*PW* about 91 microns instead of 80, and 1.75 times as broad as long instead of about 1.6 times; with its lateral margins only slightly concave so that scutum appears almost rectangular instead of sides appearing emarginate; *PL* setae longer, about 72 microns in length instead of 63.

Description.—**Body:** Subovate, 334 × 232 microns in slightly engorged holotype. Eyes paired, subequal in size or anterior one a little larger; at level of *PLs*. **Gnathosoma:** Chelicerae about 4 times as long as broad at base, with apical tricuspid cap. Palpal formula *N/N/bNN*. Galeal and palpal coxal (maxillary) setae heavily plumose, barbs quite long. Palpal tarsus with 6 branched setae and a striated rod. Palpal claw 3-pronged. **Scutum:** One and three-fifths to 1¾ times as broad as long. Anterior margins slightly sinuate, convex in middle above insertion of *AM*. Lateral margins somewhat concave between *ALs* and *PLs*. Posterior margin straight or slightly concave near middle. *AL* setae at antero-lateral angles of scutum. *PLs* set well anterior to caudal margin of scutum, but distinctly posterior to imaginary midline; inserted slightly anterior to level of sensillae bases. Scutum lightly micropunctate except around insertions of *AM* and posterior to sensillae bases. Scutal setae fairly stout; plumose. Both *AM* and *PLs* long, about 70 microns. Sensillae flagellate proximally, this portion appearing smooth but actually, when seen under oil, with minute barbs; branched for distal two-thirds.

STANDARD MEASUREMENTS IN MICRONS

	AW	PW	SB	ASB	PSB	A-P	AM	AL	PL	DS	PW/Cox. II	PW/SD	PW/ASB	PW/Tars. III
Holotype (B-25897-1)	81	88	38	35	21	26	75	46	77	67-74	88/65 = 1.35	88/56 = 1.57	2.51	1.05
Paratypes (20) Mean	85	91	41	35	21	27	71	44	72	64-78	1.31	1.65	2.67	1.19
Range (+or—)	5	6	4	4	2	4	5	4	6		0.05	0.13	0.31	0.14

T.(*L.*) *zeta*, n. sp. Fig. 8, scutum; fig. 9, dorsal view of chigger (with ventral aspect of legs); fig. 10, ventral view of chigger; fig. 11, humeral seta; fig. 12, dorsal seta; fig. 13, dorsal seta; fig. 14, preanal seta; fig. 15, postanal seta; fig. 16, gnathosoma.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Body Setae: Dorsal setae resembling scutal setae; as long as *AM* and *PLs;* 32-36 in number generally arranged 2-8-6-6-6-4-2. Two pairs of sternals followed by 40-42 ventral setae, of which 12 are postanals. True ventrals 35-37 microns long; pectinate or somewhat shaggy. **Legs:** All coxae unisetose; seta on coxa III submarginal, almost median. Sensory setae as in *T.(L.) gemiticula,* n. sp.

Type Material.—Holotype and paratypes (B-25897) *ex Apodemus agrarius,* Korea, Munsan-ni, 6 November 1953, coll. Field Unit of the Commission on Hemorrhagic Fever. All paratypes from Korea and with same collector, as follows: 7 *ibid;* 6 *ex Apodemus agrarius,* Kumhwa, 2 December 1953; 18 *ex Apodemus agrarius,* Taehoesan-ni, with collecting data as follows—three 18 December 1953, three 19 December 1953, six 20 February 1954, one 19 February 1954, four 6 April 1954, and one 7 April 1954; 23 *ex Apodemus agrarius,* Yangwon-ni (Commonwealth Division Area) 30 miles N. Seoul, 8 of these 29 December 1953, eight 3 March 1953, and seven 21 March 1953.

Holotype (U.S.N.M. No. 2232), deposited in collections of U. S. National Museum, and paratypes distributed as for *T. (L.) gemiticula,* n. sp.

Comment.—This species of chigger was found primarily in the winter and spring, particularly on *Clethrionomys* on Hill 1468, near Kapyong and Kumhwa. When *T. zeta* was found on *Apodemus agrarius,* the largest collections were from Commonwealth Division Area or Yangwon-ni, Saemal, Yongp'yong 16 miles South of Ch'orwon, Kumhwa, Munsan-ni, Taehoesan-ni 12 miles South of Ch'orwon, and Nop'a-dong, 7 miles Northwest of Munsan-ni.

Discussion.—Since *T.(L.) zeta* closely resembles *T.(L.) subintermedia,* and the two are separated by the size of the scutum and length of *PLs,* it is advisable to consider the possibility that both names really merely represent extremes in the sizes and representatives of the same species. If this were true, then the mean of the measurements of the *PWs* or *PLs* in a long series would in each instance fall near the midpoint of the two extremes, producing a typical bell-shaped curve when plotted as a graph. In actuality, however, the measurements of 200 specimens resulted in a bimodal curve—a bell-shaped curve for the *PW* or *PL of T.(L.) zeta* and another for the *PW* or *PL* of *T.(L.) intermedia,* with the lower measurements of the former species overlapping the upper extremes of the latter. Further, the presence of a broad scutum was invariably correlated with long *PL* setae. Biologic data support the contention that these are two distinct species. For example, *T. (L.) zeta* comprised almost half of the chiggers collected during the winter months by the research teams studying hemorrhagic fever. One third of all the *T.(L.) zeta* were found in January and February (Traub, et al., *in prep.*). On the other hand, *T.(L.) subintermedia* was common during the spring—three-fourths of the specimens having been collected in April and

May, and less than 4 per cent having been taken in the winter (Traub, et al., *in prep.*). It is estimated that more than one-third of the *T.* (*L.*) *zeta* occurred on the striped field mouse, *Apodemus agrarius*, but that nearly 60 per cent parasitized the red-backed vole, *Clethrionomys*. In contrast, over 90 per cent of the *T.*(*L.*) *subintermedia* were taken on *Clethrionomys*. Geographical differences in distribution were also noted, and the new species was rarely collected south of the 38th parallel, such as at the National Forest near Seoul, where *T.*(*L.*) *subintermedia* was common.

Trombicula (Leptotrombidium) tecta, n. sp.

(Figs. 17-24)

Diagnosis.—Separable from all known Korean *Leptotrombidium* in having a 4-pronged palpal claw. Nearest to *Trombicula* (*Leptotrombidium*) *tosa* Sasa and Kawashima, 1951, (from Japan) in size and general shape of scutum. Separable by the length of the dorsal setae, which have a maximum size of 72 microns instead of 60 as in *T.*(*L.*) tosa, and with *A-P* 25, not 22.

Description.—**Body:** Subovate, 285 x 188 microns in partially engorged holotype. Eyes paired, about equal, at level of *PLs*, about 2 microns from scutum.

Gnathosoma: Chelicerae quite curved; about 5 times as long as broad at base, with an apical tricuspid cap. Palpal formula sequence *N/N/BNN*. Galeal and palpal coxal (maxillary) setae branched. Palpal tarsus with 7 branched setae and a basal striated rod. Palpal claw 4-pronged, the proximal prong smallest.

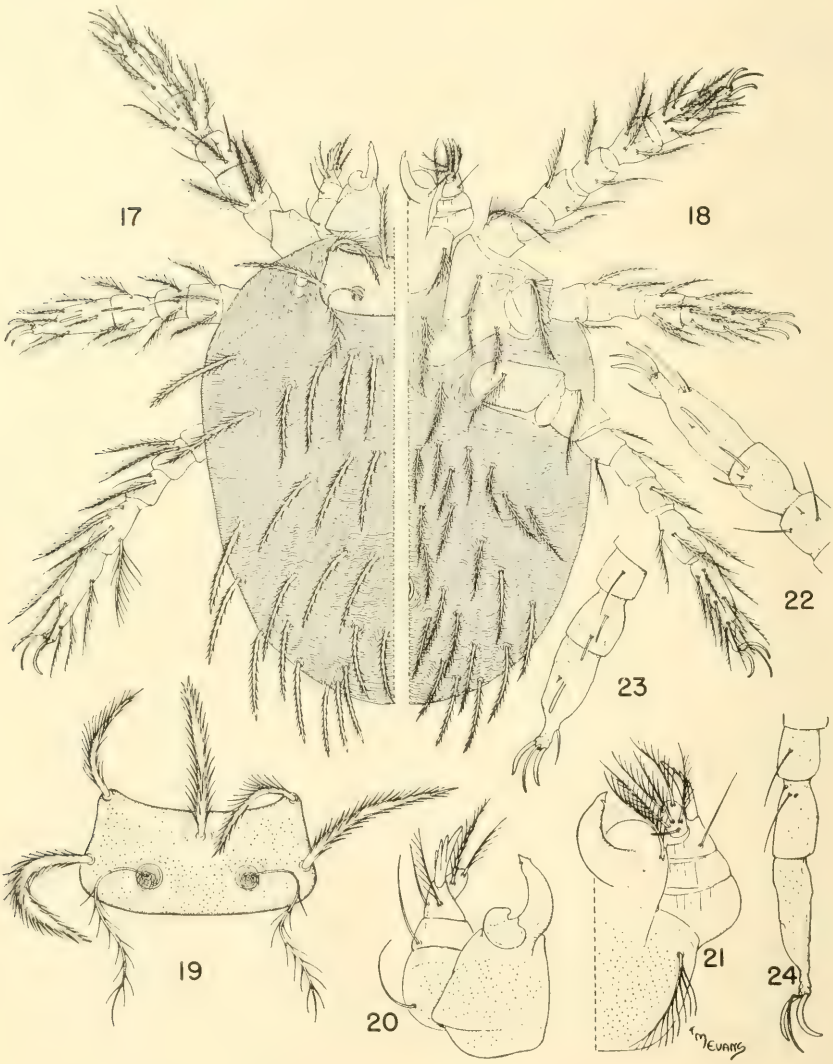
Scutum: Anterior margin straight or slightly sinuate, lateral margins fairly straight anterior to insertion of *PLs*. Posterior margin essentially straight. *ALs* inserted in "shoulders" at anterolateral angles. *PLs* distinctly removed forward so that they are a short distance (2-3 microns) anterior to level of sensillae bases; *PLs* not inserted in distinct shoulders. Scutum lightly punctate except around *AM* and posterior to sensillae bases. Scutal setae quite long, thick, with numerous stout barbs arising from all sides of the shaft. *PLs* about half again as long as *ALs*. Sensillae flagellate, proximal half of basal third with small inconspicuous barbs; distally with fine branches.

STANDARD MEASUREMENTS IN MICRONS

	AW	PW	SB	ASB	PSB	A-P	AM	AL	PL	DS	PW/Cox. II	PW/SD	PW/ASB	PW/Tars. III
Holotype (RT B-30998-7)	70	75	34	32	14	26	59	39	63	58	78/63 =1.24	1.63	2.34	1.12
Paratypes (11)										-70				
Mean	68	77	34	31	14	25	57	40	62	58 -72	1.23	1.69	2.46	1.14
Range	6	5	3	1	1	2	3	3	4		0.07	0.10	0.17	.08

Body Setae: Dorsal setae resembling *PLs* in size and structure: 40 to 46 in number and arranged typically 2-10-8(10)-8-6(8); remaining rows with variable numbers. Two pairs of sternal setae 40-45 microns long; with long, very slender

barbs. Ventral setae about 46 to 48 in number, of which about 16 are postanals. First row of ventral setae 35 to 40 microns but the setae get progressively longer toward the posterior end of the chigger. **Legs:** Coxae and legs punctate. The seta on 3rd coxa submarginal. Sensory setae as in all above-described *Leptotrombidium.*



T.(L.) tecta, n. sp. Fig. 17, dorsal view of larva; fig. 18, ventral view of larva; fig. 19, scutum; fig. 20, gnathosoma (dorsal); fig. 21, gnathosoma (ventral); fig. 22, leg I (distal segments); fig. 23, leg II (distal segments); fig. 24, leg III (distal segments).

Type Material.—Holotype and 27 paratypes (RT B-30998, L 541030-5 and 6) *ex* a pool of *Apodemus agrarius* and *Microtus fortis pelliceus*, Korea, Chip'o-ri, 30 October 1954, Field Unit of the Commission on Hemorrhagic Fever. Other paratypes as follows: 2 cultured in the laboratory from chiggers taken *ex Apodemus agrarius*, Chip'o-ri, 30 October 1954, coll. as above; 4 cultured in the laboratory from chiggers taken on *Microtus fortis pelliceus*, Chip'o-ri, date and collector *ibid;* 19 raised in the laboratory on white mice, 6 from mouse No. 23, 8 from mouse No. 35, 1 from mouse No. 37, 3 from mouse No. 39, and 1 from mouse No. 58.

Holotype (U.S.N.M. No. 2231) deposited in the U. S. National Museum and paratypes distributed as for *T.(L.) gemiticula*, n. sp.

Trombicula (Leptotrombidium) pumilis, n. sp.

(Figs. 25-32)

Diagnosis.—Superficially resembles *Trombicula* (*Leptotrombidium*) *subintermedia* Jameson & Toshioka, 1954, but differs as follows: Scutum smaller (PW 69 microns instead of 80); the posterolateral corners of the scutum somewhat obtuse, not fully and evenly rounded; posterior margin distinctly sinuate; with fewer dorsal setae (27-32 instead of about 36).

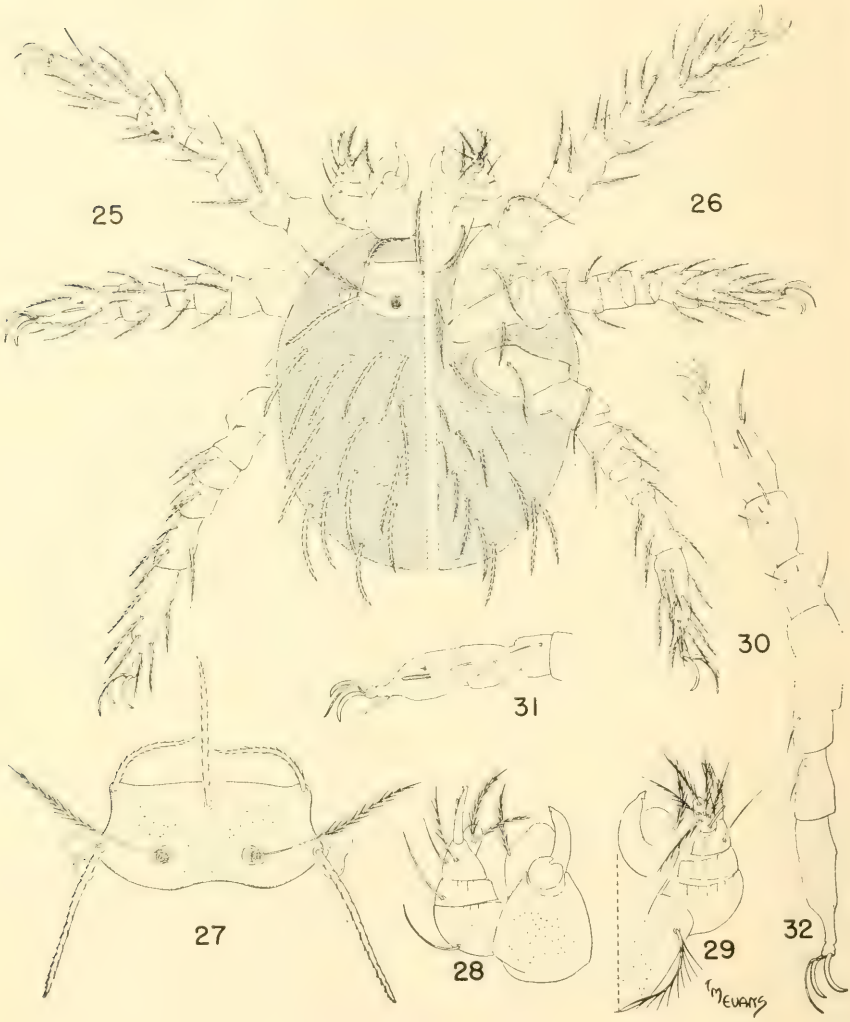
Description.—**Body:** Small, subovate, 228 x 158 microns in holotype. Eyes double, subequal in size, at level of *PLs* and only 1 micron distant from scutum. **Gnathosoma:** Chelicerae about 3 to 4 times as broad as long at base, with apical tricuspid cap. Palpal formula *N/N/BNN*. Galeal setae branched, pectinate. Palpal tarsus with 7 branched setae and a basal, striated rod. Palpal claw 3-pronged. **Scutum:** Nearly twice as broad as long. Anterior margin relatively straight. Lateral margins slightly concave. Posterior margin biconvex. *PLs* inserted just slightly anterior to posterior margin and on a level with sensillae bases. *AM* and *PL* setae quite stout barbs. Scutum micropunctate except around and anterior to *AM* and posterior of *PLs* and sensillae bases. Sensillae flagellate, nude at proximal fourth or third; remainder plumose.

STANDARD MEASUREMENTS IN MICRONS

	AW	PW	SB	ASB	PSB	A-P	AM	AL	PL	DS	PW/Cox. II	PW/SD	PW/ASB	PW/Tars. III
Holotype (B-28082)	60	68	29	23	12	20	48	31	54	44	68/53 = 1.28	1.94	2.96	1.19
										-47				
Paratypes (10) Mean	58	69	29	26	12	20	47	32	55	43	1.25	1.81	2.65	1.16
										-50				
Range (+or—)	2	4	4	3	0	1	3	3	3		0.11	0.16	0.31	0.05

Body Setae: Dorsal setae resembling scutal setae; thin, barbs mostly adpressed, short, 27 to 32 in number arranged typically 2-8(-7-10)-6-6-6(4)-2. Two pair of pectinate sternal setae; first pair longer. Ventral setae about 25 in number with about 6 of these postanals. Typical ventrals, as found in first 2 rows, 28 microns long. **Legs:** Coxae all unisetose. Seta on 3rd coxa submarginal in position. Sensory setae as in above described species.

Type Material.—Holotype and 59 paratypes (Rt B-28082-84) *ex* three chipmunks, *Eutamias sibiricus* (Laximann), Korea, Central National Forest 20 miles North of Seoul, 18 April 1954, coll. Field Unit of the Commission on Hemorrhagic Fever. Seventeen paratypes *ibid*,



T.(L.) pumulis n. sp. Fig. 25, dorsal view of larva; fig. 26, ventral view of larva; fig. 27, scutum; fig. 28, gnathosoma (dorsal); fig. 29, gnathosoma (ventral); fig. 30, Leg I (distal segments); fig. 31, Leg II (distal segments); fig. 32, leg III (distal segments).

but collection dates as follows—one 9 October 1954, five 29 May 1954, seven 27 March 1953, two 13 April 1953, one 5 September 1953; 5 *ex Apodemus peninsulae, ibid,* 31 July 1953; 1 ex *Micromys minutus,* 5 miles South of Munsan-ni, 5 May 1953; 31 *ex* a bat, (*Myotis* sp.?), Uijongbu Mountains, about 13 miles North of Seoul, 31 July 1952; 1 *ex* a bird, presumably *Parus major wladiwostokensis,* 16 April 1954; 1 *ex Apodemus peninsulae,* Sangbonch'on-ni, 17 miles Southeast of Seoul, 14 April 1954.

Holotype (U.S.N.M. No. 2233) deposited in U. S. National Museum and paratypes distributed as for *T.* (*L.*) *gemiticula,* n.sp.

Trombicula (Leptotrombidium) halidasys, n. sp.

(Figs. 33-40)

Diagnosis.—Resembles *T.*(*L.*) *miyazakii* Sasa *et al.,* 1952, and *T.*(*L.*) *owuensis* Sasa *et al.,* 1952, regarding size of scutum, although differing in general configuration, and in having 7 branched setae on palpal tarsus. Differs further from these two described species in that there are far more setae, 85 to 100, instead of about 45 as in *T.*(*L.*) *miyazakii* or 56 as in *T.*(*L.*) *owuensis.* The dorsal setae are shorter with longer and heavier barbs, (in this respect resembling the dorsal setae of *T.*(*L.*) *pallida* Nagayo *et al.,* 1919).

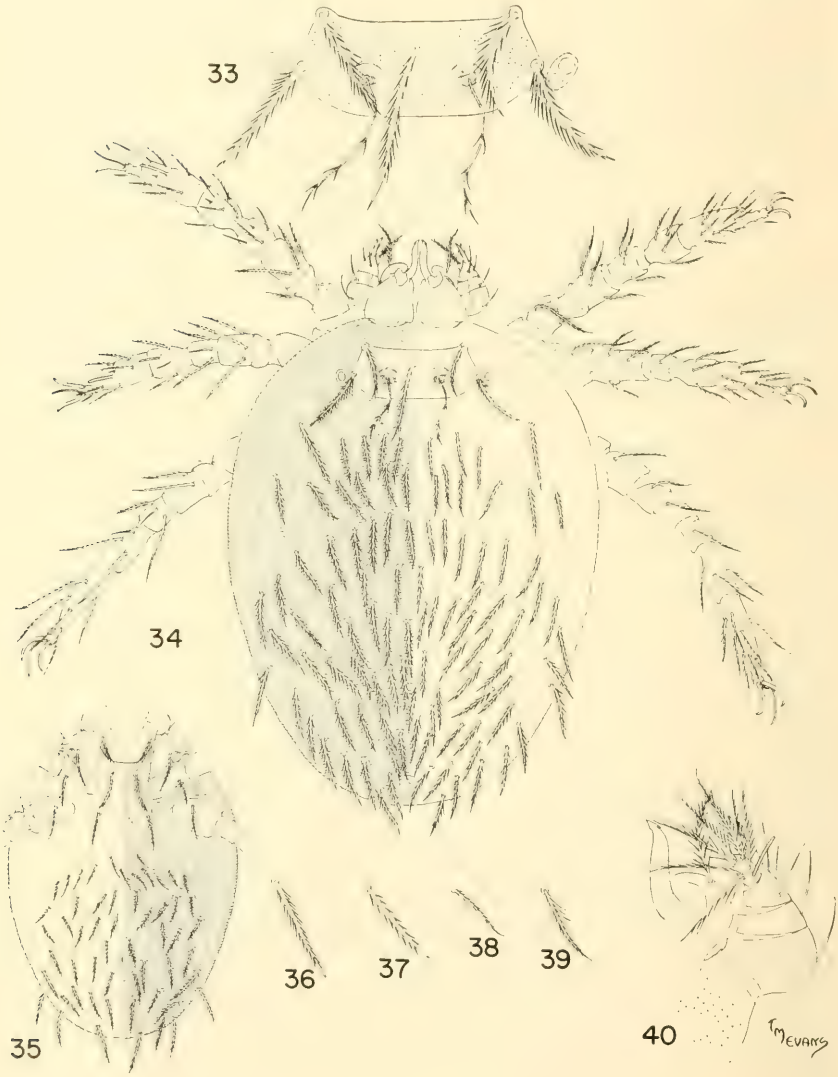
Description.—**Body:** Ovate, 425 x 306 microns in engorged holotype. Eyes double; anterior one twice as large as posterior eye; at level of *PLs.* **Gnathosoma:** Chelicerae 3½ to 4 times as long as broad near base, with apical tricuspid cap. Palpal setal formula *N/N/BNN.* Galeal seta branched with long pectinate barbs. Palpal tarsus with 7 branched setae and a basal striated rod. Palpal claw 3-pronged. **Scutum:** Usually twice as broad as long; anterior margin straight until near lateral margins where it slopes anteriorly at insertions of *ALs,* forming "shoulders." Lateral margins straight but declivous, sloping lateral toward *PLs.* Posterior margin straight or slightly sinuate except where curving anteriorly towards *PLs,* which are set in shoulders slightly anterior to level of sensillae bases. Lightly punctate except around insertion of *AM.* Scutal setae quite stout; *ALs* and *PLs* heavily branched. *AM* seta longest of scutal setae, pinnae resembling those on *ALs* and *PLs* but usually more appressed. Sensillae thin and fragile, present on only 1 or 2 of the 50 specimens known. Proximal third with small barbs; distal ⅔ very sparsely branched.

STANDARD MEASUREMENTS IN MICRONS

	AW	PW	SB	ASB	PSB	A-P	AM	AL	PL	DS	PW/Cox. II	PW/SD	PW/ASB	PW/Tars. III
Holotype (B-25928-5)	88	106	45	33	17	24	76	48	59	48	106	2.12	3.42	1.52
											1.48	2.09	3.22	1.50
										-52	——=1.45			
Paratypes											74			
Mean	86	108	45	34	18	26	74	51	61	39 -60				
Range	6	6	5	2	2	3	7	7	6		0.11	0.22	0.42	0.08

Body Setae: Dorsal setae resembling scutal setae in structure, with same stout pinnae but shorter in length, 85 to 105 in number; arranged very irregularly, the rows generally commencing 2-8-12-10. . . . Two pairs of sternal setae. Ven-

tral setae about 60 in number, of which about 16 are postanals. True ventrals 28-30 microns long; subpectinate. **Legs:** All coxae are unisetose. Seta on coxa III is submarginal. Sensory setae as in *T.(L.) gemiticula*, n. sp.



T.(L.) halidasys, n. sp. Fig. 33, scutum; fig. 34, dorsal view of larva (with ventral aspect of legs); fig. 35, ventral view of larva; fig. 36, humeral seta; fig. 37, dorsal seta; fig. 38, preanal seta; fig. 39, postanal seta; fig. 40, gnathosoma (dorsal).

Type Material.—Holotype and 42 paratypes (RT B-25928) *ex Apodemus agrarius*, Korea, Commonwealth Division Area or Yang-won-ni, 30 miles North of Seoul, 7 November 1953, coll. Field Unit of the Commission on Hemorrhagic Fever. Three paratypes from 2 shrews, *Crocidura suaveoleus*, *ibid*, 30 and 31 March 1954; 1 *ex* same host, Ori-dong, 35 miles North of Seoul, 16 December 1952; 4 *ex Crocidura suaveoleus*, 7 miles Northwest of Munsan-ni, Nop'a-dong, 24 February 1954; 1 *ex* soil sample, Tokkum-ni, 4¼ miles North of Yonch'on, 25 March 1954.

Holotype (U.S.N.M. No. 2234) deposited in U. S. National Museum, and paratypes distributed as for *T.(L.) gemiticula* n.sp.

Euschöngastia (Laurentella) arcaricola, n. sp.

(Figs. 41-48)

Diagnosis.—Nearest to *Euschöngastia kitajimai* Fukuzumi and Obata, 1953, which was described from *Rattus rattus* in Japan but is also found on chipmunks in Central Korea. Differs from *kitajimai* in having fewer dorsal setae (± 30 instead of ±40). The scutum of the new species is narrower although the length is the same, thus making the *PW/SD* ratio ± 1.44 instead of ± 1.26. With the posterior margin of the scutum sinuate near *PLs* instead of being evenly convex as in *E. kitajimai*, and not extending as far caudad.

Description.—**Body:** Subovate in engorged holotype, 339 x 232 microns. Eyes paired, anterior eye larger than posterior one. Anterior eye at level of sensillae bases. **Gnathosoma:** Chelicerae about 5 times as long as broad near base; with apical triscuspid cap bearing a distinct lateral proximal tooth. Cheliceral bases, palpal coxa and femora punctate. Palpal formula *B/B/bbb;* however branches on genual seta, dorsal and ventral tibial setae usually appressed or broken off. Galeal seta nude. Palpal coxal (maxillary) seta with 4 to 5 branches. Palpal tarsus with 6 branched setae and a basal striated rod. Palpal claw 3-pronged. **Scutum:** Evenly micropunctate except just posterior to *AM*. Anterior margin nearly straight between shoulders. *AM* marginal in insertion. *ALs* set back about 12 microns from anterior margins of shoulders. Lateral margins slightly to distinctly concave between *ALs* and *PLs*. Posterior margin sinuate, in many cases actually biconvex. *PLs* inserted at posterior corners of scutum. Sensillae bases slightly closer to *ALs* than to *PLs*. Distinct ridges over sensillae bases. Sensillae clavate, about 32 microns long (including petiole) x 10 microns wide. Scutal setae slender with short appressed barbs.

STANDARD MEASUREMENTS IN MICRONS

	AW	PW	SB	ASB	PSB	A-P	AM	AL	PL	DS	PW/Cox. II	PW/SD	PW/ASB	PW/Tars. III
Holotype (B12069-4)	48	61	24	22	21	24	28	19	31	29-31	61/46 = 1.32	1.42	2.80	1.39
Paratypes (11) Mean	48	61	25	23	19	23	28	20	31	27-31	1.38	1.44	2.71	1.39
Range (+or—)	3	8	2	2	3	2	3	3	5		0.09	0.16	0.29	0.12

Body Setae: Dorsal setae resembling scutal setae; 29 to 31 in number, usually arranged 2-8-6-6-6-. Two pairs of sternal setae; 1st pair inserted at level of apices of coxae I; 2nd pair inserted between coxae III; short, thin, with appressed barbs. Ventral setae 30-34 in number, of which about 8-10 are postanals. True ventrals 19 microns long, but posterior ones slightly longer; caudomarginal ones same length as dorsal setae. **Legs:** Coxae and legs with small punctae. All coxae unisetose. Seta on coxa I medial. Seta on coxae II near middle of posterior sclerotized margin. Seta on coxa III median. Sensory setae of legs as follows: Leg I with 3 genualae, a microgenuala, 2 stout tibialae, a microtibiala, tarsal spur, microspur, a subterminala, parasubterminala, and pretarsala. Leg II with a genuala, 2 tibialae, tarsal spur, microspur and pretarsala. Leg III with a genuala, a tibiala, and a mastitarsala.

Type Material.—Holotype and 13 paratypes (Rt B-12069) *ex* chipmunk, *Eutamias sibiricus* (Laxmann), Korea, Central National Forest, 20 miles N. of Seoul, 26 August 1952, coll. Field Unit of the Commission on Hemorrhagic Fever; 11 paratypes, (B-12068), *ibid;* 17 paratypes *ibid,* but 4 September 1952.

Holotype (U.S.N.M. No. 2235) deposited in U. S. National Museum, and paratypes distributed as for *T.(L.) gemiticula,* n.sp.

Comment.—This species, as with *E. kitajimai,* is a member of the *indica*-group which has now been revised as a subgenus, *Laurentella,* by Audy (1956). It is therefore in order to refer to this species as *Euschöngastia* (*Laurentella*) *arcaricola.*

Gahrliepia (Walchia) comataxilla, n. sp.

(Figs. 49-56)

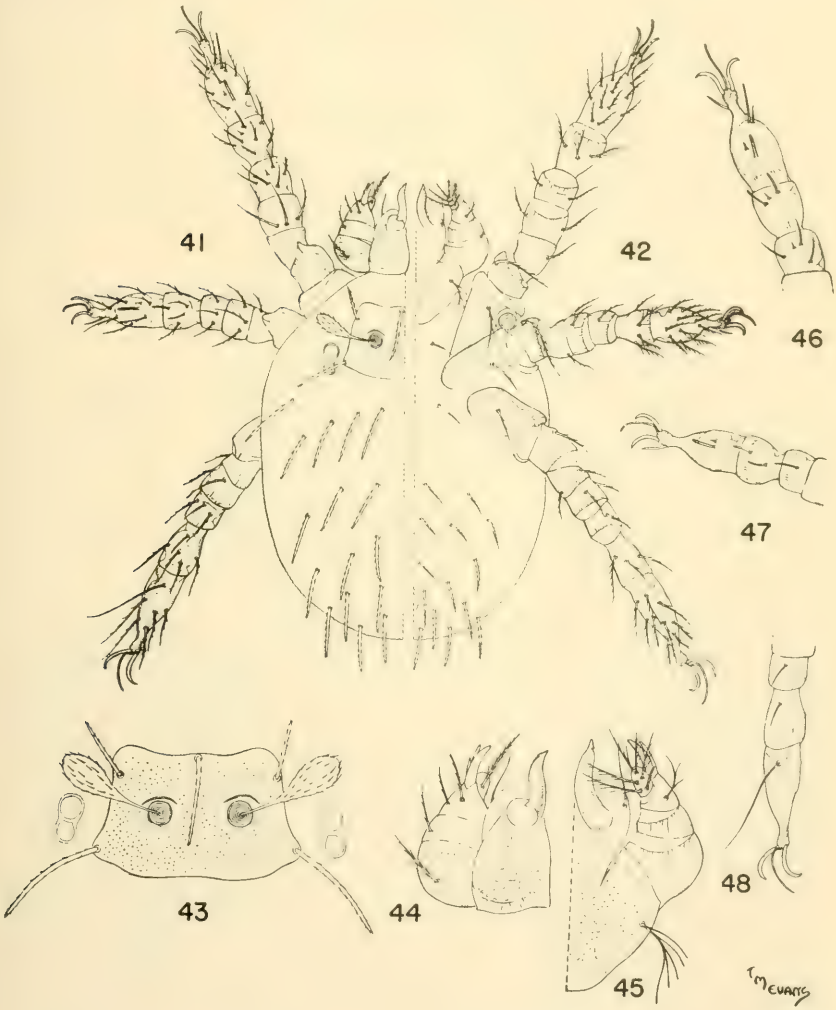
1954. *Gahrliepia* (*Walchia*) *brennani* var. *ventralis* Jameson and Toshioka *nec.* Womersley, 1952, *err. det.,* Pacific Science 8:12-14 (Fig. 1).

1954. *Gahrliepia* (*Walchia*) *brennani ventralis* Traub *et al., nec.* Womersley, 1952, *err. det.,* Amer. Jour. Hyg. 59 (3):300.

Diagnosis.—A Korean species which is close to *G.(W.) ventralis* (Womersley, 1952) (new status) from Malaya, and like it, unique in that there are 2 or 3 ventral setae inserted immediately anterior and lateral to coxa III. Further agreeing with *G.(W.) ventralis* in that there are 2 humeral setae per side. Separable from *G. (W.) ventralis* as follows: *PLs* merely subequal to *ALs* in length instead of being much longer than *ALs* i.e., half again as long. Coxa II scarcely greater than *PW,* so that the ratio $\frac{PW}{\text{Coxa II}}$ is approximately 0.91, while in (*W.*) *ventralis PW* is only about two-thirds or three-fourths the length of coxa II, and the resulting ratio is about 0.74. *AW* and *PW* significantly greater (44 and 50 microns) than in (*W.*) *ventralis* (34 and 45 microns), but *PSB* virtually identical (49 versus 47 microns). The scutum is therefore proportionately broader in the new species.

Description.—**Body:** Subovate, but constricted above midpoint in greatly engorged holotype, which is 512 x 314 microns. Eyes absent. **Gnathosoma:** Chelicerae about 3½ or 4 times as long as broad; with a typical tricuspid cap. Papal

setal formula *N/N/NNN*. Palpal thumb with 4 plumed setae. Palpal claw 3-pronged, the middle prong the longest. **Scutum:** About two-thirds as broad as long (50 x 75 microns); shield-shaped, with anterior margin slightly concave; lateral margins sloping from *ALs* towards *PLs;* margins beyond *PLs* fairly straight and sloping mesads at an angle of about 45°, the resulting triangle with



Euschongastia (*L.*) *arcaricola*, n. sp. Fig. 41, dorsal view of larva; fig. 42, ventral view of larva; fig. 43, scutum; fig. 44, gnathosoma (dorsal); fig. 45, gnathosoma (ventral); fig. 46, leg I (distal segments); fig. 47, leg II (distal segments); fig. 48, leg III (distal segments).

an altitude (*PP*) which almost equals *A-P*. Uniformly micropunctate. *AL* setae at anterolateral angles of scutum, but corners evenly rounded and "shoulders" therefore absent. *AL* setae fairly well branched; resembling *PLs* in structure and length. *PLs* marginal, inserted at level slightly below midpoint of scutum. *SB* inserted at line midway between *ALs* and *PLs;* removed from lateral margins of scutum for a distance equal to their diameters. With a faint ridge anterior to each sensillary base. Sensillae of typical clavate pattern; the expanded portion about 2½ times as long as broad.

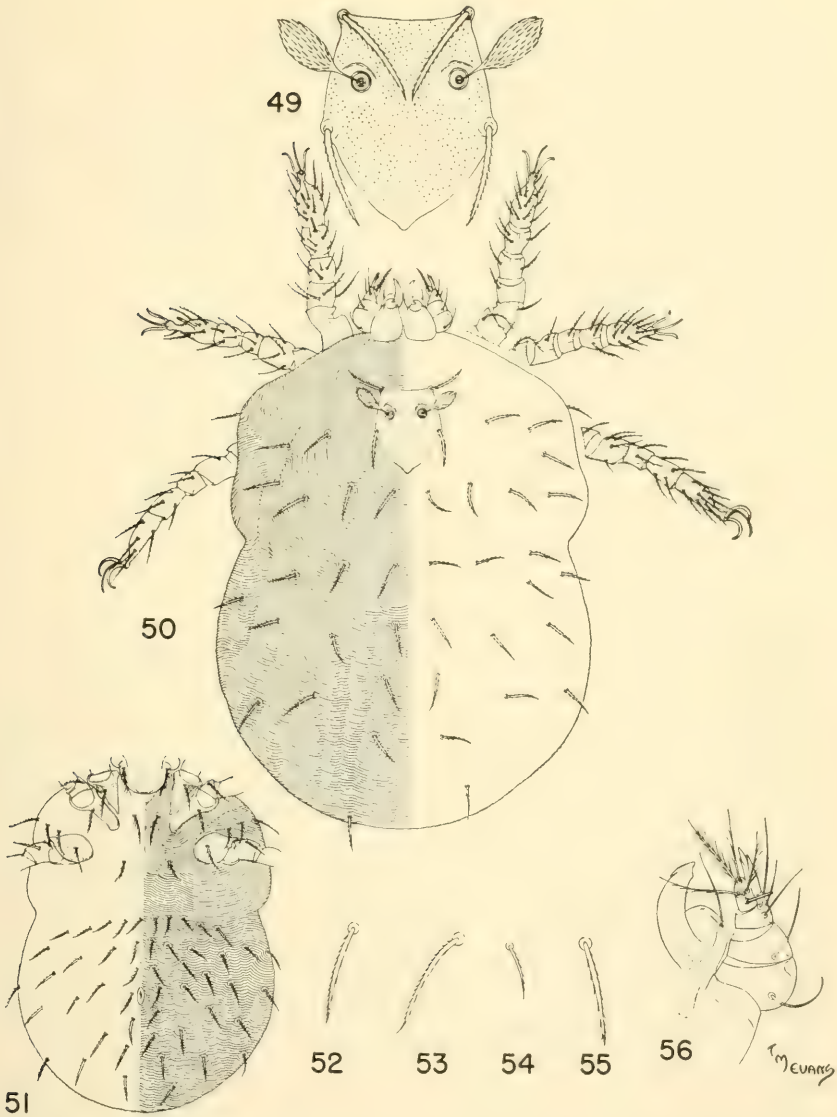
STANDARD MEASUREMENTS IN MICRONS

	AW	PW	SB	ASB	PSB	A-P	AL	PL	DS	PP	PW / Cox. II	PW / SD	PW / ASB	PW / Tars. III
Holotype (B-24925-1)	43	49	35	23	49	39	33	33	30	33	49/50 = 0.92	0.68	2.1	49/51 = 0.96
Paratypes (10) Mean	44	50	36	25	48	41	32	32	30	32	0.91	0.68	2.0	0.95
Range (+or—)	4	3	2	2	3	3	4	4	2	3	0.06	0.05	0.1	0.07

Body Setae: Dorsal setae resembling scutal setae; about 36-38 in number; frequently arranged 4-8. . . , the rest irregular so that some rows have two or four setae out of line. Ventral setae about 54 in number, of which about 18 are postanals, but these not much differentiated from true ventrals, although somewhat longer. True ventrals about 21 microns in length; thin; pinnae sparse and short.

Legs: Coxae each with 1 seta; in coxa III it is submedian in position. With 1, 2, or 3 ventral setae inserted anterior to coxa III; near anterolateral angle; one of these setae may be near lateral margins of body. Sternal setae 2-2. Sensory setae as typical for genus.

Type Material.—Holotype and 13 paratypes (RT B-24925) *ex* the reed vole, *Microtus fortis pelliceus* Thomas, Korea, Taegwang-ni, 7 miles SW of Ch'orwon, 19 August 1953, coll. Field Unit of the Commission on Hemorrhagic Fever (U. S. Army), as were others in type series. One hundred and seven other paratypes, all from Korea, as follows: 5 *ibid*, but 10 November 1953; 7 *ex* the Old World or striped field mouse *Apodemus agrarius, ibid,* 12 September 1953; 4 *ex Microtus fortis pelliceus,* Munsan-ni, 6 November 1953; 1 *ex* same locality and date but from the Korean hamster, *Cricetulus triton nestor* Thomas; 20 *ex* 4 specimens of *Cricetulus triton nestor,* Ori-dong, as follows—eleven, 7 October 1952; five, 22 August 1952; six, 13 September 1952; three, 20 September 1952; 9 *ex* 3 hamsters at Kumhwa—two, 9 September 1952; six, 5 August 1952; one, 29 June 1952; 21 *ex* a hamster of Chong'gong-ni, 16 September 1952; 15 *ex* 2 hamsters, Yonch'on—thirteen, 29 August 1952; two, 4 October 1952; 9 *ex Apodemus agrarius,* Seoul, August 1951; 1 ex *Microtus fortis pelliceus,* Chip'o-ri, 5 June 1952; 1 *ex* a *Mus* at Yonch'on, 15 December 1952; 2 *ex* a mole, *Talpa* sp., at Yangwon-ni, 20 April 1953; 4 *ex* a hamster, *Yongp'yong,* 20 October 1953 and 1 *ex* the Korean redbacked vole,



G. (*Walchia*) *comataxilla*, n. sp. Fig. 49, scutum; fig. 50, dorsal view of larva (ventral aspect of legs); fig. 51, ventral view of larva; fig. 52, humeral seta; fig. 53, dorsal seta; fig. 54, preanal seta; fig. 55, postanal seta; fig. 56, gnathosoma (dorsal).

Clethrionomys rufocanus regulus, Yongp'yong, 14 April 1954; 1 from *Microtus fortis pelliceus,* Yangwon-ni, 3 September 1953.

Holotype (U.S.N.M. No. 2236) deposited in U. S. National Museum, and paratypes distributed as for *T.* (*L.*) *gemiticula,* n.sp.

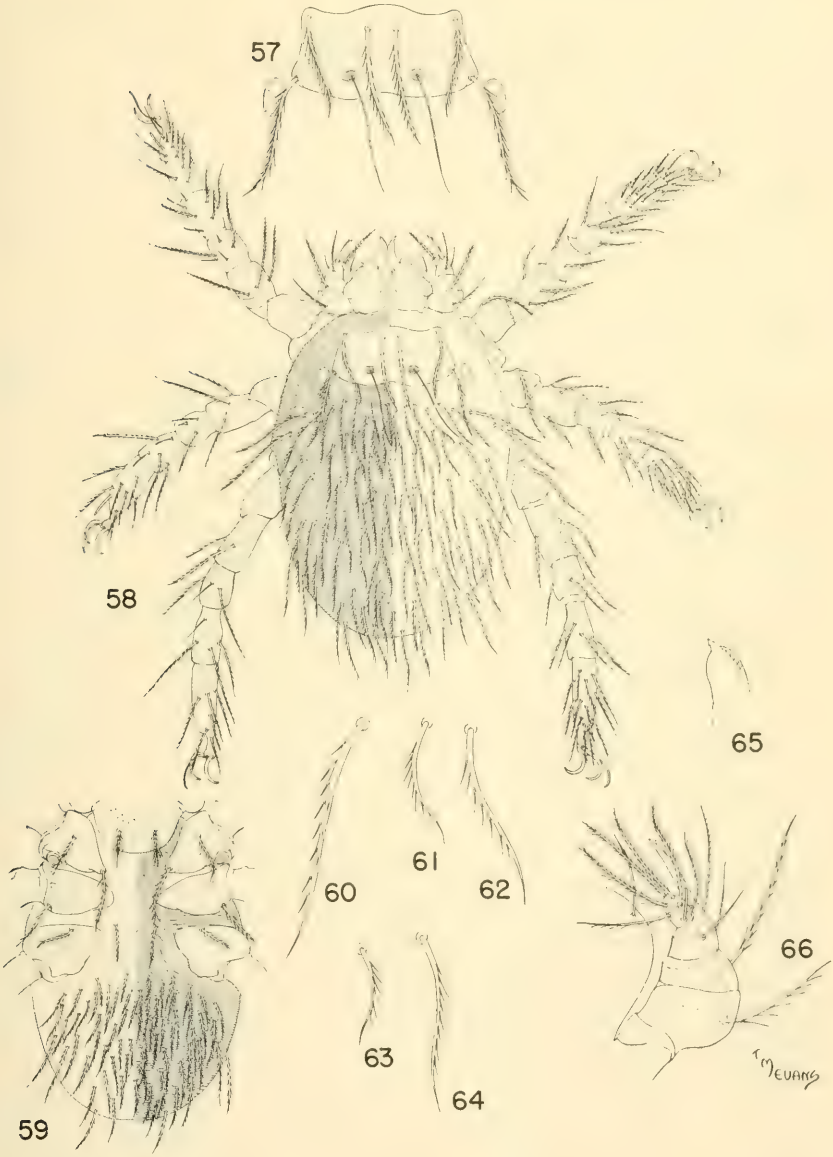
Comment.—Over 90% of the specimens of *G.*(*W.*) *comataxilla* were collected from the hamster, *Cricetulus.* Since several hundred mice trapped among the lush moist vegetation bordering streams at Yonch'on and Chip'o-ri were not infested with this chigger, it is believed that *G.*(*W.*) *comataxilla,* n.sp., is most apt to be found on the relatively dry, rocky slopes of hillsides, the type of terrain characteristically inhabited by *Cricetulus.* Nearly two-thirds of the specimens were collected during the summer months, a relatively dry period of the year.

Even when present, *G.*(*W*). *comataxilla* generally constituted a minority of the chiggers sampled. Frequently less than 10% of the chiggers on these particular hosts were this species, but in one instance 25 of 45 identified from a *Cricetulus* were *G.*(*W.*) *comataxilla.*

Shunsennia hertigi, n. sp.
(Figs. 57-66)

Diagnosis.—Nearest to *Shunsennia biplumulosa* Teller, 1956, but readily separable as follows: Coxae II and III with one seta instead of two; palpal setal formula B/B/BNN instead of B/B/NBB; as well as by significant differences in standard measurements and sensory setae. Separable from the genotype *S. tarsalis* Jameson and Toshioka, 1953, as follows: 1) With a distinct subapical row of teeth on the chelicerae (fig. 65) which is absent in *S. tarsalis* (fig. 74). 2) Scutum with posterior margin sinuate (fig. 57), not convex (fig. 67). 3) Scutum about twice as broad as long, at maxima, instead of about 1½ times as broad. 4) Eyes double (fig. 57), not single (fig. 67). 5) Lateral and ventral tibial setae of palpus nude (fig. 66), not branched (fig. 74). 6) Palpal thumb with 6 setae instead of 7. 7) Galeal seta nude instead of barbed. 8) Palpal claw bifid, not trifid. 9) Leg I with a tarsal parasubterminala, which is lacking in *S. tarsalis.* 10) Leg II lacking the tarsal microspur and pretarsala of *S. tarsalis.* 11) Leg III with a genuala but lacking the tarsal spur. Instantly separable from *S. ochotona* (Radford, 1942) by virtue of characters 1, 2, 5, 7, among others.

Description.—**Body:** Very long and subovate, 513 x 302 microns in moderately engorged holotype. Eyes double; anterior one larger; just posterior to level of insertion of *PLs.* **Gnathosoma:** Chelicerae about ⅜ as long as broad at base; with subapical row of very small teeth immediately proximad to the cheliceral cap. Seta on palpal femora branched; seta on genu nearly twice as long as femoral seta, subpectinate; dorsal tibial seta branched; the lateral and ventral tibial setae nude; palpal formula therefore B/B/BNN. Palpal tarsus with 6 branched setae and a basal striated rod. Palpal claw 2-pronged. Chelicerae bases, palpal coxae, and femora punctate. Coxal setae (maxillary setae) branched, inserted somewhat medially on palpal coxa. **Scutum:** Slightly more than twice as broad as long. Anterior margin biconcave. Lateral margins straight except for rounded "shoulders." Posterior margin biconvex, with a deep median sinus. The two *AMs* inserted at level slightly posterior to insertions of *ALs.* Scutum



Shunsennia hertigi, n. sp. Fig. 57, scutum; fig. 58, dorsal view of larva (with ventral aspect of legs); fig. 59, ventral view of larva; fig. 60, humeral seta; fig. 61, dorsal seta; fig. 62, dorsal seta; fig. 63, preanal seta; fig. 64, postanal seta; fig. 65, chelicera; fig. 66, palp and galea (ventral view).

very lightly micropunctate except around *AMs* and posterior to sensillae bases. Sensillary bases on same level as *PLs* or just slightly anterior. Sensillae flagellate, nude for entire length. A darkened ridge just anterior to bases.

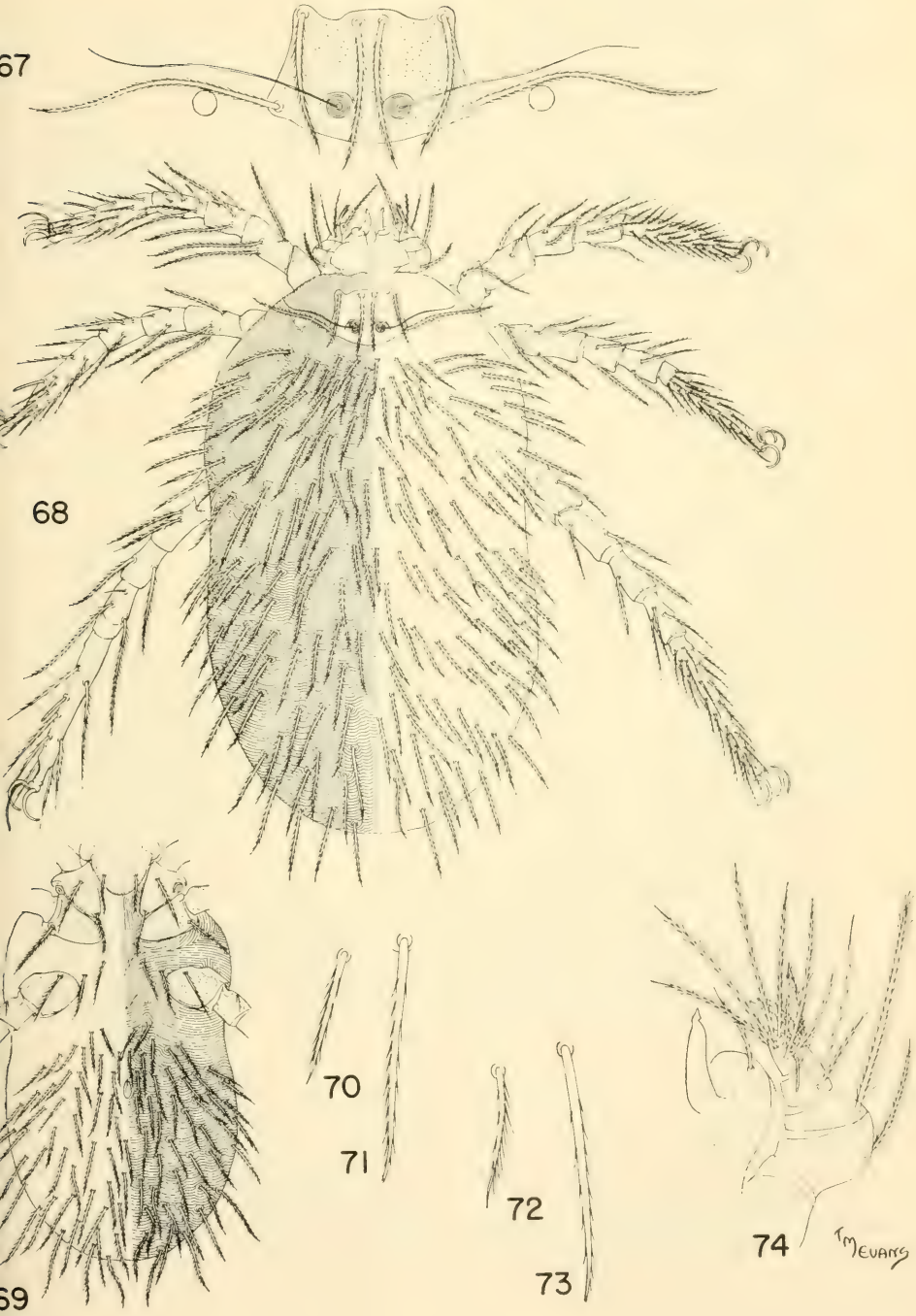
STANDARD MEASUREMENTS IN MICRONS

	AW	PW	SB	ASB	PSB	A-P	AM	AL	PL	DS	PW / Cox. II	PW / SD	PW / ASB	PW / Tars. III
Holotype (B-28722)	90	115	43	43	16	41	86	81	77	44 -93	115 —=1.44	1.95	2.56	1.28
Paratypes (9)														08
Mean	90	116	43	44	17	41	79	78	82	39 -100	1.44	1.90	2.61	1.34
Range (+or—)	5	7	1	3	3	4	7	12	8		0.08	0.23	0.3	0.06

Body Setae: Dorsal setae thinner than and not quite as plumose as scutal setae, varying in length from 39 to 100 microns with shortest setae in middle of first row. Humeral seta usually closely associated with displaced setae of first dorsal row, posteriorwards on each side so as to be inserted immediately anterior to outermost 2 setae of first dorsal row. Humeral setae and lateral-most of first row the longest of the dorsal setae. Dorsal setae ranging in number from 81 to 98; variable in arrangement of rows; with from 14 to 21 setae in first row; those in second row irregular, at times appearing as distinct rows. Only one pair of sternal setae present; inserted midway between coxae II and III; about 70 microns long. Ventral setae about 80 in number; 35-40 microns long in the first few rows behind 3rd coxae. Anal aperture relatively anterior in position, between 3rd and 4th row of ventral setae, so that nearly half of ventral setae are postanals. **Legs:** Coxae and legs finely punctate. First coxa with 2 setae, one almost median; the other in mesocaudal angle. Coxa II unisetose; seta inserted in the posterolateral angle. Coxa III unisetose; seta anteromarginal. Sensory setae as follows: Leg I with 2 genualae, microgenuala, 2 tibialae, microtibiala, tarsal spur, microspur, subterminala, parasubterminala, pretarsala; leg II with a genuala, microgenuala, 2 tibialae, a tarsal spur, a pretarsala; leg III with a genuala and a tibiala. Tarsi with 2 claws and a claw-like empodium.

Type Material.—Holotype (RT B-28722) *ex Apodemus peninsulae* Korea, Sangbonch'on-ni, 17 miles SE of Seoul, 28 May 1954, coll. Field Unit of the Commission on Hemorrhagic Fever (U. S. Army). The following 12 paratypes were all collected in Korea by the same field unit: 3 *ex Apodemus agrarius*, Nop'a-dong, 7 miles NW of Munsan-ni, 24 February 1954; 1 *ex Apodemus agrarius*, Yongp'yong, 16 miles S of Ch'orwon, 2 March 1954; 2 *ex Apodemus agrarius*, Munsan-ni, 6 and 7 November 1953; 3 *ex Clethrionomys rufocanus regulus*, Camp Indianhead, 2¾ miles E of Yangwon-ni, 17 September 1953; 3 from Sangbonch'on-ni—1 *ex Apodemus agrarius*, 14 April 1954; 1 *ex Apodemus peninsulae*, 14 April 1954; 1 *ex Apodemus peninsulae*, 14 April 1954; 1 *ex Apodemus agrarius*, 16 February 1954. Holotype (U.S.N.M. No. 2237) deposited in U. S. National Museum.

Shunsennia tarsalis J. and T. Fig. 67, scutum; fig. 68, dorsal view of larva (with ventral aspect of legs); fig. 69, ventral view of larva; fig. 70, dorsal seta; fig. 71, dorsal seta; fig. 72, preanal seta; fig. 73, postanal seta; fig. 74, gnathosoma.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T M EVANS

Paratypes distributed amongst collections of the Rocky Mountain Laboratory of the U. S. Public Health Service, the Colonial Office Research Unit at Kuala Lumpur, the Department of Entomology, University of Kansas, and the authors.

Comment.—As can be seen from the diagnosis, *S. hertigi* differs rather considerably from the genotype, and in some respects suggests *Chatia* Brennan, 1946, although distinct from that genus. Since the higher classification of trombiculid mites needs considerable study, it is felt advisable to treat this interesting species as a *Shunsennia*.

This species is named for Dr. Marshall Hertig, Director of the Commission on Hemorrhagic Fever of the Armed Forces Epidemiological Board, whose work in medical entomology at the Gorgas Memorial Laboratory in Panama was interrupted for several years while he served as Director of the Field Unit in Korea.

ACKNOWLEDGEMENTS

We are grateful to Dr. Joseph E. Smadel, former Director of the Division of Communicable Diseases, Walter Reed Army Medical Center, Washington, and to Dr. Marshall Hertig, of the Gorgas Memorial Laboratory, Panama, both of whom served as Directors of the Commission on Hemorrhagic Fever of the Armed Forces Epidemiological Board and as leaders of the Field Units in Korea, and who made it possible to collect and study these trombiculid mites. Our debt to various Army installations for their unstinted cooperation is great, and since these organizations are listed in detail elsewhere (Traub *et al., in prep.*), we here merely express our thanks. Although two of the authors (R.T. and L.J.L.) served in Korea, the large numbers of specimens available for study were obtained only by the enthusiastic assistance of the officers and men of the field teams, particularly T. T. Harriss, W. H. Lawrence, William Barnes, James J. O'Keefe, and Ervin Kardos. Dr. E. W. Jameson, Jr., and Dr. Paul Oman, formerly of the 406th Medical General Laboratory in Tokyo, and Dr. J. R. Audy, of the Institute for Medical Research, Kuala Lumpur, Malaya, were especially helpful in loaning specimens for comparison. Thanks are also due Thomas M. Evans, of the Department of Entomology, Walter Reed Army Institute of Research, who prepared the illustrations for this paper. Gordon Marsh, of that institution, greatly assisted in the identification of thousands of Korean chiggers, including some of the new species herein described.

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ON A SMALL COLLECTION OF MALLOPHAGA FROM THE UNITED STATES, WITH DESCRIPTIONS OF THREE NEW SPECIES

By M. A. Carriker, Jr., *Popayan, Colombia, S. A.*

The species listed in this paper were sent to the author for identification by Mr. Nixon Wilson, Department of Entomology, Purdue University, and were, when not otherwise indicated, collected by him.

The collection contains nine species, three of which are apparently new to science and are described below, while a fourth is probably a new subspecies, but lack of the necessary comparative material prevents its proper description.

All measurements are in millimeters and all drawings were prepared by the author, accurately drawn by means of the eyepiece micrometer.

All types have been returned to Mr. Wilson, but paratypes, when available, have been retained by the author.

Philopterus ocellatus (Scopoli), 1763

Pediculus ocellatus Scopoli, Ent. Carniolica, p. 382 (Host: *Corvus corone* (*sardonius* Kleinschmidt).

The species of *Philopterus* found on the American Crow (*Corvus brachyrhynchos*) has been determined to be the same as that of the European Crow (*C. corone*), according to Hopkins and Clay (Checklist of Mallophaga, 1952). I have not personally compared the American parasite with authentic specimens of *ocellatus.*

A pair of this species was taken on *Corvus brachyrhynchos* by S. R. Joseph at Jacobus, York Co., Pa., Nov. 12, 1955. They agree with specimens in my own collection from Pennsylvania and Nebraska.

Philopterus sp.

A pair of this genus from *Eremophila alpestris,* collected by R. E. Mumford, Washington Co., Ind., Jan. 10, 1955.

They are closely related to *P. c. citrinellae* (Schrank) (= *P. communis* of authors, *in partim*), and are very likely subspecies of it, but I lack the necessary material for comparison.

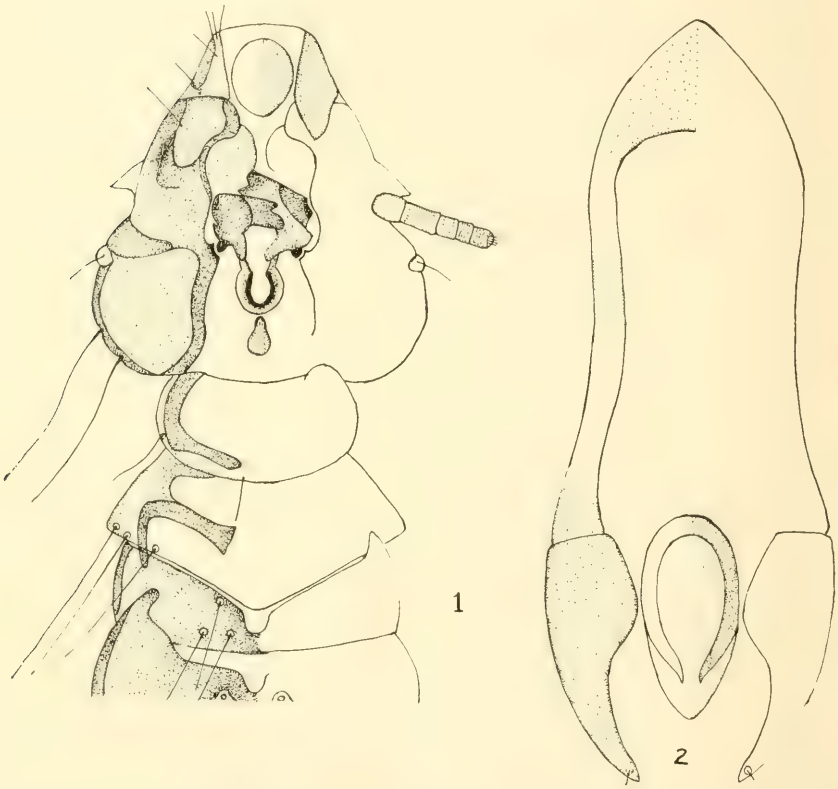
Brüelia rotundata (Osborn), 1896

Nirmus rotundatus, Osborn, Bull. U. S. Bur. Ent. (n.s.) 5: p. 226 (Host: *Corvus corone brachyrhynchos* Brehm).

A pair was taken on the same individual host as noted under *Philopterus ocellatus.* The specimens agree perfectly with material from the type host collected by the author at Lincoln, Nebraska.

Penenirmus arcticus sp. nov.
(Figs. 1 and 2)

Types, male and female adults, collected by R. E. Mumford from a *Picoides arcticus* (Swainson), taken 3 miles east of Pike Lake, Luce Co., Michigan, Feb. 5, 1956.



Penenirmus arcticus, n. sp., male: fig. 1, head, thorax and abdominal segments I-II; fig. 2, genitalia.

Diagnosis.—Apparently nearest to *P. auritus varius* Emerson, from *Sphyrapicus varius*, agreeing with that species in the small, uniformly colored anterior plate. It differs in having the head narrower at temples and wider at the frons; anterior plate smaller; cephalic carinae narrower, less deeply chitinized and paler in color. The pleurites are of a different color pattern and the tergites are separated from the pleurites by a wide hyaline area, in which are located the spiracles.

The dark, marginal carinae of the legs, so prominent in *auritus*, are but slightly indicated along their inner margins. The types were left too long in the clearing solution so that it is not possible to evaluate all of the markings of the head and body.

It is apparently specifically distinct from *auritus* (Scopoli), due to the totally different shape and structure of the anterior plate, the differences in the male genitalia and structure of the abdominal sclerites. The genitalia have long parameres, but slightly incised at their tips, and the endomera is longer.

In *auritus* the heads of the abdominal tergites, while equally long, are of a different shape; the hyaline area surrounding the spiracles is scarcely evident in I and II, and becomes more prominent posteriorly. The median emargination of tergites I and II in the male is absent in segment II of the female.

In the pair of neoparatypes of *auritus*, with which these specimens have been compared, the median anterior portion of the abdomen in both sexes is completely obscured by foreign matter, so that it is impossible to determine whether or not the median emarginations of tergites I and II are present.

The species is represented by the ♂ holotype, ♀ allotype and 3 ♂♂ and 3 ♀♀ paratypes. All are in good condition. ♂ and ♀ paratypes in author's collection.

	♂		♀	
	length	width	length	width
Body	1.71	------	1.78	------
Head frons	----	.137	----	.158
Head temples	.506	.45	.55	.497
Prothorax	.124	.288	.20	.301
Pterothorax	.21	.45	.24	.463
Abdomen	.89	.603	1.23	.70
Basal plate	.174	.095		
Parameres	.085	.10		
Endomera	.07	.035		

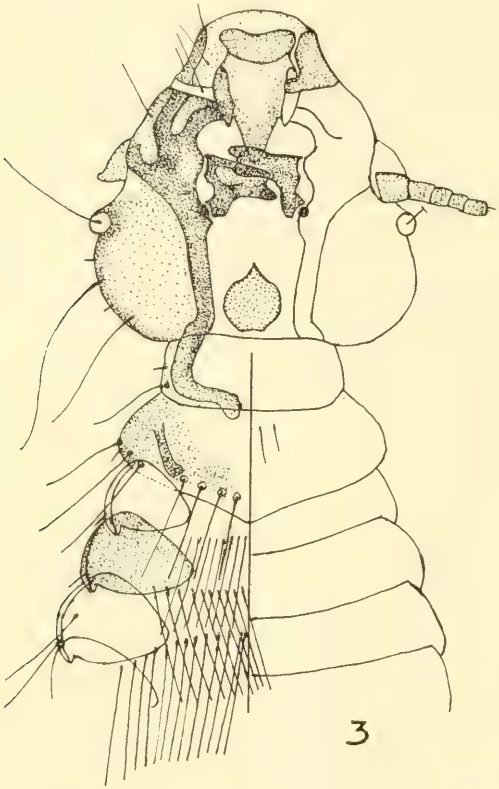
Strigiphilus varius sp. nov.
(Figs. 3 and 4)

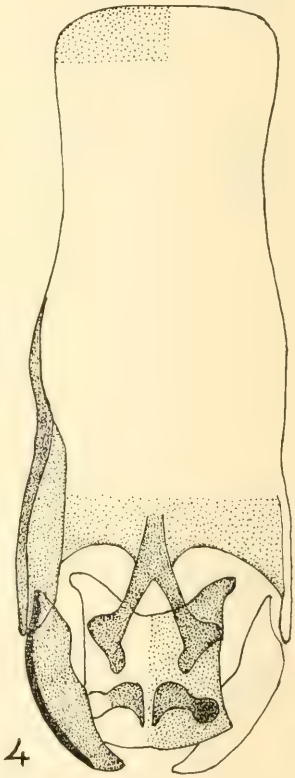
Types, male and female adults, from *Strix v. varia* Barton, collected at Saltillo, Washington Co., Ind., Dec. 29, 1955.

Diagnosis.—Most closely related to *Strigiphilus syrnii* (Packard), from *Strix nebulosa*, with which they have been compared (a ♂ and 2 ♀♀ in the author's collection from the type host).

It differs from *syrnii* in much larger size; head proportionally wider at temples (♀ head .72 x .697 against .63 x .58); decidedly different cephalic carinae; both mandibles with apical portion parallel-sided, and both with bipartite tips (right mandible in *syrnii* pointed).

The premarginal carinae are submarginal posterior to the clypeal suture (marginal in *syrnii*); lateral margins of head, anterior to clavi, are undulating, while in *syrnii* they are uniformly concave; anterior plate is hour-glass shaped, less swollen laterally in median portion.





Strigiphilus varius, n. sp.: fig. 3, head, thorax and abdominal segments I-III, female; fig. 4, male genitalia.

The pleurites are very much narrower and poorly chitinized (prominent and deeply chitinized in *syrnii*); tergites are short, poorly chitinized and with broadly-rounded inner ends. With the exception of the short tergites the whole abdomen is hyaline, the margins of the segments being almost invisible; hooks at posterior ends of pleurites in segments I to III more strongly developed.

Chaetotaxy much as in *syrnii;* abdominal segments VIII and IX are fused in the female, forming one large segment, while in the male they are distinctly separated, IX being small and rounded apically. In segment III there is one long seta set within the pleurite, slightly posterior to the middle of tergite; in segment IV two long setae and in V to VIII there are 3 in a transverse row.

The male differs from the female in smaller size, narrower frons, shorter and more rounded abdomen and different structure of abdominal segments VIII and IX, as described above. Chaetotaxy about the same, excepting greater abundance and longer setae on segment IX of male.

The genitalia differ decidedly from those of *syrnii*, especially the basal plate, which is shorter and wider, also the endomera. The parameres in *syrnii* are much thicker basally and taper to a slender tip (see fig. of genitalia).

The nymphs present a very interesting and decidedly different head structure from that of the adults, the pre-antennary area being short and broad, with the marginal carina unbroken at the clypeal suture, this area having a strikingly similar appearance to *ceblebrachys*, so much so that I suspected at first examination that two species were involved.

The species is represented by the ♀ holotype, ♂ allotype, 9 ♂♂ and 21 ♀♀ paratypes; 2 ♂♂ and 2 ♀♀ paratypes retained by the author.

Measurements of the types:

	♂		♀	
	length	width	length	width
Body	1.84	....	2.10	....
Head frons	....	.18	....	.245
Head temples	.64	.59	.72	.697
Prothorax	.20	.346	.17	.39
Pterothorax	.216	.52	.237	.59
Abdomen	.92	.78	1.12	.92
Basal plate	.33	.144		
Parameres	.07	.13 (bases)		
Endomera	.12	.08		

Strigiphilus otus Emerson, 1955

Strigiphilus otus Emerson, 1955, Proc. Ent. Soc. Wash. 57(5):241; figs. 1 and 2 (Host: *Otus asio gilmani* Swarth.)

A pair of what seems to be this species from *Otus asio*, collected by G. L. Ward at Earlham College, Wayne Co., Ind., summer of 1953.

The specimens are, unfortunately in poor condition, and are not in a condition for careful, detailed study.

The male genitalia seem to be the same as the figure published by Emerson. The abdominal chaetotaxy cannot be distinguished.

Gruimenopon canadense Edwards, 1949

Gruimenopon canadense Edwards, 1949, Psyche 56:116; pl. VI, figs. 1-4 (Host: *Grus c. canadensis* (Linné).

Several specimens of this species were collected by R. E. Mumford from a *Grus c. tabida*, taken at the Jasper-Pulaski State Game Preserve, Pulaski Co., Ind., Nov. 29, 1955.

I do not have material of this species for comparison, but the specimens are in perfect condition and agree exactly with the description and figures published by Edwards. The only other species of this genus is *G. longum* (Giebel), from *Grus g. grus*, of which I have a pair from the type host.

The American species is, apparently, very rare in collections.

Myrsidea interrupta (Osborn), 1896

Menopon interruptum Osborn, Bull. U. S. Bul. Ent. (n.s.), 5, p. 245; pl. II, fig. h. (Host: *Corvus corone brachyrhynchos* Brehm).

Several specimens of both sexes from the type host, collected by S. R. Joseph, at Jacobus, York Co., Pa., Nov. 12, 1955. Compared with material collected by the author from type host taken at Delmar, Pa., they agree in all respects.

Menacanthus aurocapillus sp. nov.
(Figs. 5, 6, 7 and 8)

Types, male and female adults, from *Seiurus aurocapillus* (Linné), collected at Fort Meade, Anne Arundel Co., Maryland, July 21, 1955.

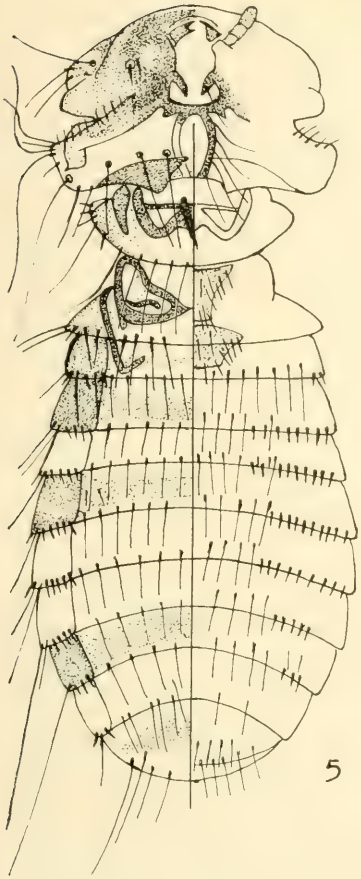
Diagnosis.—The present species is an unusual type of the genus *Menacanthus*, resembling in some ways, especially the shape of the head, the genus *Machaerilaemus*. The ventral head spines are poorly chitinized and are set at an unusual distance behind the bases of the mandibles. At first glance these sclerites do not seem to be the usual ventral spines of the genus, but a careful study of numerous specimens of both sexes leaves no doubt of their real identity.

The deep ocular notches are also typical of *Menacanthus*, and are not present in *Machaerilaemus*. The horseshoe-shaped occipital plate, on each side of which are set four long, strong setae (not 5 as shown in figure) is also present in many species of *Menacanthus*, while such a structure is known from but one aberrant species of *Machaerilaemus*, while the type of genitalia also agrees with the former genus.

The present type of thoracic sternal plates, with their setae, is also to be found in *Menacanthus*, as well as the abdominal chaetotaxy. The heavy infestation of this species (30 specimens on one individual host), together with the large number of males is totally unlike the species of *Machaerilaemus*, of which never more than 1 to 3 individuals are found on a single bird, while the male sex is extremely scarce. There are numerous records of *Menacanthus* being taken on Passerine birds but this seems to be the first instance of its presence on a species of the Parulidae.

The abdominal chaetotaxy, as here represented, is not commonly found on the genus *Menacanthus*, but is present on a number of known species. There is a series of short spines (3 to 5) along the dorsal, posterior margin of the pleurites, with another row of 3 to 10 spines on the posterior margin of sternites II to VII, extending from near the lateral angle to a point more than half way to the median line of the abdomen on segments II to V.

Menacanthus aurocapillus, n. sp.: fig. 5, male; fig. 6, tip of female abdomen; fig. 7, male genitalia; fig. 8, sternal sclerites, female.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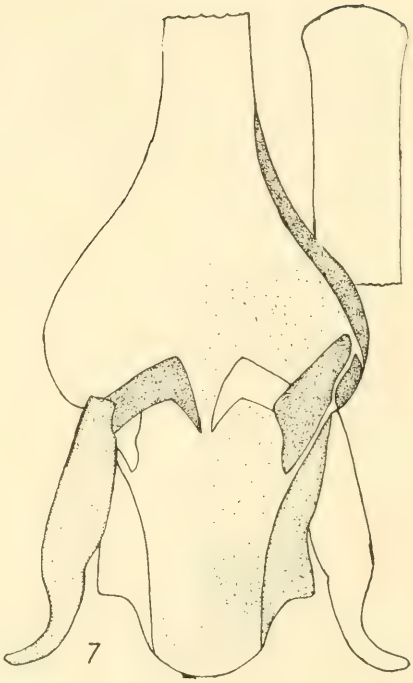
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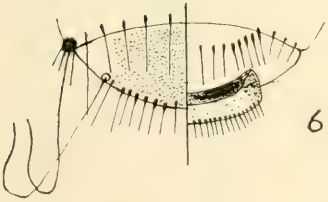
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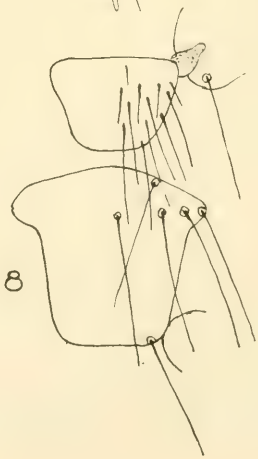
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The remainder of the abdominal chaetotaxy, as well as that of the head and thorax, is shown in the figure. The tergites are continuous across the abdomen and fused with the pleurites, but are separated by hyaline borders on both sides. The sternites are not clearly visible, being directly beneath the posterior half of the tergites, but they, also, seem to be fused with the pleurites.

The species is represented by the ♂ holotype, ♀ allotype, 12 ♂♂, 12 ♀♀ and 6 nymphs paratypes. 2 ♂♂ and 2 ♀♀ paratypes have been retained in the author's collection.

	♂		♀	
	length	width	length	width
Body	1.00	----	1.23	----
Head frons	----	.30	----	.33
Head temples	.247	.342	.274	.397
Prothorax	.11	.25	.126	.129
Pterothorax	.096	.288	.13	.348
Abdomen	.565	.415	.77	.49
Basal plate	.247	.095		
Parameres	.075	.124 (tips)		
Endomera	.08	.08		

Note on Strigiphilus oculatus (Rudow) and S. bubonis (Osborn)

I have in my collection 2 ♂♂ and 2 ♀♀ of a *Strigiphilus* taken on *Bubo v. virginianus*, shot at Indiana, Pa., and 3 ♀♀ from *B. v. occidentalis*, collected at Lincoln, Neb. Also a large series of the same genus from *B. v. elutus* Todd, collected in Colombia. This material represents three decidedly distinct species. Those from Pennsylvania have the preantennary area much shortened, with the clypeus short and broad and with divergent sides, approaching the type of *ceblebrachys* (Nit.)

The 3 ♀♀ from Lincoln have the preantennary area longer and narrower and with the clypeal area longer and narrower anteriorly, and with the sides less divergent, very similar in this respect to *syrnii*. The series from Colombia have the preantennary area still longer and narrower, especially the clypeus, the latter with the sides but slightly divergent, more of the type of *cursor*.

It would seem from this evidence that there is no logical reason for sinking *Docophorus bubonis* Osborn (Hopkins & Clay, 1950, p. 339) in favor of *Nirmus oculatus* Rudow. Osborn's description certainly agrees with my specimens from Indiana, Pa. He says: "General appearance of *ceblebrachys*," which is quite true. On the other hand, if we wish to keep Rudow's *oculatus* it would seem much more logical to apply it to the specimens from Nebraska, with the longer, narrower head, which certainly approximates the old idea of "*Nirmus*," as given by Rudow.

I therefore designate a female from *Bubo virginianus occidentalis*, collected by the author on Nov. 4, 1902, at Lincoln, Neb., as the neoparatype of *Strigiphilus oculatus* (Rudow).

DIFFERENCES, IN THE FEMALE SEX, BETWEEN TWO NORTH AMERICAN BAT-FLEAS

(SIPHONAPTERA, ISCHNOPSYLLIDAE)

By F. G. A. M. SMIT, *British Museum (Natural History), The Zoological Museum, Tring, Herts., England*

Two of the commonest species of fleas occurring on bats of the genus *Myotis* in North America are *Myodopsylla insignis* (Rothschild) (occurring mainly on *Myotis lucifugus*) and the closely related *M. gentilis* Jordan & Rothschild (a parasite of *Myotis lucifugus* and *M. yumanensis*). The differences in structure of the genitalia in the male sex of these fleas are very distinct and therefore males of these two species are not difficult to identify. The females, however, are so much alike that up till now no reliable differences between those of the two species have been found. For example, Holland (1949: 180) says: "According to the original description the female of this species [*M. gentilis*] is very close to that of *M. insignis*, but 'the head of the receptaculum seminis appears to be a little shorter and the tail slightly longer than in *insignis*.' This character does not appear to be reliable in our material; in fact, sometimes the reverse seems to be the case. As the ranges of the two species overlap in part, definite determinations should not be made on the strength of females alone." Hopkins & Rothschild (1956: 247) remark that the females of *M. gentilis*, *M. insignis* and *M. nordina* Traub & Hoff appear to be inseparable.

A recent donation by Dr. C. A. Hubbard of several females of *Myodopsylla* induced me to study this sex of the two species concerned and I was able to find the following differences between females of *M. gentilis* and of *M. insignis:*

In *gentilis* the distance between the posterior margin of the sensilium and the base of the anal stylet is less than the length of the stylet and the anterior setae of the anal tergum are situated quite close to the sensilium (Fig. 1); in *insignis* the distance mentioned is greater, the anal tergum is markedly longer and the setae are placed more distad from the sensilium (Fig. 2). In *gentilis* the dorsal margin of sternum VII (Fig. 4) usually slants downwards more steeply than in *insignis* (Fig. 3). In *gentilis* the genal process is on an average somewhat narrower than in *insignis*, but this is not an easy character to use. I found no other constant differences.

To a considerable extent the females of these two species of *Myodopsylla* can be determined by consideration of geography, since there is very little, if any, overlap between them. Their distribution, based upon published records (see list of References), is shown in Fig. 5; two of the recorded localities for *M. insignis* could not be traced, namely Mt. Aeolus (? Mt. Arolus) in Vermont and Laird, Algoma District, Ontario. It will be seen that *M. insignis* occurs throughout the north-eastern United States and in Canada from Ontario to

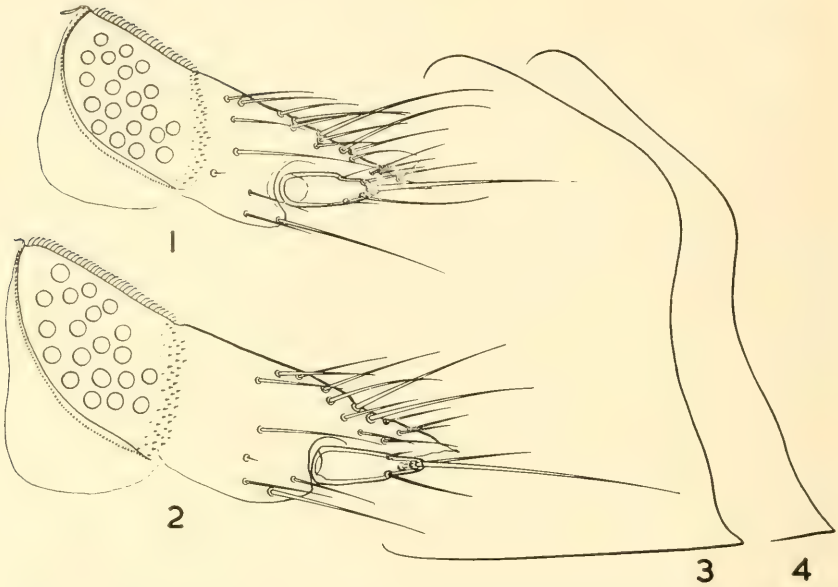

Fig. 1, sensilium and anal tergum of *Myodopsylla gentilis* (from Forest Grove, Oregon); fig. 2, same of *M. insignis* (from Hatchville, Massachusetts); fig. 3, outline of sternum VII of *M. insignis*, ♀ (from Hatchville, Mass.); fig. 4, same of *M. gentilis*, ♀ (from Forest Grove, Oregon).

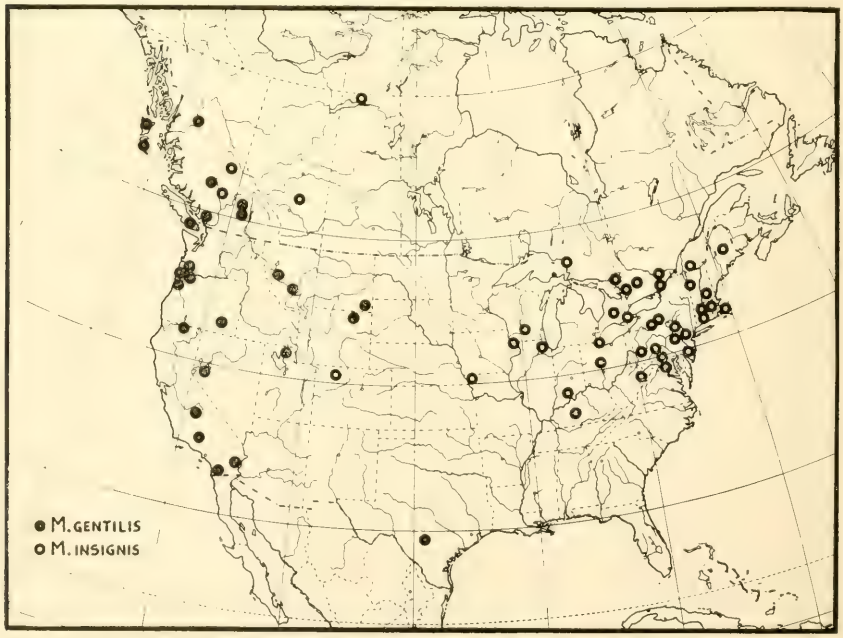

Fig. 5, map showing distribution of *M. gentilis* and *M. insignis* in North America.

British Columbia. *M. gentilis* is found in a long stretch of country adjoining the west coast, but going inland as far as south-east Montana and north-east Wyoming. The record of *M. gentilis* from Texas and perhaps that of *M. insignis* from Colorado seem to need corroboration; these records may have been based on misdetermined females and the Texas specimen(s) are probably *Myodopsylla collinsi* Kohls. The five females *M.* '*insignis*' recorded from Barber County, Kansas, by Hopkins & Rothschild (1956: 249) proved to be *M. collinsi*, and the female *M.* '*gentilis*' from Blackfalds, Alberta (*l.c.:* 251) is *M. insignis*.

As regards the differences between the females of the two species dealt with above and that of *M. nordina*, the female of the latter has, according to the figure published by Traub & Hoff (1951: Fig. 17), a shorter anal tergum than that of *M. gentilis* and the anal stylet is situated at a distance of only about half its length from the sensilium; sternum VII of *M. nordina* is also markedly different from that of *gentilis* and *insignis* and the ductus bursae is shorter than that of the last two species.

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ANNOUNCEMENT

Short scientific articles, not illustrated, two double-spaced typewritten pages in length, are welcome and will usually receive prompt publication. References to literature should be included in the text, and the author's name should appear at the end of the article.

A SYNOPSIS OF THE GENUS MELANDERIA ALDRICH

(DIPTERA, DOLICHOPODIDAE)

PAUL H. ARNAUD, JR.[1]

The purpose of this paper is to provide a synopsis of the genus *Melanderia*. A new species, which occurs geographically between the two previously known species, is described. The genus is divided into two subgenera, with a new subgeneric name being proposed for *Melanderia curvipes* (Van Duzee).

The genus *Melanderia* was proposed by J. M. Aldrich in 1922 for a species of marine dolichopodid fly with remarkable "mandible-like" mouth parts. In the general habitus of external characters and on the usual key characters used, the genus *Melanderia* has been considered to be closely allied to the genus *Hydrophorus* Meigen. In her studies of the mouth parts, M. B. Cregan (1941, p. 30) considered the mouth parts sufficiently distinct to place *Melanderia* in a special group IX on the basis (in her terminology) "labrum not elongated; four prongs connected; no panels," while she placed *Hydrophorus* in group X with five other genera characterized by "labrum plate-like; four prongs connected; six panels geminately sclerotized." Her groups are not currently accepted.

The generic type, *Melanderia mandibulata* Aldrich, was collected along the Pacific ocean at Ilwaco, Washington, by A. L. Melander, and subsequently recorded from the northern California coast. A second species, *curvipes* (Van Duzee), described in the genus *Hydrophorus*, is distributed along the southern California coast. Recent collecting by the writer along the central California coast at Pacific Grove has revealed a third species which is closely related to *mandibulata* Aldrich.

The species of *Melanderia* are not inhabitants of sandy sea beaches, but appear to be confined to rocky areas along the Pacific sea coast which are subjected to strong wave action. The immature stages are unknown.

Melanderia Aldrich

1922. *Melanderia* Aldrich, Proc. Ent. Soc. Washington, 24(6): 146. Additional references: Snodgrass, 1922: 148-152 [morphology of mouth parts]; Curran, 1934: 221, 229, fig. 72 on p. 266 [keys, figure of head]; Neave, 1940: 85 [listed]; Cregan, 1941: 11, 20, 22, 23, 25, 27, 29, 30 [study of mouth parts]; Wirth & Stone, IN: Usinger, 1956: 454 [key to California species].

Generic Characterization.—Medium-sized dolichopodids. First antennal joint bare above, third antennal joint short, arista dorsal. Palpi large and flat, resting upon the proboscis, proboscis greatly enlarged, its basal portion forming a very broad, short tube, the apical half fleshy, opening underneath in a longitudinal

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slit, each side bilobed, the outer side pieces extending forward in the form of mandibles. Head bulging behind, with numerous bristles below at the neck, a single row of which extend across the occiput above with only a slight interruption in the middle. Prothorax with spines around the neck except below. Pleura hairy or bristly in front of the prosterior spiracle, acrostichal hairs in an irregular double row. Scutellum with a single pair of upright bristles; dorsocentral bristles 6 or 7, intraalar 2, one of which is directly on the suture, supraalar 1, postalar 1. Abdomen with 6 visible segments in the male, 5 in the female. Hind cross-vein of the wing beyond the middle, about its own length from the margin. Genital segments of the male rather prominent, but not extending forward under the venter.

Subgenus **Melanderia** Aldrich

Sternopleura haired on posterior half and first antennal segment with stout setulae below. Two known species.

Type.—*Melanderia mandibulata* Aldrich, by original designation.

Melanderia (Melanderia) mandibulata Aldrich
(Figures 2 and 5)

1922. *Melanderia mandibulata* Aldrich, Proc. Ent. Soc. Washington, 24(6): 146-147. [n. sp. from Ilwaco, Washington.] *Additional references.*—Snodgrass, 1922: 148-152, Plate 14 [morphology of mouth parts]; Aldrich, 1930: 1 [collected at Smith River, California]; Aldrich, 1931: 111 [collected at Smith River, California]; Aldrich, 1933: 36 [very restricted distribution at Smith River, California]; Cregan, 1941: 7, 9, 20; figs. 32, 50, 82, 119, 159, 190 [morphology of mouth parts]; Crampton, 1942: 148-149, fig. 7D [figure of head]; Wirth & Stone, IN: Usinger, 1956: 454 [key, California distribution].

Type Depository.—No. 25,240, United States National Museum.

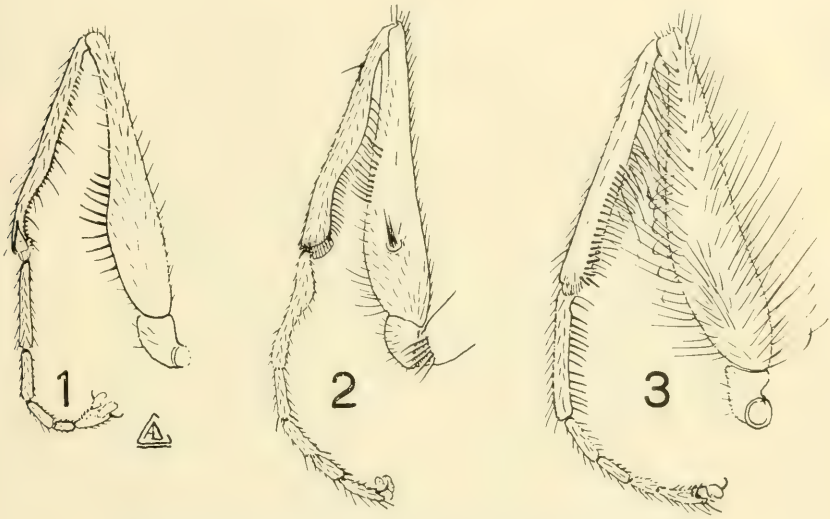
Species Characterization.—A large sized greenish species; face usually purplish; front femur of male on inner side with a close tuft of 8-10 bristles on a very slight protuberance, basitarsus modified with an enlargement on basal half; body length of male attains 5.5 mm., wing 6 mm.; body length of female attains 6 mm., wing 7.5 mm.

Distribution.—Specimens examined: 55 (42 males, 13 females). All in the collection of the United States National Museum except two topotypes in the collection of the writer. WASHINGTON: Holotype, allotype and 6 paratypes (2 males, 4 females) Ilwaco, Beach, [Pacific County], VII-17 (A. L. Melander) except 1 female paratype dated 27-VIII-17 (contrary to Aldrich's original published data on type series). Two topotypes, 1 male dated 27-VIII-17 and 1 female dated VII-17. CALIFORNIA: Smith River, [Del Norte County] (J. M. Aldrich) as follows: 6 males, 1 female, 12-VII-30; 28 males, 5 females, 21 to 25-VII-32; 4 males, 1 female [no dates].

Melanderia (Melanderia) crepuscula Arnaud, new species
(Figures 3, 6, 7 and 8)

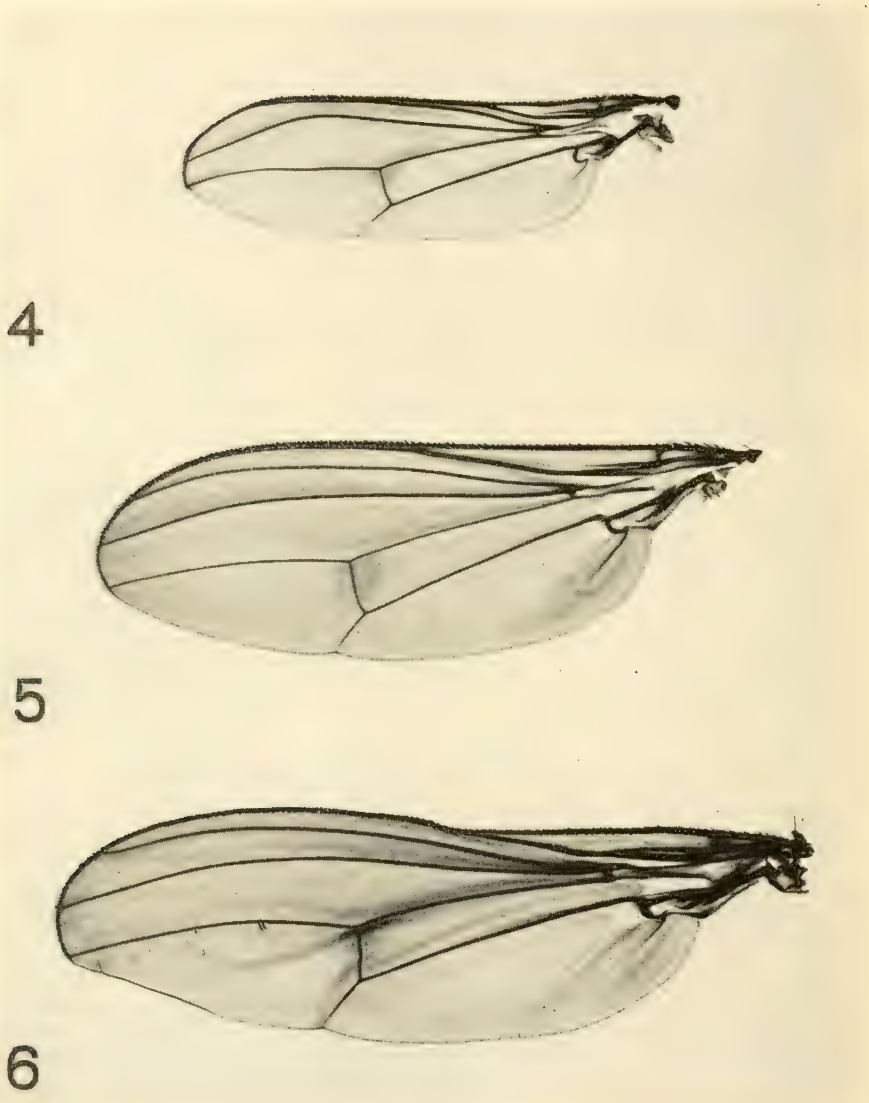
A large sized greenish species; male front femur long-haired without a tuft of bristles.

Male.—Length, 6.5 mm.; length of wing, 6.5 mm. **Head** with face and front dark metallic purple, with traces of greenish metallic iridescence, face 0.19 of head width at narrowest point. Palpi black, covered with a brownish pollen, with many black hairs; proboscis black, with brownish gray pollen except on the mandible-like parts which are shining black. Antennae black; first segment bare above but with setulae below; second segment less than half length of first, with



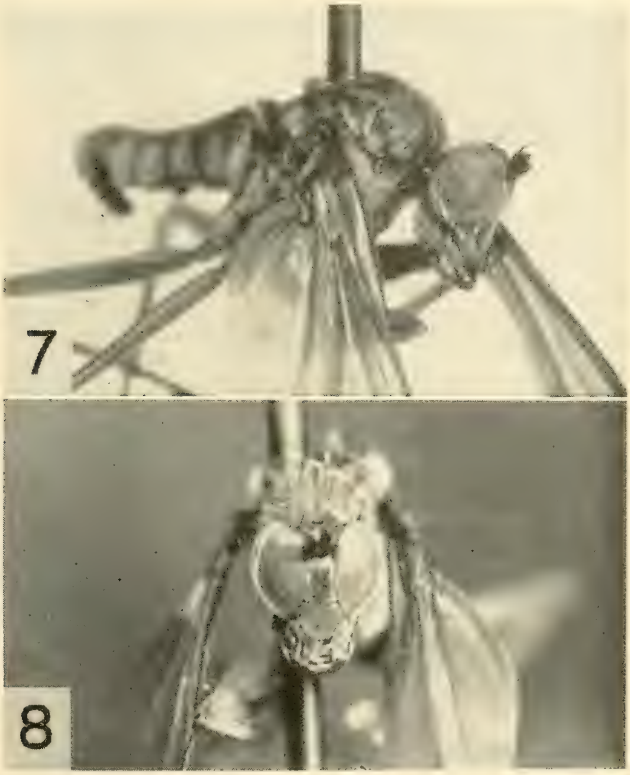
Figs. 1 to 3, inner side of front legs of male *Melanderia.* Fig. 1, *M. curvipes;* fig. 2, *M. mandibulata;* fig. 3, *M. crepuscula.* (Drawings by Arthur D. Cushman).

setulae above and below; third segment scarcely longer than wide, with short setulae on inner sides, at apex and below base of arista. Arista widened for distance twice its width and quickly tapering and slender for remainder of its length. Eyes with pale, thick, but very short pilosity. Back of head with long black hairs, the lower hairs the longest. **Thorax** with mesonotum and scutellum metallic greenish-blue with blackish reflections when viewed from above; mesonotum with two narrow blackish vittae, brownish pollinose above and whitish pollinose at sides. Scutellum with a well developed pair of midscutellar bristles and a number of very fine long hairs along posterior margin. Pleura green, with some iridescence, whitish pollinose; propleura with several black hairs and sternopleura with long slender black hairs on posterior half. Prosternum black, whitish pollinose, without hairs or bristles. Legs with front coxae, trochanter and femur (fig. 3) green with a thick white pollinosity; front tibia brownish pollinose; front femur with long black hairs and tibia with a comb of short black bristles on



Figs. 4 to 6, left wings of male *Melanderia*, enlarged same magnification. Fig. 4, *M. curvipes;* fig. 5, *M. mandibulata* (paratype); fig. 6, *M. crepuscula* (holotype).

apical half. Middle and hind legs green, slender; the femora whitish pollinose on basal half and brownish pollinose apically; tibiae mostly brownish pollinose; femora and tibiae with long black hairs except for mid tibiae which are short haired and with one postero-dorsal bristle near base and three almost equally spaced postero-ventral bristles. Wing (fig. 6) elongated, narrow, brown in color, the third and fourth veins rather parallel and not approximate at wing apex; hind cross vein at right angles to costa. Halter yellow, with about 8 minute



Melanderia mandibulata, male holotype. Fig. 7, lateral view; fig. 8, front view.

black setulae on outer side. **Abdomen** colored as thorax, six visible segments brownish pollinose above and whitish pollinose on sides, somewhat compressed laterally. Hypopygium black, whitish pollinose, left basal portion with long black hairs; lamellae blackish with black hairs.

Female.—Body length 7.5 mm.; wing length 8 mm. Similar to male in coloration, but differs structurally in that the face is wider, 0.25 of head width at narrowest portion; legs less hairy and mid tibiae without bristles; abdomen with but five well developed segments ending in a short blackish spined ovipositor.

Types.—Holotype male, allotype, and 9 paratypes (3 males, 6 females) collected at Pt. Pinos, Pacific Grove, Monterey County, CALIFORNIA, 23 May 1952, (P. H. Arnaud, Jr.). Type No. 63,459, U.S.N.M. Holotype and allotype in the collection of the U.S.N.M. and paratypes in the collections of A. L. Melander, F. C. Harmston, and the writer. This series was collected at sunset on large rocks whose bases were washed by ocean breakers.

This species is allied to *mandibulata*, but it is readily distinguished in the male by the characters furnished in the key. *M. crepuscula* attains a larger size than *mandibulata*. I am unable at this time to provide characters which will consistently separate the females of these two species.

Subgenus **Wirthia** Arnaud, new subgenus

Distinguished by its bare sternopleura; first antennal segment bare below; wing with third vein arcuate and non-parallel with 4th, 3rd and 4th veins close together at wing tip. Dedicated to Dr. Willis W. Wirth. One included species.

Type.—*Hydrophorus curvipes* Van Duzee.

Melanderia (Wirthia) curvipes (Van Duzee)
(Figures 1 and 4)

1918. *Hydrophorus curvipes* Van Duzee, Ent. News, 29(2): 48-50, fig. 2 [n. sp. from San Diego and Long Beach, California]. *Additional references.*—Aldrich, 1922: 146-148 [generic transfer to *Melanderia*]; Snodgrass, 1922: 150-152, Plate 14 [morphology of head and mouth parts]; Van Duzee, 1923: 250 [in key to *Hydrophorus*]; Van Duzee, 1926: 5, 11 [p. 5, in key to *Hydrophorus;* p. 11, in list of *Hydrophorus*]; Wirth & Stone, IN: Usinger, 1956: 454 [key, distribution].

Type Depository.—No. 3501, California Academy of Sciences, San Francisco.

Species Characterization.—A medium sized grayish green species; face metallic green; front femur of male with a row of ventral bristles which can fit into the modification of the curved apical portion of tarsus; body length of male attains 4.5 mm.; body length of female attains 4.7 mm.

Distribution.—Specimens examined: 70 (30 males, 40 females). All in the collection of the United States National Museum. CALIFORNIA: Paratype female, San Diego, [San Diego Co.], 5-IV-15, (M. C. Van Duzee). 1 male, 2 females, Santa Barbara, [Santa Barbara Co.], 6-VII-17, (J. M. Aldrich). 29 males, 37 females, Laguna [Beach, Orange Co.], 1-VIII-32, (J. M. Aldrich).

Key to Males of Melanderia

1. Sternopleuron haired on posterior half; first antennal segment with stout setulae below (subgenus *Melanderia*) 2
   Sternopleuron bare; first antennal segment bare below (subgenus *Wirthia*) (Santa Barbara Co. south to San Diego Co., Calif.) (figs. 1, 4). ..... *curvipes* (Van Duzee)
2. Front femur of male on inner side near base with a dense tuft of 8-10 bristles on a very slight protuberance, basitarsus modified with an enlargement on basal half (Del Norte Co., Calif. north to Ilwaco, Wash.) (figs. 2, 5) ..... *mandibulata* Aldrich
   Front femur of male without a tuft of bristles on inner side near base, but long black haired; basitarsus without enlargement on basal half (Monterey Co., Calif.) (figs. 3, 6, 7, 8) ..... *crepuscula*, new species

Acknowledgments

I am indebted to Dr. A. L. Melander of Riverside, California, who gave me a pair of topotypes of *Melanderia mandibulata* Aldrich, and to Dr. Alan Stone of the Entomological Research Branch, Washington, D. C., for suggestions in the preparation of this paper.

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DESIGNATION OF THE TYPE SPECIES OF THE SUBGENUS NEOTHEOBALDIA DOBROTWORSKY (GENUS THEOBALDIA NEVEU-LEMAIRE, 1902)

(DIPTERA, CULICIDAE)

The subgenus *Neotheobaldia* Dobrotworsky (1954, Proc. Linn. Soc. N.S.W. lxxix:65-78) was described on the larval characters of *Theobaldia hilli* Edwards. This species is the type of the subgenus *Neotheobaldia*.—N. V. DOBROTWORSKY, *Zoology Department, University of Melbourne, Australia.*

THE IDENTITY OF CULEX AESTUANS WIEDEMANN

(DIPTERA, CULICIDAE)

The species *Culex aestuans* Wiedmann (Aussereurop. zweifl. Ins. 1:11, 1828) was described from specimens from Brazil in Wiedemann's own collection. Theobald (Mon. Culic. 2:151, 1901) synonymized this under *Culex fatigans* Wiedemann, a synonym of *Culex pipiens quinquefasciatus* Say. Howard, Dyar and Knab (Mosq. N. and C. Amer. 3:320, 1915) questioned the synonymy and since that time the species has remained unidentified.

Through the kindness of Dr. Max Beier of the Vienna Museum we have seen five specimens, probably all original material. These are in very good condition and all agree well with *Culex pipiens quinquefasciatus*, thereby verifying Theobald's synonymy. The specimens bear the following labels:

"Brasilien/aestuans m. Coll. Wiedem." Male and female. I have mounted the terminalia of this male on a slide and here designate this specimen as the lectotype.

"aestuans m. Coll. Wiedem./C. aestuans m. Bracilia de Winth." Female.

"Brasilien/aestuans Coll. Winthem./aestuans Wied. Brasilia." Male.

"Brasilien/aestuans Coll. Winthem." Female—

ALAN STONE, *Entomology Research Division, U. S. Department of Agriculture, Washington, D. C.*

THE MOSQUITOES OF MINNESOTA, by A. Ralph Barr. Technical Bulletin No. 228, University of Minnesota Agricultural Experiment Station, St. Paul. April, 1958. Price, $1.00.

The introduction to this work consists of the historical background of the mosquitoes of the state, their biology, and instructions in technique and handling. The systematic treatment is introduced by generic keys for females, male genitalia, pupae and larvae. The main part of this section contains figured descriptions of species with keys, information on their biology, distribution inside and outside Minnesota, and their importance as pests or disease vectors.

By being published so shortly after Carpenter and LaCasse's big North American monograph, this report may tend to lose some of its importance on a country-wide basis, and become another addition to an already too long list of references.

However, for workers interested in the limited area which it covers, it ranks as one of the best published to date, even though the illustrations might have been easier to use had they all been placed together. The drawings by Mrs. Sylvia Barr are excellently executed in a technique which makes important features stand out and easy to follow. The descriptions of species are brief and concise. The author states that the keys may not always work, but this might be regarded as a valuable bit of information. To aid in identification of closely related species, measurements by histograms of comb scales and various hairs are presented. A thorough field biology is also included.

All in all this is one of the best state reports on mosquitoes yet to have been published.—HELLE STARCKE, *U. S. National Museum, Washington 25, D. C.*

THE CORRECT NAME FOR A PEST OF BEANS

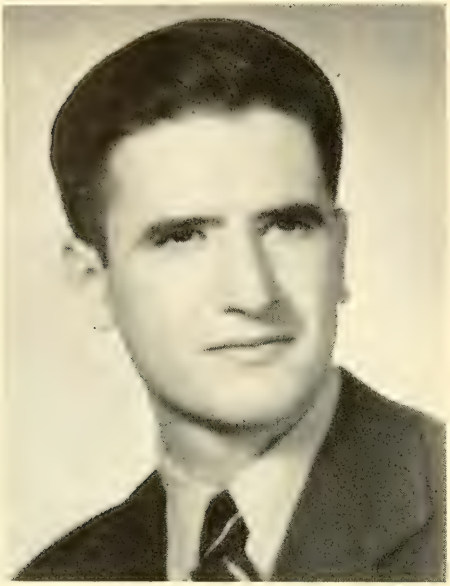
(LEPIDOPTERA, OLETHREUTIDAE)

Laspeyresia fabivora Meyrick, 1928, Exotic Microlepidoptera, 3:449.

Laspeyresia leguminis Heinrich, 1943, Proc. Ent. Soc. Washington, 45(3):71, pl. 4, figs. 1-5. **(New synonymy).**

Meyrick based his description on a single male from Honda, Colombia, reared "in fresh beans." Heinrich's description was based on a series from Peru, Panama and El Salvador. Upon the receipt of specimens from Bogota, Colombia and a comparison of this new material with my figure of Meyrick's type, my suspicion was aroused. In August, 1957, I compared an example with Meyrick's type and confirmed the identity of all the specimens. This economically important pest of lima and string beans must now be known as *Laspeyresia fabivora* Meyrick.

Distribution—Colombia, Peru, Panama, El Salvador and Mexico.—J. F. GATES CLARKE, *U. S. National Museum, Washington 25, D. C.*



FRANCISCO DE ASIS MONROS, 1922-1958

News of the death by accident on May 3, 1958, of Francisco de Asís Monrós has reached us from Argentina. His wife wrote that he was overcome when disinfecting his beetle collection and no medical help was at hand to save his life. He was one of that group of brilliant young scientists from the Miguel Lillo Institute at Tucumán who have come to the United States to study in recent years. While here he and his wife (a scientist herself in plant pathology) made many friends among entomologists who recognized his outstanding ability.

He was born in Barcelona, Spain, on June 6, 1922. Even before leaving Spain, at the age of 17, he was studying entomology under Dr. Francisco Español at the Barcelona Museum. In Argentina he attended the College of Agricultural and Veterinary Science at the National University of Buenos Aires, from which he received the degree of Agricultural Engineer. He was appointed systematic entomologist at the Miguel Lillo Institute in 1948. In 1956 he became full professor of Agricultural Zoology at the College of Agriculture there, and was Vice-Dean of that College at the time of his death.

During the hot summer months at Tucumán, Monrós, often with his wife or other colleagues, went on collecting trips not only throughout Argentina but into adjacent countries. On the way to the United States, where he was awarded a Guggenheim fellowship in 1952, he collected in Peru, Ecuador, and Panama. In the United States he spent most of his time at the National Museum at Washington and the Museum of Comparative Zoology at Cambridge, also a shorter

time at the American Museum of Natural History. At all these museums he made many notes and drawings of the collections he studied. During the summer he and his wife toured the country by bus, going even to the Pacific coast, and visiting entomologists and museums on the way. On his way back to Argentina he visited Brazil. In 1955-56 he was the recipient of a fellowship from the French government to work at the Paris Museum, and he spent the year in France with visits to the museums in England, Germany, and Switzerland. The summer before his death he spent some months collecting in the high Andes of Bolivia.

He was tireless in working on his chrysomelid beetles. His collection numbered 54,245 beetles. In his short life he published over 60 papers, many of them extensive in scope, and all illustrated by his fine pen and ink drawings. Some were written in French and English although the majority are in Spanish. His early papers were mostly on Argentine beetles, but later he wrote on both North and South American beetles, and prepared re-editions for three fascicles of the Coleopterorum Catalogus (Sagrinae, Lamprosomatinae and Clytrinae). The first volume of his largest work, "The genera of Chrysomelidae," went to press a few days before his death.

His taxonomic work is of the highest order. He was quick to see relationships, his judgment was good, and he was painstakingly conscientious. He was in communication with entomologists all over the world and alive to everything that was being done in his field. Unusual, too, was his ability to pick up languages. He and his wife always talked Catalan to each other instead of Spanish. It sounded a good deal like French to me. Once he helped us entertain a Parisian who had little knowledge of English and pretended he was deaf. When Francisco took over in French, however, the man's deafness entirely disappeared. As a boy he had learned German from a neighbor and spoke it easily. Not long after coming to the United States he was speaking English understandably, having long been able to read it.

He had all the ingredients of a naturalist, with that early and deep devotion to his chosen field that is characteristic of all naturalists. He used to tell me that he would always be happy because of this interest in natural science. Gentle, with high idealism, and single-hearted in his pursuit of the knowledge of beetles, in particular Chrysomelidae, with a great capacity for making friends, he was already high in his attainments, both as a scientist and as a man among men. It is a pity that he died so young. Our sympathy is extended to his wife and little daughter, Silvia.

His bibilography will be published by the Miquel Lillo Institute.

DORIS H. BLAKE

SOCIETY MEETINGS

Held in the U. S. National Museum

701st Meeting, April 3, 1958:

A new member, Dr. R. S. Beal, taxonomist in the Insect Identification and Parasite Introduction Laboratories, was elected.

Mr. Ray R. Kriner explained his method of taking close-up pictures of insects and showed us a number of excellent Kodachrome slides of live insects.

A booklet, "Insects not Known to Occur in the United States," published by the Plant Pest Survey Section, was exhibited and discussed by Mr. L. G. Davis.

Dr. F. L. Campbell called attention to recent joint meetings of the Washington Junor Academy of Sciences with the Senior Academy and the Washington Section of the American Chemical Society. He suggested that a similar joint meeting be arranged next fall between the Junior Academy and the Entomological Society of Washington.

As a follow-up of the Society's collection of money for minuten pins for the Hungarian Museum, Dr. Kostarab reported that the pins have been received. In the name of the Hungarian entomologists, he thanked the Society for the gift. As the collection exceeded the cost of the pins, Dr. Kostarab returned $1.20 to the Society.

The speech of the evening, "Professionalism in Entomology," was delivered by Captain K. L. Knight of the U. S. Navy. He discussed the professional status and standards for entomologists. An enthusiastic discussion followed.

Visitors introduced were as follows *Arthur H. Mason, Ward B. Watt* and *S. Wiackowski.*

The meeting adjourned at 10 P. M.

702nd Meeting, May 1, 1958:

President Sailer announced that the annual picnic, held jointly with the Insecticide Society of Washington, will take place at the Log Lodge, Agricultural Research Center, June 7. Members from our Society appointed to the Picnic Committee are Rose Ella Warner, P. G. Piquett and Helen Sollers.

New members elected to the Society are William S. Murray, Entomologist, Potomac River Command, and James W. Gentry, Department of Entomology, Walter Reed Army Institute of Research, Washington.

In connection with the Science Fair, three exhibits were on display and were described by the exhibitors. A brief history of science Fairs was given by Mr. Howard B. Owens. The winner of the Fair in northern Virginia, Hugh McMahan, discussed his exhibit which concerned the destruction of wood by fungi and insects. Ward B. Watt, the winner for Washington, D. C. explained his use of paper chromatography as a means of distinguishing two species of butterflies.

Gail Mackiernan, the winner in Montgomery County, Maryland, discussed her exhibit on color formation in wings of Lepidoptera. The fourth winner, Richard Thomas, of Prince Georges County, Maryland, was unable to be present. Each exhibitor was presented with a hand lens as a gift from our Society.

Dr. H. H. Shepard showed 2 color Kodachrome slides of live butterflies. These were followed by an exhibit of a recently accessioned female specimen of the cockroach, *Megaloblatta blaberoides* (Wlk.) by Dr. A. B. Gurney. The overall length including folded wings, is 100 mm. and the wing expanse is 185 mm. No records of larger cockroaches have been found, though other specimens of approximately this size are known. No fossil species are larger than the largest living species. The ootheca borne by this species is 41 mm. long.

Another letter from the Hungarian Museum thanking the Society for the minuten pins was sent by Dr. Z. Kaszab to Dr. Campbell, who read the communication before the Society.

Our featured speaker of the evening, Miss Alice Gray, Scientific Assistant at the American Museum of Natural History, gave a most informative talk on the Southwestern Research Station of the above-mentioned museum. She explained the opportunities for research there and showed numerous interesting colored slides of the station as well as the flora and fauna of the area.

The following visitors were introduced: *Mrs. E. B. Burch, James H. Lowe, Jr., Ralph Watt, Mrs. D. Mackiernan, K. W. McMahan, Gilbert Levesque, Donald E. Barcus,* and *Caryle Nibley, Jr.*—HELEN SOLLERS, *Recording Secretary.*

ANNOUNCEMENT

An important part of the Society's program is to make available back issues of the *Proceedings.* In recent months stocks of many issues have dwindled to unprecendented lows. Members who wish to contribute to this important function are urged to send any of their back issues (preferably with covers unmarked) to the Custodian (address on inside front cover).

A Cyanamid Report

MALATHION
FOR DIRECT APPLICATION ON ANIMALS

With newly-granted residue tolerances, malathion can be applied directly to beef cattle, poultry, and swine. This is the result of three years of extensive research in 11 states. The work proved conclusively the safety and usefulness of malathion as a spray for controlling cattle and poultry lice, poultry mites (northern fowl and chicken red mite), and cattle and poultry ticks. In addition, malathion dust may be applied to nests, litter, and floor space. Roost paints using malathion emulsifiable liquid may also be used in poultry houses. In addition to spraying beef cattle with malathion for lice control, rubbing devices incorporating the product have been most effective in suppressing lice and horn flies.

Do not apply malathion to lactating dairy cows, since it has not yet been accepted for this use, nor should it be used on calves under one month of age.

PROTECTANT FOR STORED GRAIN

With newly-granted residue tolerances for malathion on wheat, barley, oats, rice, rye, corn, grain sorghum, and peanuts (post-harvest), grain handlers storing grain have a method of protecting grain from loss to insects. Malathion, either in dust or spray form, *applied to the grain as it is being loaded into bins,* affords protection against confused flour beetle, rice weevil, granary weevil, saw-toothed grain beetle, flat grain beetle, red flour beetle, rusty grain beetle, lesser grain beetle, and Indian meal moth. It is also suggested as a residual wall, floor, and machinery spray in grain elevators, in treating truck beds, box cars, and ships' holds before loading grain. Where Indian meal moth infestations develop, *surface* applications of malathion dusts or sprays at prescribed intervals afford protection.

NEW USES FOR MALATHION ON CROPS

Tolerances have been established on 37 additional crops, including:

Vegetables	Fruits
Asparagus	Bramble family
Carrots and other root crop	Nectarines
Garlic—Leeks—Shallots	Quinces
Several leaf vegetables	Currants
Pumpkins	Gooseberries

Also, small grains, cotton, mushrooms, peppermint, spearmint, corn and rice. With these additions, malathion is now recommended on 93 crops.

Developers and producers of malathion and parathion

CYANAMID

American Cyanamid Company, Insecticide Department,
30 Rockefeller Plaza, New York 20, N. Y.

Vol. 60 OCTOBER, 1958 No. 5

PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY
of
WASHINGTON

U. S. NATIONAL MUSEUM
WASHINGTON 25, D. C.

PUBLISHED BIMONTHLY

CONTENTS

(Continued on Back Cover)

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884

MEETINGS

Regular meetings of the Society are held i Room 43 of the U. S. National Museum on th first Thursday of each month from October to Jun inclusive, at 8 P.M. Minutes of meetings are pu lished regularly in the *Proceedings*.

MEMBERSHIP

Members shall be persons over 18 years of ag who have an interest in the science of entomolog Annual dues for members are $4.00; initiation fe is $1.00 (U. S. currency).

PROCEEDINGS

Published bimonthly beginning with February b the Society at Washington, D. C. Members in goo standing are entitled to the *Proceedings* free c charge. Non-member subscriptions are $5.00 pe year, both domestic and foreign (U. S. currency) payable in advance. All remittances should b made payable to *The Entomological Society c Washington.*

The Society does not exchange its publicatio for those of other societies.

All manuscripts intended for publication shoul be addressed to the Editor. Acceptable papers su mitted by members will be published in the orde received and will be given precedence over thos by non-members. Immediate publication may b obtained at a cost to the author of about $12.0 per printed page, plus cost of *all* engraving. Titl of papers should be concise but comprehensive an should indicate the systematic position of the su ject insect. By-lines should indicate present mai ing address of the author and his organizatio affiliation, if possible. Citations in the text of p pers longer than one printed page should be b author and date and should refer to a list of co cluding references in which author, year, titl name of publication, volume and page are given i that order. In shorter articles, references to liter ture should be included in parentheses in the tex

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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 60 OCTOBER, 1958 No. 5

TWO NEW SPECIES OF ALASKAN PROSIMULIUM, WITH NOTES ON CLOSELY RELATED SPECIES

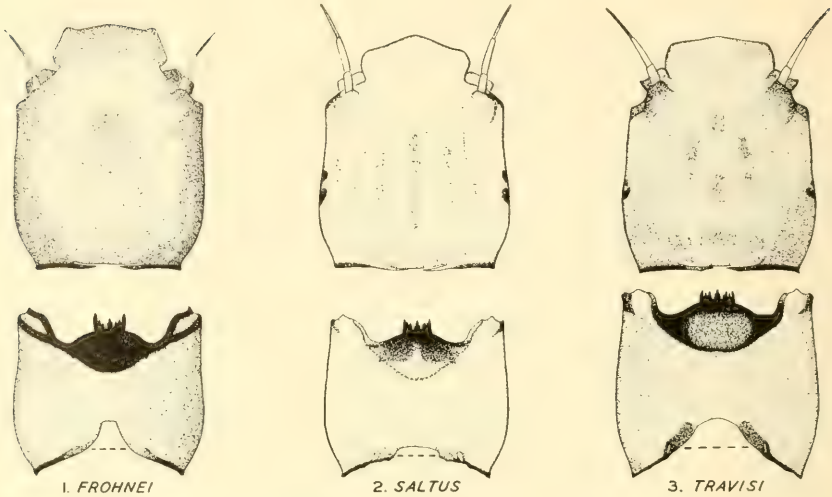
(DIPTERA, SIMULIIDAE)

KATHRYN M. SOMMERMAN, *Arctic Health Research Center*, P.H.S., *Department of Health, Education, and Welfare, Anchorage, Alaska.*

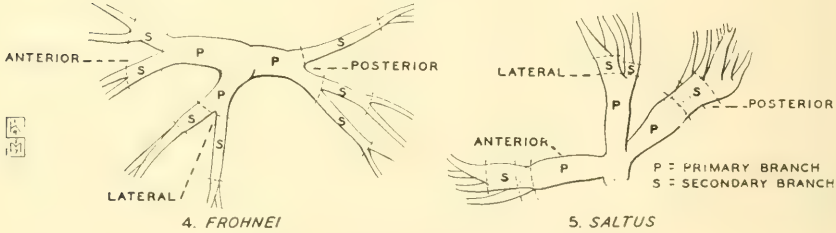
This presentation is supplementary to the papers by Stone (1952) and Sommerman (1953) on the taxonomy and identification of Alaskan black flies. It extends the known, described species from Alaska to 38, with 11 belonging to the genus *Prosimulium*. In addition the *P. hirtipes* complex in Alaska is now known to consist of at least two entities. One is here designated *hirtipes* 2 and overwinters in the larval stage. According to correspondence from Dr. Rothfels the chromosome pattern of this one is similar to the *hirtipes* 2 of Ontario, with a minor modification of the sex determining mechanism. However, the Ontario larvae differ in general appearance from these in the Anchorage area. This *hirtipes* 2 was formerly identified as *P. hirtipes* (Fries). The other member of the *hirtipes* complex in Alaska is called tentatively *hirtipes* E, and it overwinters in the egg stage. The larva of this was previously thought to be the larva of *P. travisi* Stone. The true larva of *travisi* is herein described for the first time.

I wish to thank Dr. K. H. Rothfels for information concerning the relationship of *P. frohnei*, n. sp., and *travisi* Stone, based on studies of the chromosomes of the salivary glands of mature larvae. I am greatly indebted to Dr. Alan Stone for the loan of paratypes of *P. saltus* Stone for study, and to Dr. Lewis Davies and Dr. Douglas Davies for the gift of specimens of the *hirtipes* complex from their countries.

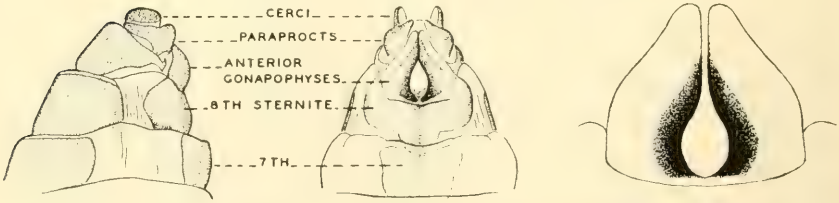
All the following descriptions and comments refer to alcoholic specimens. The drawings were made from terminalia cleared in warm NaOH, rinsed, and propped in position on a gob of vaseline submerged in alcohol in a Syracuse dish. A stereoscopic microscope was used with a "squared" ocular. The male ventral plates, ventral view, were placed in position so that the tip of the lip coincided with the arch of the anterior internal fork. The side views of the ventral plate were included to show the length of the plate, curvature, and depth of the depression on the dorsal surface. The dististyles were placed so that their condyles were superimposed, resulting in a sub-dorsal view. The larval drawings were made from uncleared specimens in alcohol.



FIGS. 1-3 LARVAL HEAD CAPSULES, DORSAL AND VENTRAL VIEW



FIGS. 4-5 BASES OF RESPIRATORY ORGANS

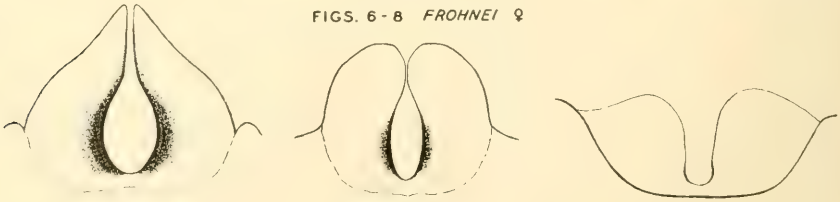


6. TERMINALIA LATERAL VIEW

7. VENTRAL VIEW

8. ANTERIOR GONAPOPHYSES

FIGS. 6-8 *FROHNEI* ♀

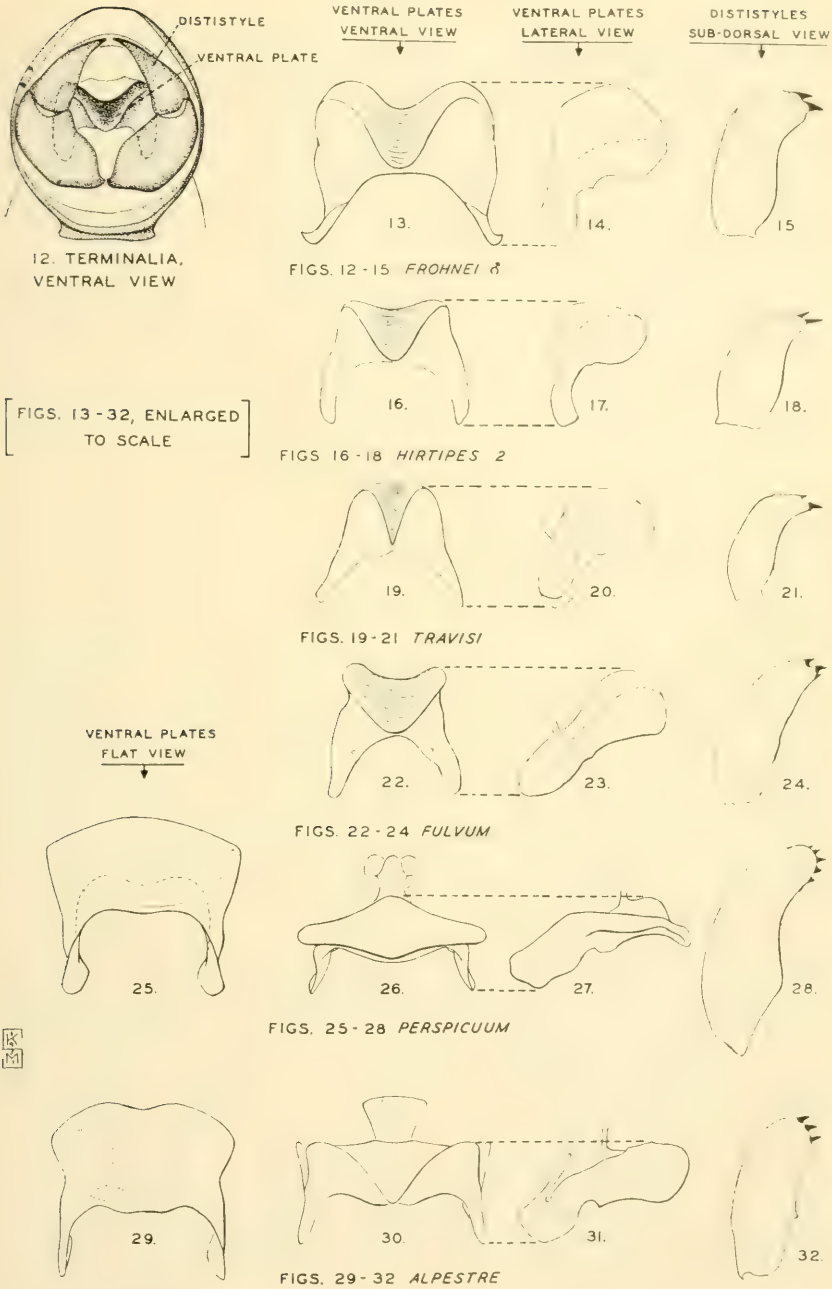


9. *TRAVISI*

10. *HIRTIPES* 2

11. *PERSPICUUM*

FIGS. 8-11 ANTERIOR GONAPOPHYSES, ENLARGED TO SCALE


DISTISTYLE
VENTRAL PLATE
VENTRAL PLATES VENTRAL VIEW
VENTRAL PLATES LATERAL VIEW
DISTISTYLES SUB-DORSAL VIEW
12. TERMINALIA, VENTRAL VIEW
13.
14.
15
FIGS. 12-15 FROHNEI ♂
[FIGS. 13-32, ENLARGED TO SCALE]
16.
17.
18.
FIGS 16-18 HIRTIPES 2
19.
20.
21.
FIGS. 19-21 TRAVISI
VENTRAL PLATES FLAT VIEW
22.
23.
24.
FIGS. 22-24 FULVUM
25.
26.
27.
28.
FIGS. 25-28 PERSPICUUM
29.
30.
31.
32.
FIGS. 29-32 ALPESTRE

Prosimulium frohnei, new species

The superficial appearance and the chromosome patterns of the larva of this species indicate close relationship with *P. ursinum* (Edw.); the pupa is similar to *saltus* and the adults to the *hirtipes* complex. The mature *frohnei* larva in alcohol is approximately 9.0 mm. long and the head capsule 1.0 mm. wide. The body is grey-brown with the head capsule very dark brown, fig. 1. The antenna is short, so also its basal segment. The mandibular phragma is wide and complete, extending all the way to the mentum. The median mental tooth is directed inward, appearing much shorter than the last lateral teeth. There are 24 rays in the mouth fan, and 12-14 respiratory filaments. The mature larva of this species can be distinguished from *ursinum* (fig. 9, Sommerman, 1953) by the darker head capsule of the former, more constricted neck, narrower throat cleft, wide and complete mandibular phragma, larger eye spots and absence of pigmented swelling below eye spots. It differs decidedly from *saltus*, fig. 2, and the Alaskan members of the *hirtipes* complex (figs. 15, 16, Sommerman, 1953) in its larger size (mature *saltus* larva in alcohol being 6.2 mm. long with head capsule 0.7 mm. wide), dark head capsule with constricted neck and short antennae, narrower and deeper throat cleft, complete mandibular phragma, and apparent short median mental tooth.

The pupa of *frohnei* is much like *saltus* but is larger, being 4.5 mm. long, and differs in that the respiratory filaments number 12-14 and the primary branches are stouter basally and are shorter than the secondary branches, fig. 4. This short primary branch with the two longer secondary branches, is especially pronounced on the middle or lateral primary branch of the respiratory organ. In *saltus* the primary branches are stouter distally and are longer than the short secondary branches, fig. 5, and there are 14-16 filaments. In addition *frohnei* differs from *ursinum* and the Alaskan members of the *hirtipes* complex in the lesser number of respiratory filaments and in that their primary branches are stout and extremely divergent. The pupal case is loosely woven, coarse and sparse.

The adults of both sexes of *frohnei* differ noticeably from those of the *hirtipes* complex and from *saltus* in their dark brown color and silvery pubescence, and third segment of all tarsi broadly bare and pale ventrally. The antero-posterior length of anterior gonapophyses *in situ* of female is approximately twice the dorso-vental length of the cerci. Head width of males, equals or exceeds width of thorax, and dorsum of ventral plate broad with a deep median concavity, and pronounced recurved lip.

Female.—General color dark brown. Wing length 5.0 mm. Head dark brown, with pale silvery hair; frons distinctly widened above. Antennae with 11 dark brown segments; scape, pedicel and basal part of first flagellar segment darkest, probably because of fine silvery pubescence on remaining segments; first flagellar segment slightly longer than pedicel. Palps with first, third and fourth segments light brown, second, dark brown with pale sensory organ containing dark spot.

Mandible serrate; maxilla with retrorse teeth. Mesoscutum dark brown with recumbent pale silver hair. Scutellum light brown with erect silver hair. Postscutellum shiny dark brown. Pleuron brown; hairs of pleural tuft fine and pale silver; sternopleural hairs absent. Hair on base of costa and on stem vein pale. Legs light brown; inconspicuous small pale area mesally on anterior surface of fore coxae; both extremities of tibiae with narrow dark band; tarsi dark brown. On all legs third tarsal segment with pale (almost white) bare area ventrally. Claws without teeth. Antero-ventrally abdomen pale, becoming progressively more fumose posteriorly, and covered with fine, pale hairs; sclerotized tergites large and brown, some with pale flecks. No sclerotized sternal plates cephalad of the seventh sternite, which is pale brown; eighth sternite conspicuous brown. Anterior gonapophyses with tapered apex, fig. 8, and black sclerotized strip extending distally beyond mesal emargination; length of anterior gonapophyses twice dorsoventral length of cerci, figs. 6 & 7.

Male.—General color darker than female but with same pale silvery pubescence. Wing length 4.5 mm. Abdominal sternites sclerotized and clothed with pale hairs. Width of truncate posterior margin of ventral plate about equal to width of its anterior internal fork; dorsum of plate with deep median concavity, figs. 12, 13 & 14. Dististyle with two stout distal teeth, fig. 15.

All the following types were individually reared from pupae and each is accompanied by the pupal exuviae and case. The pupae were collected by the author July 26, 1956, from a small trickle parallel to the road at Eklutna Lake, Alaska, elevation 875 feet. The adults emerged between July 27 and 31.
Holotype: Female, em July 31. **Allotype**: Male, em July 27. **Paratypes**: 9 males, 14 females. The holotype, allotype and five paratypes of each sex are deposited in the collection at U. S. National Museum; 2 male and 4 female paratypes are deposited at Illinois Natural History Survey; 1 male and 3 female paratypes at Canadian National Museum; and 1 male and 2 female paratypes at Arctic Health Research Center. In addition a few specimens of larvae and pupae are also deposited in the collections of these institutions.

This species is named in honor of Dr. William C. Frohne, who has contributed so much to our knowledge of Alaskan biting flies.

P. frohnei has been taken only from a tiny spring-fed trickle, 6-12 inches wide, an inch or less deep, which flowed parallel to the road and was exposed to sunshine part of the day. There were a few old leaves and small stones in the trickle and, later in the season, rather long strands of a rope-like alga attached to the rocks. This species has but one generation a year, overwintering in the egg stage. The eggs hatched in early May or June, depending upon the progress of the season. The larvae attached to the under and deflecting surfaces of loose stones or to leaves, directly in the slight current, which was probably one foot per second at the most. The larval and pupal stage together required about two months, the adults emerging in late June or July, depending upon seasonal progress. The host of this species is not known.

Prosimulium travisi Stone

The mature larva of this species remotely resembles *P. fulvum* (Coq.). The chromosome patterns of the salivary glands of the mature larva are distinct. The larva can be distinguished readily from *fulvum* by its dark brown, patterned head capsule, and dark color of the body. Sometimes the dark spots of the dorsal head pattern, fig. 3, are so faint as to be almost non-apparent but the two pale crescents are diagnostic. The median mental tooth is longest, with the last laterals just slightly shorter. The second innermost lateral tooth is the next longest with the adjacent one slightly shorter, and the inconspicuous innermost one the shortest. The mature preserved larva is 7.5 mm. long and the head capsule is 0.8 mm. wide.

The pupa is readily distinguished from all other Alaskan species of *Prosimulium* by two of the characters Stone (1952) mentioned—the pronounced rugose condition of the deeply pigmented dorsum of the thorax and the closely clumped respiratory filaments.

The adults can be distinguished from those of the *hirtipes* complex by the ashy grey sides of the thorax and abdomen. In addition the females have the second segment of the palps blackish brown, much darker than the clypeus. The anterior gonapophyses of the female are longer than the dorso-ventral length of the cerci and the distal tips of the gonapophyses are acute, fig. 9, whereas those of *hirtipes* 2, fig. 10, are more rounded and are about as long as the cerci. The lip of the ventral plate of male *travisi*, figs 19 & 20, is much narrower than the anterior internal fork and it is sharply pointed. There is, at most, only a slight basal concavity on the dorsal surface of the plate. The lip of the ventral plate of male *hirtipes* 2, figs. 16 & 17, and *fulvum*, figs. 22 & 23, is rounded and the surface of the plate is distinctly concave. The hind femora of the males of *travisi* and *hirtipes* complex are brown so they can not be distinguished from each other on that basis. The dististyles of *travisi*, fig. 21, are truncate and have two or three distal teeth while those of *hirtipes* 2, fig. 18, and *fulvum*, fig. 24, are more tapered or rounded and also usually have only two teeth.

Larvae and pupae of this species have been taken in small spring-fed streams above timberline in the vicinity of Anchorage. The stream speeds ranged from 2.5 feet per second to tumbling. This species has but one generation a year, overwintering in the egg stage. The eggs probably hatched during June at this elevation. Mature larvae and pupae were taken the middle two weeks of August. The larvae and pupae were attached to the under and deflecting surfaces of loose stones directly in the current. They were taken in direct association with mature larvae and pupae of a species of *Gymnopais*. The host of *travisi* is not known. Larvae, pupae, and reared adults of this species are deposited in the collections of the following institutions: U. S. National Museum, Canadian National Museum, Illinois Natural History Survey, and Arctic Health Research Center.

Prosimulium perspicuum, new species

This species appears to be most closely related to *P. alpestre* D., R. & V. The "fixed" mature larvae prepared for chromosome study revealed no patterns suitable for study. All stages,—larvae, pupae and adults of *perspicuum* are easily distinguished from *alpestre* and from all the other known species of Alaskan *Prosimulium*.

The mature larva in alcohol is approximately 6.0 mm. long and the head capsule 0.65 mm. wide. The living larva is almost transparent except for the head capsule which is off-white. Both body and head capsule of preserved specimens are opaque white with fumose dorsal bands on abdomen. Sommerman, 1953, fig. 13 depicts the dorsal and ventral aspects of the head and gives additional characters in the key for differentiating the larva of this species. It is very difficult to determine the exact anterior limit of the throat cleft in some specimens because of the transparent surrounding area of the head capsule. There is slight variation in the length of the mental teeth, but the median tooth is always longest, and in general the projections on the median tooth are about as long as (on the level with) the second innermost lateral tooth; the last lateral tooth is slightly shorter, the tooth adjacent to it a little shorter still, and the inconspicuous innermost lateral tooth the shortest of all. There are approximately 36 rays in the mouth fan, and 16-21 respiratory filaments.

The preserved pupa is approximately 3.5 mm. long, exclusive of the respiratory filaments. The pupal exuviae are pale excepting for light brown dorsum of thorax and respiratory filaments. The number of dichotomous filaments varies from 16-21, usually 20. The filaments arise from three primary branches, the anterior branch ultimately producing 6, lateral 6, and posterior 8. The respiratory clump is about 1 mm. long. Antennae of both males and females extend beyond rear margin of eyes, those of females overlapping thorax. Dorsal trichomes 6, very fine, curving forward. Abdominal segments 3-4 with 8 stout hooks on posterior margin of each; tergites 5-8 with anterior row of many fine spines; terminal hooks long, slender, almost straight; segments 5-7 ventrally each with 4 retrorse hooks on posterior margin, segment 4 ventrally with 2 hooks. Pupal case is compact, rather elastic, composed of very fine, colorless strands which entrap fine particles of silt producing a felt-like light gray mass that covers the body except for dorsum of thorax and respiratory organs. The pupa is readily distinguished from *alpestre* by the number of respiratory filaments.

Female.—General color dark brown. Wing length 4.0 mm. Head dark brown with rather coarse pale hair; frons distinctly widened above. Antennae long, with 11 dark brown segments, the pedicel largest with f_1 a bit smaller and f_9 longest of all segments. Second segment of palps dark brown, slightly darker than clypeus. Margin of mandibles near tip with about a dozen short protrusions, apex with about a half-dozen longer projections. Tip of maxillae armed with fine bristle-like projections. Mesoscutum dark brown with short, sparse, pale recumbent hair. Scutellum dark brown with erect hair. Postscutellum elongate, shiny dark brown.

Pleuron brown; a few pale hairs in pleural tuft; sternopleural hairs absent. Hair on base of costa and stem vein sparse, short and rather pale. Legs brown; sparse dark hair on coxae. Claws with subbasal rounded tooth adjacent to basal swelling of similar size so that claw appears to have two basal teeth. Sides of abdomen pale with fine brown striations. Sclerotized tergites large and brown. Sclerotized brown sternal plates on segments 3-7. Anterior gonapophyses pale, truncate, not extending back to paraprocts, fig. 11. Anterior gonapophyses about as long as dorsoventral length of cerci. The female is easily distinguished from *alpestre* by the sclerotized brown sternal plates on segments 3-7.

Male.—General color darker than female. Wing length 3.8 mm. First or last flagellar segment longest of all antennal segments. Abdominal sternites dark brown and sclerotized, sparsely clothed with hairs. Ventral plate broad, margin lacking a median recurved lip, ventral surface concave and clothed apically, dorsal surface convex and shiny, figs. 25, 26 & 27. Dististyle with 5-6 distal teeth, fig. 28. The male is easily distinguished from *alpestre,* which has a median recurved hairy lip on the margin of the broad ventral plate, figs. 29, 30 & 32, and the entire body of *alpestre* is much more hirsute overall.

All the following types were individually reared from pupae and each is accompanied by the pupal exuviae and case, except for one pair which was "mass reared". The pupae were collected between August 14-30, 1957, by the author from trunks, branches, and roots of dead trees lodged in the swift water of Eagle River, a glacial stream, 13.5 miles north of Anchorage, Alaska. The adults emerged between August 19 and September 5. The majority of the type material consists of mated pairs.

Holotype: Female, em Aug. 28. **Allotype**: Male, em Aug. 27,—mated with holotype August 28, both killed August 29, unfed. **Paratypes**: 10 mated pairs; 1 mated pair plus a male; 3 pairs, mating not observed; 3 males, 3 females;—making a total of 18 male and 17 female paratypes. The holotype, allotype and five paratypes of each sex are deposited in the collection at U. S. National Museum; 4 paratypes of each sex are deposited at each of the following institutions: Illinois Natural History Survey, Canadian National Museum, and Arctic Health Research Center. (The latter also has the extra male paratype.) In addition a few specimens of larvae, pupae, reared males, and "wild" adults are also deposited in the collections of these institutions. The name "*perspicuum*" refers to the transparent condition of the living larva.

P. perspicuum has been taken in the Anchorage area from a large glacial stream, Eagle River, which fluctuates considerably in width and depth between summer and winter. This species has but one generation a year, apparently overwintering in the egg stage. The eggs probably hatched in June. During the 1957 season medium and maturing larvae were taken on July 11 from small branches trailing in the water just below the surface. The first mature larvae and one pupa were taken August 8. Later mature larvae and pupae were taken for the most part on the trailing sides of tree trunks and branches lodged in swift glacial water, 3-6 feet per second and 2-4 feet

deep. It was not possible to sample in deeper or faster water nor on boulders. The immature forms were usually a foot or so below the surface of the stream. The adults emerged the latter part of August and in early September. The summer and fall of 1957 were warm and adults, mostly males, were first taken in flight or resting on bushes along the margin of the stream on August 30. By September 13 they were swarming around cottonwood trees and crawling over their leaves at the open picnic site on the margin of the stream by the highway bridge. It was estimated that they averaged three per leaf, ventral surface. The trees were quite large, trunks 8-12 inches in diameter and the leaves had not yet begun to fall in numbers. The males tried to mate with each other. A sweep-sample was taken on each of three visits to the site between August 30 and September 16 and approximately 250 males, and only five females were taken, including one mating pair which was crawling on a leaf. Oviposition was not observed. Because this species is closely related to *alpestre* it may deposit its eggs in flight over smooth stretches of swift water while oriented up-stream, as does *alpestre*.

The reared adults of *perspicuum* showed a preponderance of males by approximately 3:1. The individual rearing cages described by Sommerman, 1956 were used, not only for adult emergence but as living and feeding quarters also. After emergence the exuviae and pupal cases were carefully removed from the moist cotton and a few granules of dextrose introduced, preferably loose on the cork bottoms. Some cages were supplied with ruptured crow berries, currants and rose hips, but these were not so satisfactory as the dextrose granules because the adults became bloated, or stuck in the exuded juice. Dextrose granules placed directly on the moist cotton proved attractive to the adults but often they became bloated. They seemed to do better if the dextrose granules were dry so long as they could get a drink of water from the wet cotton-filled tubes. Under such conditions both males and females lived a maximum of 20 days, the males averaging 13, and the females 8.5.

Mating occurred readily in these small cages. Six timed matings lasted an average of 11 minutes and 36 seconds, with the longest being 16 minutes and 15 seconds, and the shortest six minutes and 40 seconds. When the adults were put in one cage the male occasionally flitted his wings but usually he seemed to be unaware of the female until the two collided. In general virgin females offered no resistance. The males grabbed them anywhere and curled the tip of the abdomen under them and gradually moved backward until the genitalia of both were joined. During copulation the females remained in their normal upright position with all tarsi on the substrate, but the males were in various positions, sidewise with the head toward the female's head, upside down, or straight out behind the female. Usually there was at least one twist in the abdomen of the male because, upon fusion, the male genitalia are upside down. Occasionally the females walked about with the males dragging along behind. Usually the males separated

from the females but sometimes the females pushed them off with their hind tarsi. In most cases immediately after separation the males tried to regain the mating position but the females curled the tip of the abdomen and the head way under to the thorax and also pushed off the males with their hind tarsi. In one instance mating occurred for six minutes and 40 seconds and a minute later the male succeeded in regaining the mating position and the second time mating lasted 12 minutes and 35 seconds. Three times after copulation unmated males were put with the females and a second mating did not occur because the females tucked their heads and abdomens close under the thorax and pushed the males off. Most of these females that emerged in the lab mated as soon as the male was introduced, which was for the most part the same day the female emerged.

Rather well-developed eggs were present in some of the females 7-9 days after mating, most of these females having fed on dextrose. Eggs were not deposited in the cages, either on the cork bottoms or on the moist cotton, as with the females of a species of *Gymnopais* that emerged in the laboratory. Because of the close relationship between *perspicuum* and *alpestre* it is possible that the following technique may have induced the *perspicuum* females to deposit eggs, had it been tried with them. Bottle caps containing water were introduced into large cages of wild-caught *alpestre* females and they deposited eggs in the water after crawling or alighting on the surface.

The host of *perspicuum* is not known, but judging from the structure of the mouthparts, which are quite similar to those of *alpestre*, and from the fact that eggs developed when females fed on dextrose, it is obvious that this species is not blood-sucking.

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NOTES ON THE PHLEBOTOMUS OF PANAMA XV FOUR APPARENTLY NEW SYNONYMIES[1]

(DIPTERA, PSYCHODIDAE)

G. B. FAIRCHILD and MARSHALL HERTIG[2]

On working over our collections of *Phlebotomus* we have accumulated notes on several specific synonymies which it seems best to publish at this time.

Phlebotomus longipalpis Lutz and Neiva

1912, Mem. Inst. Oswaldo Cruz, 4 (1):90-92 (♀, ♂, S. Paulo, Minas, Brasil). Costa Lima, 1932, Mem. Inst. Oswaldo Cruz, 26(1):25-28 and figs. Barretto, 1947, Arq. Zool. Est. S. Paulo, 5, Art. 4:208-209 (full references).

Phlebotomus almazani Galliard, 1934, Ann. Parasit. Hum. Comp., 12(3):193-195, 1 fig. (♀, Chichen Itza, Yucatan, Mexico). Barretto, 1947, Op. cit., p. 183 (full references). Pifano and Ortiz, 1952, Rev. Sanidad Assist. Social, Caracas, 17 (12):147, fig. 1 (♀; Venezuela). Dampf, 1947, An. Esc. Nac. Cienc. Biol., Mexico, 4:424-426, figs. 1-9 (♀; redescription of type).

(New synonymy.)

There appears to be some confusion concerning the female of this species. Lutz and Neiva (1912) described the female from among specimens collected near Sao Paulo, and from Maquine and Ouro Fino in Minas Geraes, the male from a specimen from Ouro Fino. Costa Lima (1932) states, however, that the "typical" material consists almost exclusively of a large number of males taken in Quixada (Ceara) at light by Dr. Gomez de Faria. Costa Lima goes on to note that Lutz mounted three females from this material on a single slide and that he (Costa Lima) mounted some others. It is to be presumed that the photomicrograph given by Costa Lima (Plate XXX, fig. 142) is of one of these specimens. This shows a slender, fusiform finely annulate spermatheca quite unlike the barrel-shaped structure figured by most subsequent authors. In any event, if this specimen was from Ceara, it could hardly have formed part of the type series, since no such locality is mentioned in the original description. It is perhaps better to base the specific name on the male, at least until Lutz and Neiva's real co-types can be re-examined, if they still exist in recognizable condition.

Subsequent authors have either dealt with two different species when describing and figuring the spermathecae, or their figures have been inaccurate. Coutinho (1940) gives a photomicrograph of the spermatheca of a specimen from Ceara, republished more clearly in Galvao and Coutinho (1940). The reproduction is not very clear in either case, but indicates a more or less barrel shaped structure with weak or irregular annulations. A drawing in the latter paper shows a much more clearly annulate spermatheca. DeLucena (1949) figuring

[1] The work here reported was supported in part by a research grant from the National Institute of Allergy and Infectious Diseases, N.I.H., U.S.P.H.S.

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material from Pernambuco, shows the spermatheca weakly and irregularly annulate. Floch and Abonnenc (1952) consider *almazani* and *longipalpis* as distinct species, copying Galvao and Coutinho's drawing for their figure of the spermatheca of *longipalpis*, Dampf's (1947) drawing for *almazani*.

The problem is complicated by the presence of at least two other closely related males, *P. cruzi* Mangabeira and *P. gaminarai* Cordero, Vogelsang and Cossio, which occur within at least the southern portions of the range of *longipalpis* but whose females remain unrecognized. We have compared males from Paraguay, Brasil, Venezuela, Panama, Costa Rica and Chiapas, Mexico, and find that they do not differ specifically. Females from Paraguay, Venezuela, Panama, Costa Rica and Mexico also agree, except that the spermathecal ducts of the Paraguay material appear to be slightly shorter and thicker than those from the other localities. The spermathecae of these females agree reasonably well with the figures of *almazani* published by Galliard, Dampf, and Pifano and Ortiz, and with the figures of *longipalpis* published by Galvao and Coutinho, and de Lucena, taking into account the variable quality of the published figures. The only figure of the cibarium of *longipalpis* we have seen, that of Coutinho (1940), shows 10 horizontal teeth, while both Galliard and Dampf figure 8 teeth for *almazani*. All material we have examined, including the series from Paraguay, shows 8 teeth. The species has been reared several times and there seems little question as to the correct association of the sexes.

The matter is of some importance, since recent work by Deane (1956) indicates that *longipalpis* is the most important vector of visceral leishmaniasis in Brasil. The known distribution of the species suggests also that it prefers relatively dry areas. The localities in Panama, Costa Rica and Mexico from which we have secured material are all in areas of relatively low rainfall, while its reported occurrences, or at least maximum abundance, in Brasil seem also to be in the dry northeastern states. It is certainly not primarily a rain forest species.

Phlebotomus saulensis Floch and Abonnenc

1944, Inst. Pasteur Guyane Terr. l'Inini, Pub. No. 80, pp. 11-12, fig. 6, (♂; Saul, Haute Mana, and Crique Anguille, French Guiana). Barretto, 1947, Arq. Zool. Est. S. Paulo, 5, Art. 4, p. 222. Floch and Abonnenc, 1952, Faune de l'Union Francaise, XIV, Dipteres Phlebotomes de la Guyane et des Antilles Francaises, pp. 112-114, fig. 38.

Phlebotomus pinealis Floch and Abonnenc, 1944, Inst. Past. Guyane Terr. l'Inini, Pub. No. 81, pp. 11-12, fig. 6, (♀; Critique Anguille, French Guiana). Barretto, 1947, Arq. Zool. Est. S. Paulo, 5, Art. 4, p. 219. Floch and Abonnenc, 1952, Faune de L'Union Francaise, XIV, pp. 185-186, fig. 84. Rosabal, 1954, Investig. Epidem. No. 3, Ministerio Salub. Publ., San Jose, Costa Rica, pp. 29-30, figs. 59-63; (♀; Costa Rica). **(New synonomy.)**

We have long hesitated to combine these two names due to the discrepancies in the wing venation, the male (*saulensis*) having delta short or zero, the female (*pinealis*) having it relatively long. The quite close agreement in other characters, the fact that both sexes appear to belong in the same group, the lack of other possible mates, and the fact that though both sexes are quite rare, they have been taken together at three localities, make it seem advisable to combine them. Certainty in the matter will only be achieved by rearing.

Phlebotomus vexillarius Fairchild and Hertig

1952 (December) An. Ent. Soc America, 45 (4):514-516, figs. 31-41 (♂, ♀; Panama).

Phlebotomus foliatus Mirsa and Ortiz, 1952 (April-May), Rev. Sanidad Assist. Soc. Venezuela, 18 (3-4):249-252, figs. 1-4 (♂; Venezuela). **(New synonomy.)**

Although the number of Vol. 18 in which the description of *foliatus* appeared was dated April-May 1952, Dr. Ortiz (in litt.) informs us that it was not actually published until after July 1953, while the description of *vexillarius* appeared 30 January 1953. Dr. Ortiz concurs in the synonymy.

Phlebotomus camposi Rodriguez

1950 (July-December), Rev. Ecuat. Hig. Med. Trop., Guayaquil, 7(3-4): 7-10, figs. 1-7 (♂; Ecuador). Rodriguez, 1953, Rev. Ecuat. Ent. aPrasit., 1(2):91-96, figs. 1-9. Rodriguez, 1956, Rev. Ecuat. Hig. Med. Trop., 13 (2):79.

Phlebotomus acanthobasis Fairchild and Hertig, 1952, Ann. Ent. Soc. America, 45 (4):508-511, figs. 9-18 (♂, ♀; Panama). **(New synonomy.)**

In spite of the published date of the description of *camposi*, we have been informed that the publication did not appear until November 1952, when our description was in press. The figures of *camposi* originally published did not show the spines on the bases of the parameres, an oversight corrected in Rodriguez' careful redescription of the species published in 1953.

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NOTES ON THE AEDES MUELLERI COMPLEX[1]

(DIPTERA, CULICIDAE)

Aedes muelleri was originally described by Dyar in 1920 (Dyar, H. G., Insecutor Inscit. Menstr. 8: 81-82) from specimens collected at Mexico City. The species has been considered to be one of the rarer mosquitoes of North America, and the larva was not described until 1957 (McDonald, W. A., Ann. Ent. Soc. Amer. 50: 505-511).

On September 7, 1957, the writer, accompanied by two graduate students, Fred Klaus and John Riemann, made a collection of tree hole breeding mosquitoes approximately 19 miles south of Alpine, Brewster County, Texas. The cavity, with an opening approximately three inches in diameter, was in an oak tree and it contained about a pint of water. The water, which was quite dark, was removed and the cavity rinsed several times with strained pond water. Later examination revealed large numbers of larvae and pupae of *Orthopodomyia alba* Baker and several larvae of the *Aedes muelleri* complex.

Several days after the collection was made, the small amount of debris (about two tablespoons) collected with the water was dried and reflooded twice. One larva was recovered from the first and eight others from the second flooding. None of the larvae were seen until several days after flooding, and two first instar larvae appeared after the material had been exposed to water for approximately ten days.

Two additional larvae of the *muelleri* complex were obtained from the same locality but from a different tree hole. This cavity, also in oak, was moist but did not contain any free water; it was rinsed with pond water. No larvae were noticed until several days later when two young instars were discovered.

The above facts indicate that many of the eggs of these mosquitoes require more than one flooding before hatching, and that they often do not hatch until they have been exposed to water for several days.

To date three females and one male have emerged as adults, and six fourth instar larvae have been mounted for study. Additional larvae are developing slowly. With the relatively few specimens available it has not been possible to determine whether they are *Aedes muelleri* Dyar or a closely related species. So far as known, however, this is the first time the species group has been collected in the United States east of Arizona.

—OSMOND P. BRELAND, *The University of Texas, Austin.*

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[1] The collections and observations mentioned herein were made while working on a project supported by a research grant, E-1187, from the Microbiological Institute of the National Institutes of Health, Public Health Service.

NOTES ON SPATHIMEIGENIA WITH DESCRIPTIONS OF FOUR NEW SPECIES[1]

(DIPTERA, TACHINIDAE)

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Determinations of material belonging to *Spathimeigenia* have proved difficult, notwithstanding a revision of the genus with keys to the known species, published by Aldrich in 1931 (Proc. U. S. Natl. Mus., 80: 1-10). The latter reports on approximately 85 specimens distributed among 11 nominal species. The additional material accumulated during the past 25 years is still too meager to provide an adequate basis for the construction of amended keys to the currently known forms assignable to the genus.

The apparently new species described below and additional material now available in previously known forms indicate that some of the items relating to color patterns, chaetotaxy and especially the scutellar bristling, among other characters, are much too unstable for diagnostic purposes. Until specific limits of the variable forms can be established, or at least are better known, an element of doubt attends much of the routine determination work on members of this economically important genus. Its host relationships are with sawflies and long series of reared specimens from all sections of the United States and Mexico will prove especially helpful in resolving perplexing questions of specific entity.

Spathimeigenia spinigera Townsend

Townsend, 1915, Proc. Biol. Soc. Wash., 18: 19; 1940, Manual of Myiology, Pt. 10, 153.

Aldrich, 1931, Proc. U. S. Natl. Mus., 80: 4-5.

The references to this species and synonymy have been listed by Aldrich.

Hitherto only one specimen has been reported from Texas. Four additional local examples are in my collection; three reared from *Neodiprion lecontei* (Fitch) at Henderson and one female taken by me at College Station, May 15, 1943. Besides this material there are two additional females, one an ancient specimen with a fine handwritten label "Par. on pine sawfly, Iss. March 79" and one reared from "*Neodiprion swainei* Middleton, Dolbeau Co. Pa."

Spathimeigenia mexicana Aldrich

Aldrich, 1931, Proc. U. S. Natl. Mus., 80: 5-6.

The type series, including 19 males and 12 females all reared from *Neodiprion vallicola* Rohwer in Mexico, is described in part as follows:

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[1] Contribution No. 2763, from Department of Entomology, Texas Agricultural Experiment Station.

"pollen deep golden on parafrontals, parafacials, and posterior orbits; face with yellow pollen . . . Tip of fourth (abdominal) joint red, sometimes a little red on sides of second, rarely on third". Since this color pattern is based upon a good series of reared specimens, it should prove fairly typical for the species.

In the material available, one male from the Chiricahua Mts., Arizona, agrees well with the original characterization and apparently belongs here. However, two other examples provisionally referred to the present species show some seemingly important distinctions.

One male from Tamaulipas, Mexico, has the abdomen much more extensively red at the sides, the head pollen is essentially pale gray and the parafacials bear a few inconspicuous pale hairs below middle; there are additional minor differences.

Another male example from the type locality Michoacan, Mexico, differs from the typical form in the following characters among others: head pollen yellow (not golden) grayish near vertex and on upper part of posterior orbits; apex of abdomen black; third antennal segment three times longer than second; bristling of thorax and abdomen considerably stronger than in *mexicana;* four post dorsocentrals; facialia setose on lower three-fifths; genitalia about as in *setigera.* Evaluation of these items must await the accumulation of more material.

Spathimeigenia dolopis, n. sp.

In this form the male abdomen is as wide as the thorax and not much longer than same, effecting a somewhat more compact build than in any of the known allied forms.

Male.—Head pollen gray with a perceptible yellow tinge below mid front and on parafacial; latter about one-third clypeal width, with fine black hairs extending sparsely above middle; vertex 0.20 of head width; antenna black, third segment squared on apex with a sharp but not produced anterior angle, two and one-half times length of second; cheek one-fifth eye length; palpus yellow gently bowed and thickened beyond middle.

Thorax and scutellum black, dusted with gray pollen and marked with four rather broad, moderately well defined metanotal vittae; chaetotaxy as in *dolosa,* except four post dorsocentrals, hind lateral on scutellum shorter, the apical pair distinctly larger and about three pairs of discals differentiated behind middle. Legs black, mid tibia with two anterolateral bristles, claws and pulvilli equal length of last tarsal segment. Wing slightly infuscate on costal half; veins brown, third with two or three hairs near base; costal spine small; calypters white tinged with yellow.

Abdomen wholly black, last three segments with changeable gray pollen which in direct view leaves a broad subshiny posterior margin on intermediate segments; chaetotaxy as in *dolosa.* Female unknown.

Length, 9.5 mm.

Holotype: Griffin Creek, Jackson Co., Oregon, July 5, 1951 (C. Fitch).

Spathimeigenia aurifrons Curran

Curran, 1930, Can. Ent., 62: 246-47.

This species appears rather closely allied to the genotype, *spinigera*. In a series of thirty-two specimens of both sexes collected at Farmingdale, L. I., New York, June 16, 1936, by Blanton and Borders, the apex of the abdomen and the legs are regularly black, parafrontals sometimes cinereous but more frequently yellowish and rarely golden as originally described. In one additional pair reared from *Neodiprion swainei* Middleton the male, from Laniel, P. Q., VII-8-31 (M. B. Dunn), has the apex of the abdomen black but the female (LaToque, P. Q.) shows a reddish color along the hind margin on venter of the fourth tergite. One pair from Riverside, California, "ex. sawfly (?) cypress", May 15, 1926 (H. L. McKenzie) agrees with the common pattern in having fourth abdominal segment wholly black but the golden front in both sexes averages considerably wider and this form may not belong here.

Spathimeigenia dolosa, n. sp.

Traces to *S. hylotomae* in available keys but averages much larger in build and the last three abdominal segments have obviously wider basal pollen bands.

Male.—Front at vertex 0.28 of head width, equibroad to middle thence gradually widening downward; frontalia deep brown, subequal to parafrontal width; head pollen silvery often with a yellowish tinge especially on parafrontal; uppermost two frontals stout and reclinate, two or three bristles beneath antennal base; outer verticals barely differentiated, orbitals absent; proclinate ocellars well developed; parafacial over one-half clypeal width, with sparse fine black hairs on lower half; vibrissae on oral margin, with three or four bristles next above on facialia; antenna black, third segment about one-half parafacial width and barely twice longer than second; arista micro pubescent, blackish with a paler median ring, very slender beyond narrowly thickened base, proximal segments short; eye bare, strongly oblique; proboscis short, palpus longer than haustellum, yellow and beset with short black spinose hairs; cheek barely one-third eye length; occiput flat, with two rows of black hairs on upper margin and entirely pale pilose below.

Thorax gray pollinose on black ground color dorsal vittae well defined, scutellum concolorous with mesonotum. Chaetotaxy: acrostichal 3, 3; dorsocentral 3, 3; intraalar 3; supraalar 3; presutural 2; notopleural 2; humeral 3-5; pteropleural 1-2 (small); sternopleural 2, 1; scutellum with 3 lateral (hindmost pair divergent, reaching about to apex of second abdominal segment), 1 decussate hairlike apical and 1 good-sized discal pair; prosternum setose at sides; propleuron and postnotal slope bare. Legs black; mid tibia with one strong anterolateral bristle; claws and pulvilli about equal to length of last tarsal segment. Wing grayish hyaline usually with a faint yellowish tinge apparent along the principal veins; first posterior cell narrowly open well before wing tip; third vein with 1 to 3 setulae near base; hind cross vein oblique, joining fourth a little nearer cubitulus than small cross vein; costal spine well developed; epaulet and subepaulet blackish; calypters whitish to pale yellow.

Abdomen narrower and longer than thorax, apical two-fifths or more of last three segments shining black above and last two largely tomentose on venter; one

pair of median marginal bristles on first two segments and a marginal row on last two; intermediate segments each with one pair of good-sized discals and anal with two discal rows on apical half; hypopygium blackish, small and retracted; forceps short, divided beyond middle terminating in blunt-tipped non-divergent prongs; accessory process thin or bladelike in rear view and plowshare-shaped in profile or narrowed outwardly from base to widest part beyond middle thence well tapered to apex and obliquely concave on outer face; fifth sternite with a deep U-shaped apical excision, black lobes largely retracted, bearing pale pubescence intermixed with a few delicate pale hairs along inner margin.

Female.—Front at vertex 0.31 of head width and but slightly wider at antennal base; head pollen entirely gray; frontalia narrower than one parafrontal; outer verticals and proclinate orbitals present; abdomen with a ventral carina bearing about ten stubby spines on margin of third segment; genitalia terminating in a short curved sharp-tipped piercer.

Length, 8-10.5 mm.

Holotype male and allotype female, College Station, Texas, June 19 and April 24, 1946 (H. J. Reinhard). Paratypes: 3 males and 3 females, same data as type except dated from May 3 to July 10, 1945; and 1 male, Austin, Texas, April 18, 1949 (F. A. Cowan).

Spathimeigenia hylotomae (Coquillet)

Coquillett, 1898, Can. Ent. 30: 233 (*Admontia*).

This is one of the more readily recognizable members of the genus. In the sixteen specimens collected locally (April to July) the color pattern appears more stable than in some allied forms. Among the more distinctive items associated with this species are the following: head pollen subsilvery, parafacial broader than usual, with an isolated hair-patch on lower part; addomen shining black to apex with silvery pollen on basal half or less of last three segments above, each bearing a smallish but well differentiated pair of discals. The host relationships of the species in the southwestern limits of its range are not known.

Spathimeigenia erecta Aldrich

Aldrich, 1931, Proc. U. S. Natl. Mus., 80: 8.

One male from Michigan, ex. *Neodiprion pinetum* (Norton), and one pair from Canada, ex. *N. lecontei* (Fitch), are provisionally assigned here. In these specimens the color pattern of the abdomen closely approaches that of *spinigera;* however, the legs are entirely black and the discals on the intermediate abdominal segments are doubled with numerous coarse erect hairs intermixed along the median line. In the female, hitherto unknown, the apical scutellars are completely lacking, apex of abdomen is distinctly red and the proximal antennal segments are red in ground color.

Spathimeigenia bridwelli Aldrich

Aldrich, 1931, Proc. U. S. Natl. Mus., 80: 9.

This species, described from a single male specimen from Baldwin, Kansas, presents a number of peculiar characteristics that readily

distinguish it from all allied forms except perhaps *fivoris*. From the latter, the present species differs in having much denser subsilvery head pollen which completely obscures the ground color; the male claws and pulvilli are minute; discals on intermediate abdominal segments smallish and reduced to a single pair, not at all differentiated on the third segment in the one female example. Besides the latter, two males, also from Kansas, are referred here.

Spathimeigenia fivoris, n. sp.

Front wide as in *bridwelli*, but with thin plumbeous pollen on a black background which remains very apparent on entire parafacial and cheek except the reddish groove of latter.

Male.—Vertex 0.33 of head width; verticals two pairs, ocellars long; frontals in a single row, two or three bristles below antennal base; frontalia velvety black, wider than parafrontal; antenna black, second segment slightly over one-half as long as third which reaches to lower fourth of face; black, micro pubescent arista thickened on basal fourth, proximal segments short; facialia bearing three to five bristly hairs on lower fourth, vibrissae on oral margin; parafacialia over three-fourths clypeal width, with a rather large patch of fine black hairs on lower three-fifths, cheek with a similar vestiture on lower margin, about one-half eye length; proboscis short, labella fleshy, palpus rather slender, brown to blackish but sometimes paler; occiput flat, plumbeous, beset with short pale hairs.

Thorax and scutellum subshining black, lightly dusted with gray pollen; dorsal vittae poorly defined; chaetotaxy as in *dolosa*, but the hindmost lateral on scutellum shorter and the hairlike apicals usually irregular and sometimes entirely absent. Legs subshiny black; mid tibia with two stoutish anterolateral bristles and fore tibia with two posterolaterals; claws and pulvilli almost equal to length of last tarsal segment. Wing with a uniform light brownish or smoky tinge; third vein usually with two setulae near base; first posterior cell open before extreme wing tip; costal spine subequal to length of small cross vein; calypters opaque white; epaulet and halteres infuscated.

Abdomen shining black with silvery pollen on basal fourth of last three segments; discal pairs on intermediate segments usually doubled and about three irregular rows on anal; one pair of median marginals on segments one and two and a marginal row on three and four; venter entirely shining. Female unknown.

Length, 6-7.5 mm.

Holotype: Berkeley, Calif., April 14, 1954 (P. D. Hurd) in the California Academy of Sciences Collection. Paratypes 5 males all from California as follows: one, same data as type except dated April 7, 1954; one "Palmdale, III-12-1934"; one, "Los Angeles Co., V-7-39"; one, Glenville, Kern Co., IV-24-49 (E. G. Linsley, J. W. MacSwain, R. E. Smith); and one, labeled "Cal. Coql.", without precise locality.

Spathimeigenia texensis Aldrich

Aldrich, 1931, Proc. U. S. Natl. Mus., 80: 9-10.

The very short claws and pulvilli in the male seem distinctive, at least in this sex. Of the five specimens before me three are from Mexico, one from Arizona and one male is from Huntsville, Texas,

May 10, 1951 (F. A. Cowan). The latter specimen is of particular interest since the parafacials are entirely devoid of any hairs or setae but the agreement in other pertinent items, including genitalia, seems too close for any other generic assignment. However, since the front is a little wider and outer verticals are larger, the specimen may not be conspecific with *texensis*. More material is needed to determine the limits of variation in the present form.

Spathimeigenia erronis, n. sp.

A small species differing from all known allied forms in the total absence of abdominal discals.

Male.—Head pollen silvery on a dark background; front at vertex 0.28 of head width, slightly wider at antennal base; frontalia equibroad to triangle, narrower than parafrontal; outer verticals barely differentiated; antenna black, third segment not quite three times longer than second; black arista micro pubescent, tapering outward on moderately thickened proximal fourth, thence very slender or delicate to tip; parafacial inconspicuously setose on lower half, which is hardly equal to width of third antennal segment; facialia setose on lower fourth; cheek one-sixth eye length; palpus reddish; occiput wholly pale-haired behind occipital fringe above.

Thorax and scutellum black, dusted with thin cinereous pollen, which in a flat rear view shows two broad mesonotal vittae uninterrupted at suture; chaetotaxy as in *dolosa* but bristles generally weaker. Legs black, mid tibia with one anterolateral bristle; claws and pulvilli minute. Wing clear or hyaline; veins yellow, third with two hairs near base; first posterior cell closed at costa a little before wing tip; calypters translucent white.

Abdomen shining black with silvery pollen on about basal third of last three segments, hairs on upper surface of each appressed; one pair of median marginals on segments one and two and a marginal row on three and four; hypopygium small, retracted in repose. Female unknown.

Length, 5 mm.

Holotype: College Station, Texas, June 3, 1920 (H. J. Reinhard).

ANNOUNCEMENT

An important part of the Society's program is to make available back issues of the *Proceedings*. In recent months stocks of many issues have dwindled to unprecedented lows. Members who wish to contribute to this important function are urged to send any of their back issues (preferably with covers unmarked) to the Custodian (address on inside front cover.)

SOME NOTES ON BOHEMAN'S ANTHICIDAE FROM "CALIFORNIA" (COLEOPTERA)

F. G. WERNER,[1] *University of Arizona, Tucson*

Dr. René Malaise, of the Naturhistoriska Riksmuseum in Stockholm, has very kindly made available all of the specimens of Anthicidae described by Boheman from the voyage of the "Eugenie." All of the species described were based, wholly or in part, on specimens purported to have come from California.

Casey (1895, Ann. New York Acad. Sci. *8:* 731) has already indicated that three of the species are definitely not North American and two of the others only doubtfully so. Except in the case of *caesiosignatus* he made no attempt to locate the actual type locality. A reexamination indicates no Nearctic affinities for the species but does show that they must be Neotropical. *Caesiosignatus* and *amplicollis* belong in the genus *Ischyropalpus*, *nitidus* and *atomarius* in *Lappus*, *taitiensis* in *Sapintus* and *troglodytes* in or near *Acanthinus*. *Ischyropalpus* is entirely Neotropical, the rest entirely New World, with some species, but not Boheman's, Nearctic. According to the account of the voyage, the "Eugenie" touched at a number of ports on both the Atlantic and Pacific sides of South America. The specimens may have come from one locality or many. In any event they were not collected at the localities stated on the labels, unless the Puna locality is correct and refers to Puna Island off Ecuador, as surmised by Casey.

The following additions to Boheman's descriptions should aid future workers in assigning his names to Neotropical species.

Ischyropalpus La Ferté, 1848, NEW STATUS

Anthicus (Ischyropalpus) La Ferté, 1848, Monographie des Anthicus et des genres voisins . . . : 106, 141.

This is one of the most distinctive genera of Neotropical Anthicidae, closely related to *Lappus* Casey. With this latter genus it shares the following characters: Last segment of maxiliary palpi very broad, in the form of an isosceles triangle with the apex at the point of attachment; tibial spurs with several series of very small spinules near the base, most readily visible on slide preparations; male genitalia of a distinctive form, with separate parameres and a bilaterally symmetrical sclerotization on the internal sac unlike anything found in other Anthicidae (for an example see Werner, Coleop. Bull. *10:* 88). No other genus thus far examined possesses any of these characters. The expanded palpal segment is sufficient for recognition of the group. La Ferté associated *Anthicus trigonocephalus* with the South American species he included in *Ischyropalpus* even though it came from "*India Orientalis.*" The single specimen lacked palpi and was therefore in-

[1] Based on part of a dissertation presented in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Harvard University in 1950.

cluded on general facies, the tibial sur and genitalia characters not being used by La Ferté. I have never seen either *Ischyropalpus* or *Lappus* from the Old World and believe that *trigonocephalus* should not be included in the former genus.

Ischyropalpus differs from *Lappus* mainly in external form and size. The head and pronotum are very heavily sculptured, the head with the disc evenly rounded to a very sharp margin, which extends from eye to eye around the back of the head. The disc of the pronotum is wide and flattened, sharply margined at the sides. In *Lappus* the head is only lightly sculptured by comparison, even in *Lappus nitidulus* (Lec.), our most strongly punctured species, and the head margin is not as sharp. The pronotum is fairly normal, not as flattened and without distinct margins on the sides. All *Ischyropalpus* species examined have been much larger than *Lappus*. Until a gradation between the two genera is discovered, the two are most conveniently kept separate.

Ischyropalpus caesiosignatus (Boheman), NEW COMBINATION

Anthicus caesiosignatus Boheman, 1858, Kongliga Svenska Fregatten Eugenies resa omkring Jorden . . . ; Entomologiska Bidrag—Coleoptera: 104.

I have found Boheman's measurements of Anthicidae misleading. Because of the deflection of the head in the family, very different measurements can be arrived at, depending on how the specimen has been mounted. The measurements added here are from the first specimen in Boheman's series in all cases. Head: length to clypeus 0.63 mm., width 0.68; prothorax: 0.74 mm. long, 0.23 wide at collar, 0.44 at base, 0.67 at widest, 0.44 mm. from base; elytra 1.86 mm. long, 0.82 wide at humeri, 0.92 at widest. Total length, based on the above lengths: 3.25 mm.

The sculpture of head and pronotum is not exactly as Boheman described it. The head is densely covered with shallow-crateriform punctures, almost contiguous but not coalescing, becoming sparser and obsolete toward the back. The pronotum has numerous longitudinal rugae, with little indication of punctures in their troughs. They average 0.02 to 0.03 mm. from crest to crest and are not perfectly straight. There are a few cinereous setae along the sides behind the widest portion and on the basal fifth. The markings of the elytra are in the pubescence only. Cinereous markings are as follows: narrowly at base, narrowing at the humeri; a W-shaped marking with the lateral margins slightly expanded, in the transverse impression; and a narrow, almost transverse band $^2/_5$ from the apex, narrowing and angling forward slightly at the suture.

There are five specimens in the series, four labeled "California" and one "Puna."

Ischyropalpus amplicollis (Boheman), NEW COMBINATION

Anthicus amplicollis Boheman, *op. cit.:* 106.

Head: 0.61 mm. long, 0.67 wide; prothorax: 0.79 mm. long. 0.25 wide at collar, 0.46 at base and 0.80 at widest, 0.47 mm. from base; elytra: 2.07 mm. long, 0.83 mm. wide at humeri, wider behind but not measurable because of the position of the elytra in the specimen. Total length: 3.47 mm.

This is a light brown species in which the paler markings are indicated both in the ground color and in the pubescence. Paler markings occur as follows on the elytra: narrowly at base; in the transverse impression, interrupted at the suture; and in a small, oblique fascia on each elytron one-fourth from the apex. The sculpture of the head consists of dense, shallow but distinct punctures that do not anastomose. On the pronotum the punctures are equally dense but tend to anastomose longitudinally, forming very indistinct longitudinal rugae.

This species is represented by a single male labeled "California."

Lappus Casey, 1895

This genus has already been discussed above. Two of Boheman's species are assignable to it. These are unlike any known from California and are undoubtedly synonymous with each other.

Lappus nitidus (Boheman), NEW COMBINATION

Anthicus nitidus Boheman, *op. cit.:* 105.

Anthicus atomarius Boheman, op. cit.: 106. NEW SYNONYMY.

Anthicus nitidus var. *atomarius*, Pic, 1911, Coleopterorum Catalogus, Pars 36: 64.

This is a small, tannish species, with the antennae luteous. It is sparsely and finely punctured and has sparse, appressed pubescence. The transverse impression on the elytra is almost obsolete and all the pubescence in it is directed backward.

Nitidus and *atomarius* are represented by two specimens each, all labeled "California." Except for a very small difference in size, the two appear identical. Measurements of the first specimen of *nitidus* are: head: 0.49 mm. long, 0.59 wide; prothorax 0.59 mm. long, 0.22 mm. wide at collar, 0.36 at base, 0.35 at the postmedian constriction and 0.49 at widest, 0.36 mm. from base; elytra 1.68 mm. long, 0.69 at humeri, 0.97 at widest. Total length: 2.76 mm.

Sapintus Casey, 1895

At present the species properly assignable to this genus are unicolorous, tan to brown Anthicidae which have a small prothorax and the pubescence on the elytra triple, consisting of scattered erect or suberect tactile setae, a moderately dense covering of backward-directed, subdecumbent setae and a denser undercoat of decumbent setae directed obliquely laterally. Some Old World forms have similar pubescence but are not unicolorous and apparently are not related.

Sapintus taitiensis (Boheman), NEW COMBINATION

Anthicus taitiensis Boheman, *op. cit.:* 105.

Anthicus taitensis, Pic, *op. cit.:* 76 *(lapsus calami).*

In general appearance this species is very similar to *Sapintus fulvipes* (Laf.) from eastern North America. The male lacks any special development of the trochanters, as does that species. A male would have to be dissected before exact placement would be possible. There are similar species in the Neotropical region. The backward-directed setae on the elytra are ca. 0.10 mm. long and the undercoat setae ca. 0.05 mm. Measurements: head: 0.47 mm. long, 0.55 wide; prothorax 0.52 mm. long, 0.23 wide at collar, 0.43 at base and 0.51 at widest, 0.38 mm. from base; elytra 1.84 mm. long, 0.77 wide across humeri, 0.90 at widest. Total length: 2.83 mm.

Boheman mentions only Taiti but his series includes three specimens labelled "Taiti" and one "California." There is little chance that either locality is correct.

Acanthinus La Ferté, 1848

Anthicus (Acanthinus) La Ferté, 1848, *op. cit.*: 106, 136.
Acanthinus, Casey, 1895, op. cit.: 732.

The genus *Acanthinus* can be defined as including all Anthicidae which have the following combination of characters: mesosternum greatly expanded laterally, the free margins bearing some long setae; hypopygium of male deeply cleft; head and pronotum deeply sculptured, at least semi-opaque; and prothorax not narrow and deeply constricted. So defined, the genus includes *troglodytes* (Boheman). If the presence of sharp or blunt spines on the prothorax is added to the definition, the genus would contain only the species usually assigned to it and *troglodytes* would be in an undescribed genus. Until a thorough review of the Neotropical Anthicidae can be undertaken, it would be preferable to leave the species in *Acanthinus*.

Acanthinus troglodytes (Boheman), NEW COMBINATION

Anthicus troglodytes Boheman, op. cit.: 105.

To Boheman's description of the color pattern of the elytra should be added a note that the pale pattern is marked in the ground color. The elytral pubescence is moderately dense but very short, fine and appressed and does not affect the general color of the insect. Part of it is directed obliquely laterally, particularly in the pale areas. The head and pronotum are densely but quite finely and deeply punctured, the pronotum showing tendencies toward longitudinal rugulation because of partial confluence of punctures. The measurements of the first specimen in the series are: head: 0.48 mm. long, 0.56 wide across eyes, narrower behind; prothorax 0.59 mm. long, 0.21 wide at collar, 0.33 at base, 0.26 at postmedian constriction and 0.43 at widest, 0.38 mm. from base; elytra 1.54 mm. long, 0.61 wide at humeri and 0.81 at widest. Total length: 2.60 mm.

There are six specimens in the series labeled "California" and one "Taiti." There is no indication of a cave association on the labels, as might be expected from the trivial name. Such an association is very unlikely.

THE SUBSPECIES OF TYPOCERUS LUNATUS, A CERAMBYCID BEETLE

(COLEOPTERA, CERAMBYCIDAE)

RICHARD L. HOFFMAN, *Biology Department, Virginia Polytechnic Institute, Blacksburg*

Several years ago, while arranging the insect collection of the Virginia Agricultural Experiment Station, I noticed that specimens of *Typocerus lunatus* (F.) from localities in western Virginia differed somewhat in color pattern from beetles of the same species collected in the Virginia Coastal Plain. Since then, as the occasion permitted, I have examined the material of *lunatus* in various museum collections and have determined that the species consists of two distinct color pattern types, each occupying a geographic range exclusive of the other and thereby qualifying for recognition as valid subspecies. Although the recognition of such forms has not been widely practiced in the case of American beetles, it seems likely that many of the entities currently considered full species will ultimately be shown to be but geographic races of widespread and variable forms. This may be especially true in respect to species with distinct and complex color patterns.

Through the generous cooperation of Drs. Ross H. Arnett, W. L. Brown, Jr., Mont A. Cazier, Henry Dietrich, J. M. Grayson, and M. W. Sanderson, I have seen all of the specimens of *T. lunatus* in the collections of the United States National Museum, (135), the American Museum of Natural History (59), Cornell University (45), the Illinois Natural History Survey (16), the Museum of Comparative Zoology (11), and the Virginia Agricultural Experiment Station (20)—a total of 286 beetles. In addition, Dr. D. L. Wray kindly supplied sketches of specimens in the collection of the North Carolina Department of Agriculture.

Although the number of specimens thus recorded is fairly large, the distribution of material is unfortunately quite uneven. Much of it comes from the vicinity of Washington, D. C., with a few long series from other localities, and but very little from the Middle Western States. Still, there is enough distributional data to provide a general picture of the ranges of the two races, and imperfections in our knowledge about exact limits will eventually be ironed out by additional collecting.

In the material which I have seen, typical examples of both subspecies, as well as various degrees of intermediates, are represented from several localities such as Washington, D. C., and Raleigh, North Carolina. Whenever the series have been adequate for the purpose, assignation of such mixed populations was made on the basis of dominance. For example, in a series from Nelson County, Virginia, 3 individuals out of 21 are referable to *lunatus*, the other 18 to *fractus*, and the latter name is thus considered applicable to that local population. Allocation of single specimens from marginal localities has been made tentatively, influenced by a consideration of the geographic probability involved. At a subspecific level, occasional occurrences of one

color type within the range of the other (as observed several times in this study) do not, of course, seriously militate against the usefulness of the subspecific category.

The genus *Typocerus* has been adequately treated in the admirable monograph of the Lepturini by Swain and Hopping (1928). For this reason a detailed description of the species need not be introduced.

Typocerus lunatus lunatus (Fabricius)

Figure 1

Leptura lunata Fabricius, 1801, Syst. Eleuth., vol. 2, p. 360.

Typocerus lunatus Aurivillius, 1912, Coleopt. Cat., pars 39, p. 246.—Swain and Hopping, 1928, Nat. Mus. Canada. Bull. 52, p. 33.

Typocerus lunulatus Leng, 1920, Catalog. Coleopt., p. 274.—Brimley, 1938, Insects of North Carolina, p. 213 (in part).

Diagnosis.—Basal spots of elytra lunate or bent at a right angle, tending to be more orange or orange-red; body averaging slightly larger than in *T. l. fractus.*

Discussion.—The original description of this beetle leaves no doubt of its identity. The type specimen was received from the French consul Bosc, most of whose collections were made in the vicinity of Charleston, South Carolina, which may reasonably be considered the type locality. No specimens have been seen from that region, but Charleston lies well within the range of the typical subspecies as here defined.

It is a matter of interest that the dichotomy of pattern in this species escaped the critical eye of T. L. Casey, a situation perhaps explainable by the fact that only within the past fifty years have many inland specimens made their way into collections. The only literature to color variation in *lunatus* which I have found is that of Swain and Hopping (op. cit., p. 33), who observed that the elytral pattern consists of four basal spots which are often merged into lunate markings; their illustration is of a typical *T. l. lunatus.*

Distribution.—The Coastal Plain of southeastern United States, from southeastern Pennsylvania to northern Florida, thence west as far as the Colorado River in Texas. Intergradation with *T. l. fractus* takes place along the Fall Line in the Middle Atlantic States. Information is now desirable on the following points: does *lunatus* extend farther southward into peninsular Florida, and does it occur on the Del-Mar-Va peninsula or southern New Jersey as might be anticipated on the basis of the Pennsylvania record

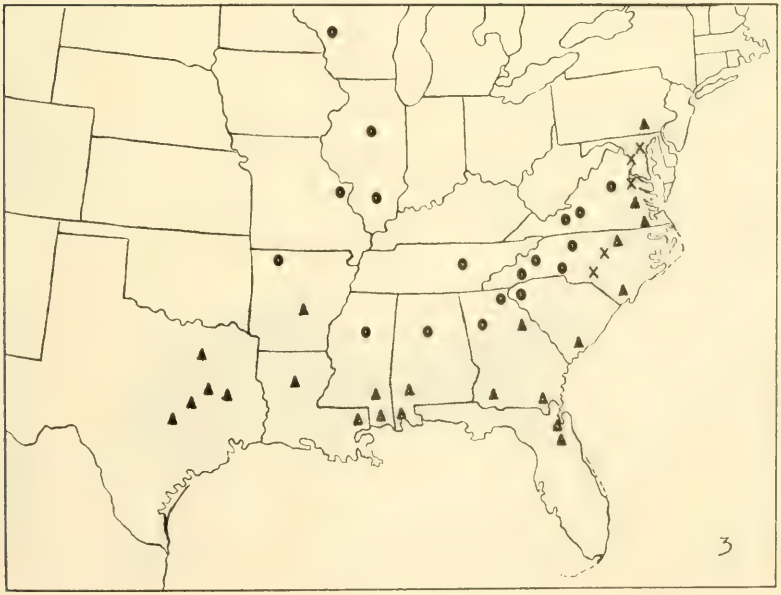
Specimens have been examined from the following localities:

PENNSYLVANIA: Dauphin Co., Hummelstown (4). MARYLAND: Montgomery Co., Glen Echo (2). Prince Georges Co., Bladensburg, (1), Beltsville (1). DISTRICT OF COLUMBIA: Washington (2). VIRGINIA: Arlington Co.:

Fig. 1: sketch of color pattern, dorsal aspect, of *Typocerus lunatus lunatus* (Fabr.). Fig. 2: same, *Typocerus lunatus fractus,* n. subsp. Fig. 3: map showing localities from which specimens of *T. lunatus* have been examined. Triangles in the shaded distribution represent *T. l. lunatus;* spots, *T. l. fractus;* crosses intermediate samples.

1

2



3

Glencarlyn (4). Fairfax Co.: Falls Church (4), Bareroft (1), Mount Vernon (3). Spotsylvania Co., Fredericksburg (2). New Kent Co.: no precise locality (7). Nansemond Co., Holland (6). NORTH CAROLINA: Wake County, Raleigh (4). Northampton Co., Pendleton (1). Brunswick Co., Leland (1). GEORGIA: Clarke Co., no precise locality (1). Charlton Co., Okefenokee Swamp (1). Tift Co., Tifton (2). FLORIDA: Duval Co., St. Nicholas (1), Jacksonville (1). Putnam Co., Welaka (2). County undetermined: Fort Capron (1). ALABAMA: Mobile Co.: Mobile (7). Washington Co., Leroy (1). MISSISSIPPI: Jackson Co., Ocean Springs (1). George Co., Lucedale (14). Harrison Co., Biloxi (1). Forrest Co., Hattiesburg (3). Perry Co., Richton (1). LOUISIANA: St. Tammany Par., Covington (2). Natchitoches Par., Vowell's Mill (8). ARKANSAS: Garland Co., Hot Springs (3). TEXAS: Angelina Co., Lufkin (20). Bastrop Co., Bastrop (2). Brazos Co., College Station (2). Lee Co., without locality (3), Lexington (1). Dallas Co., Dallas (1).

Typocerus lunatus fractus, new subspecies

Figure 2

Typocerus lunulata Brimley, 1938, Insects of North Carolina, p. 213 (in part, western records only).

Typocerus lunatus Fattig, 1947, Emory Univ. Mus., Bull. 5, p. 19 (in part, northern records only).

Diagnosis.—Basal spots of elytra strongly constricted at the angle, usually separated into four small subtriangular or pyriform spots, these usually bright yellow in contrast to the more orange markings of the nominate subspecies.

Type specimens.—Holotype, U. S. Nat. Mus. No. 64108, from Blacksburg, Montgomery Co., Virginia, collected on July 8, 1948, by G. M. Bousch. Paratypes from Black Mountain, Cumberland Co., Tennessee (C.U. 1); Lake Toxoway, Transylvania Co., North Carolina (A.M.N.M. 1); and Blacksburg, Virginia (V.A.E.S. 3).

Distribution.—The Southern Appalachians and the middle and upper Mississippi Valley, west as far as the eastern edge of the Great Plains, north to Wisconsin. Intergradation with *T. l. lunatus* occurs in eastern Virginia and central North Carolina, and doubtless elsewhere on the inner edge of the Coastal Plain.

Material has been seen from the following localities:

DISTRICT OF COLUMBIA: Washington (10). MARYLAND: Anne Arundel Co., Odenton (4). VIRGINIA: Arlington Co., Glencarlyn (2). Fairfax Co., Falls Church (5), Great Falls (1), no exact locality (1). Nelson Co., no exact locality (21). Botetourt Co., Bonsack (2). Montgomery Co., Blacksburg (5). NORTH CAROLINA: Polk Co., Tryon (3). Buncombe Co., Asheville (2), Swannanoa Valley (2). Transylvania Co., Lake Toxoway (1). SOUTH CAROLINA: Oconee Co., Clemson (1). GEORGIA: Rabun Co., Clayton (1). Fulton Co., Atlanta (3). ALABAMA: no exact locality (6). MISSISSIPPI: Oktibbeha Co., Agricultural College (2). ARKANSAS: Marion Co., no exact locality (1). MISSOURI: St. Louis Co., St. Louis (11). No exact locality (1). TENNESSEE: Cumberland Co., Black Mountain (1). ILLINOIS: "S. Ill." (1). Woodford Co., Kappa (1). WISCONSIN: Monroe Co., Sparta (1).

The most curious facet of the distribution of this subspecies is its excessive scarcity in midland United States. It was not reported for Indiana by Blatchley, and Dr. Sanderson advises me that the Illinois Natural History Survey has but a single specimen from Illinois, taken many years ago. Knull treats *lunatus* in his survey of the Cerambycidae of Ohio, but cites no localities and I presume the species was included as a "probable" for the state. There appear to be no published records for West Virginia and Kentucky, and no specimens have been seen from either state. Yet fair sized series have been taken in Virgina and Missouri, and it may be that additional collections will prove the occurrence of the form in as yet unrepresented intervening areas.

THE APPLICATION OF THE NAME PLECTISCUS

(HYMENOPTERA, ICHNEUMONIDAE)

The generic name *Plectiscus* was proposed by Gravenhorst in 1829 (Ichneumonologia europaea 2: 978) for some small, slender ichneumonids. The genotype of *Plectiscus* was first designated by Westwood in 1840 (Introduction to the modern classification of insects 2: Synopsis of the genera . . . p. 58) as *Plectiscus impurator* Gravenhorst. There has nearly always been uncertainty about the zoological identity of this genotype, and hence about the proper application of the generic name *Plectiscus*. The subfamily name Plectiscinae, based on *Plectiscus*, is involved with the generic name.

In April, 1958, I was able to study Gravenhorst's personal collection at Wroclaw, Poland. Gravenhorst had one male and two females under the name *Plectiscus impurator*, none with locality labels. All fit the original description and appear to be the same species. I hereby designate the male as lectotype. In the same month I saw the Manger Collection in Berlin. Manger collected at Warmbrunn, one of the localities mentioned by Gravenhorst for *P. impurator*. His collection was determined largely by Gravenhorst, and in many cases contains syntypes of Gravenhorst species. In the Manger Collection four specimens are under the label *P. impurator*, none with locality labels. All of these appear to be near or the same as the species represented by the lectotype in Wroclaw, though two of the specimens are in such poor condition as to make determination difficult.

The species represented by the lectotype belongs in the genus *Leipaulus*, subfamily Orthocentrinae. I hereby synonymize *Leipaulus* Townes, 1945, under *Plectiscus* Gravenhorst, 1829, synonymize the subfamily name Plectiscinae under Orthocentrinae, and propose the subfamily name Microleptinae for Plectiscinae of authors. The name *Brephoctonus* Förster, 1868, has the same genotype as *Plectiscus* (designated by Förster, 1871), so is also a synonym of *Plectiscus*. The Nearctic *Deleter suffuscus* Davis, 1897, is hereby transferred from *Leipaulus* to *Plectiscus*.

The name Microleptinae is based on the generic name *Microleptes* Gravenhorst 1829, which is the oldest generic name in the subfamily.

—HENRY TOWNES, *Museum of Zoology, University of Michigan.*

NEW SYNONYMY IN THE GENUS APHAERETA WITH A REDESCRIPTION OF APHAERETA PALLIPES (SAY)[1]

(HYMENOPTERA, BRACONIDAE)

C. W. McCOMB, *University of Maryland, College Park*

Over 700 specimens of *Aphaereta* (Braconidae, Alysiinae) were examined in a recent study of the North American members of this genus. In addition to the study of pinned specimens, slides of male terminalia, tarsal segments, and antennae were made from examples of several series studied, but comparison failed to yield any reliable morphological characters by which separation could be attempted.

Muesebeck and Walkley (1951, U. S. Dept. Agr. Monogr. No. 2, p. 148) included six species in this genus. *Aphaereta sarcophagae* Gahan and *A. pegomyiae* Brues, the types of which I have seen, have been examined and are here suppressed as synonyms. A study of notes on the types of *A. subtricarnita* Viereck and *A. delosa* Viereck, made by Mr. C. F. W. Muesebeck at the University of Kansas, indicates that these two forms should also be included in this synonymy; and although the types of *A. auripes* (Provancher) and *A. pallipes* (Say) were not examined, the descriptions of these forms in the literature indicate that they likewise represent the same species. (The type of *A. pallipes* is presumed to be destroyed.)

Aphaereta pallipes (Say)

1828 *Alysia pallipes* Say, Contrib. Maclur. Lyc. Phila. 1:77.
1859 *Alysia pallipes* Say. Le Conte, *Complete Writings of Thomas Say* 1:380.
1881 *Trichesia auripes* Provancher, Le Naturaliste Canadien 12:203. Fig. 30. N. Syn.
1883 *Trichesia auripes* Provancher. Provancher, Petite Faune Entomologique du Canada, 536.
1886 *Trinaria pilicornis* Provancher, Addit. Corr. Faune Ent. Canada Hym., 149.
1887 *Aphaereta auripes* (Provancher). Cresson, Synop. of the Hym. of N.A., Part 2:231.
1887 *Aphaereta pallipes* (Say). Cresson, Synop. of the Hym. of N.A., Part 2:231.
1888 *Aphaereta auripes* (Provancher). Provancher, Addit. Corr. au Vol. II de la Faune Ent. du Canada, 392.
1889 *Aphaereta muscae* Ashmead, U.S. Natl. Mus. Proc. 11:647.
1889 *Aphaereta californica* Ashmead, U.S. Natl. Mus. Proc. 11:647.
1889 *Aphaereta oscinidis* Ashmead, U.S. Natl. Mus. Proc. 11:647.
1898 *Aphaereta auripes* (Provancher). Dalla Torre, Cat. Hym. V. 4, P. 42.
1898 *Aphaerete pallidipes* (Say). Dalla Torre, Cat. Hym. V. 4, P. 42.
1905 *Aphaereta delosa* Viereck, Kans. Acad. Sci. Trans. 19:283. N. Syn.
1905 *Aphaereta subtricarinata* Viereck, Kans. Acad. Sci. Trans. 19:283. N. Syn.
1907 *Aphaereta pegomyiae* Brues, Extr. MS. Rpt. Minn. State Ent., P. 4. N. Syn.
1914 *Aphaereta sarcophagae* Gahan, U.S. Natl. Mus. Proc. 48:158. N. Syn.

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[1] Misc. Pub. No. 312, Contribution No. 2882 of the Maryland Agricultural Experiment Station, Department of Entomology.

Aphaereta pallipes (Say) may be characterized as follows:

FEMALE.—Length 1.2 to 2.5 mm; mandibles tridentate; face more than twice as broad as high, strongly convex, smooth and polished; eyes round and with a few distinct hairs near the middle; temples convex, narrower than the eyes; antennae with 19-25 segments, scape and pedicel yellow, flagellum dark, filiform, the first segment shorter than the second, the rest subequal; head smooth, polished, with a line running caudad from the median ocellus to the neck; ocellocular line more three times diameter of an ocellus.

Thorax black in fresh material; the prosternum yellow; a well impressed mesopleural furrow present containing a varying number of fovea; mesoscutum polished with two short ridges arising at a 90 degree angle from the anterolateral edge of the mesoscutum vanishing on approaching the dorsal surface; prescutellar suture twice as long as wide (actually a pit), deeply impressed and with 1-3 longitudinal ridges; propodeum largely smooth but with some irregular rugae and usually with a median longitudinal keel on the short dorsal face and often two more less parallel median longitudinal carinae on posterior face; costulae sometimes well developed, but sometimes indistinct.

Wings covered with a fine pubesence; 1st cubital and 1st discoidal cells confluent; the 2nd cubital cell twice as long as wide; the cubital and median veins not reaching the outer edge of the wing; stigma at its widest point about as wide as the length of the first section of the radius which joins it at the center of the anterior edge of the wing; metacarpus extending to the distal end of the wing where it is joined by the radius; nervulus a little postfurcal; subdiscoidens interstitial; hind wing very narrow, the cilla on posterior margin about as long as width of wing; mediella very weak; radiella and nervellus wanting.

Legs very slender, yellow but with the apical tarsal segment generally darker than the other tarsal segments; calcaria of posterior tibiae very short, indistinct.

Abdomen smooth, polished; the first segment yellow on dorsal surface with two longitudinal posteriorly convergent median carinae present often fading out near middle of tergite; varying amounts of carinulation on postpetiole; ovipositor yellow, sheaths brown, longer than the tibia of the metathoracic leg.

MALE.—Like the female except that number of segments in the antennae of material examined ranges from 20 to 26.

Specimens of *Aphaereta pallipes* (Say) are parasitic on various muscoid Diptera.

The author wishes to express his appreciation to the Division of Insects, U. S. National Museum; the University of Minnesota; the Museum of Comparative Zoology at Harvard; the Division of Entomology, Science Service, Canadian Department of Agriculture; Mr. R. R. Dreisbach of Midland, Michigan; and Dr. W. W. Judd of the University of Western Ontario, London, Ontario Canada, for the loan of material used in this work. The author is especially grateful to Mr. C. F. W. Muesebeck for his advice and guidance throughout this study.

A NEW ZEUGMATOTHRIPS FROM BRAZIL

(THYSANOPTERA, PHLAEOTHRIPIDAE)

J. DOUGLAS HOOD, *Cornell University, Ithaca, N. Y.*

The genus *Zeugmatothrips* Priesner is one of the more distinctive genera in the Neotropical fauna, and its known species, now fifteen in number, form a compact group much alike in aspect, habits, and behavior. They range from Mexico to Trinidad, Peru, and Brazil. All of them feed upon fungus spores and the accompanying gelatinous matter—such is true, at any rate, of the thirteen species which the author has described. Though in general appearance they suggest a diminutive *Actinothrips*, they are doubtless more closely related to the African *Zeugmatothripoides* Bagnall, represented by one species of unknown habits taken in Sierra Leone and distinguished principally by chaetotactic differences.

Zeugmatothrips pallidulus, sp. nov.

Figures 1 and 2

Female, forma macroptera.—Length about 2.6 mm. **Color** to naked eye or under low magnifications, by reflected light, dark brown in fore part of and along sides of head, blackish brown to nearly black in abdominal segments III-X (most of these segments a trifle paler posteriorly, IX paler throughout), the remainder of head, all of thorax, and segments I and II of abdomen pale brown, the contrast between II and III marked, II with a pair of well-separated rounded dark spots at middle, III-VII with a more or less darkened area occupying about median one-third of anterior portion, these spots margined in front and at sides by a heavy black line; legs pale dull yellow excepting the light brown fore and middle coxae, the black tarsal cups, and the nearly colorless ends of femora and tibiae; internal pigmentation red[1]; antennae with segments I and II blackish brown, about concolorous with head, but with I pale basally and II yellow apically; III-V dull yellow, IV and V lightly touched with gray in swollen apical portion, VI dull yellow in pedicel, shaded with gray-brown in apical three-fifths; VII and VIII gray-brown, each more or less yellowish basally; wings of both pairs pale brownish yellow, palest in a narrow streak just in front of the usual vein, which is brownish yellow and darkest near middle of wing.

Head (Fig. 1) with total length about 1.6 times its greatest width, which is across eyes, the cheeks broadest just behind a slight postocular notch, nearly as wide at basal third, narrowed just in front of distal third and again in front of basal collar; head produced between eyes and antennae, the sides of this production deeply and roundly emarginate, its greatest width (anteriorly, near bases of antennae) about 103μ, its length in front of eyes about 52μ; dorsal surface of head conspicuously and sharply polygonally reticulate, excepting in the head-process and in the area of the four major setae, the reticles not wrinkled; postocular setae brown, moderately long (about 95μ), stout, knobbed, and arising from conspicuous elevations, their bases on a line with posterior margins of eyes, the interval between

[1] Living or very freshly-mounted specimens, to judge from other species which I have myself collected, may possibly have in addition chalky-white internal areas in the legs or beneath intersegmental membranes in the body.

these setae about 63μ; dorso-cephalic setae similar to postoculars in form and color but much shorter (51μ), about 34μ apart, and arising about 13μ behind them; genal setae very pale, slender, and pointed. **Eyes** distinctly protruding, with an enlarged facet or two on sides behind middle, these producing a slight subangulation when the eyes are observed from above; dorsal length of eyes (89μ) nearly 0.3 that of head, their width about 54μ, their interval about 83μ. **Antennae** (Fig. 2) less than 2.2 times as long as head, formed as usual in the genus, the intermediate segments with long slender pedicels; segment I with the usual long dark brown knobbed seta arising from a distinct tubercle; II with the inner seta near middle of dorsum rather large, pale brown, and knobbed at tip, but much shorter and much more slender than the large one on dorsum of I; III and IV each with two strong dorsal knobbed setae (instead of the single one found in some species), these brown in color with bases nearly black; V with the usual similar single dark dorsal seta; sense-cones long, slender, pale, and pointed, III-V each with one on inner and one on outer surface, V with an additional smaller one on dorsum at apex, VI with one on inner surface and a shorter one on dorsum, VI with the usual large one on outer dorsal surface. **Mouth-cone** semicircularly rounded at tip, extending about 104μ beyond posterior dorsal margin of head.

Prothorax (Fig. 1) with median length of pronotum about 0.56 that of head and contained in the trans-coxal width about 1.9 times; pronotum with anterior margin nearly straight, its surface lightly reticulate in about anterior half, lightly cross-striate posteriorly with widely-spaced anastomosing lines; epimeron and episternum fused with each other and with notum; antero-marginal setae 75μ, antero-angulars 128, midlaterals 64, epimerals 116, postero-marginals 65, coxals 53. **Legs** normal to the genus (fore leg shown in Fig. 1), the usual knobbed setae disposed as usual; fore tarsi not toothed. **Wings** of both pairs typical, long, narrow, and of nearly equal width throughout; fore wings with the three subbasal setae knobbed, measuring 21, 35, and 45μ, respectively. **Mesothorax** much narrower than metathorax, the latter about 419μ wide and much swollen at sides and with the usual knobbed pleural seta; metanotum reticulate like head and with a pair of strong knobbed setae, these about 39μ long and 92μ apart.

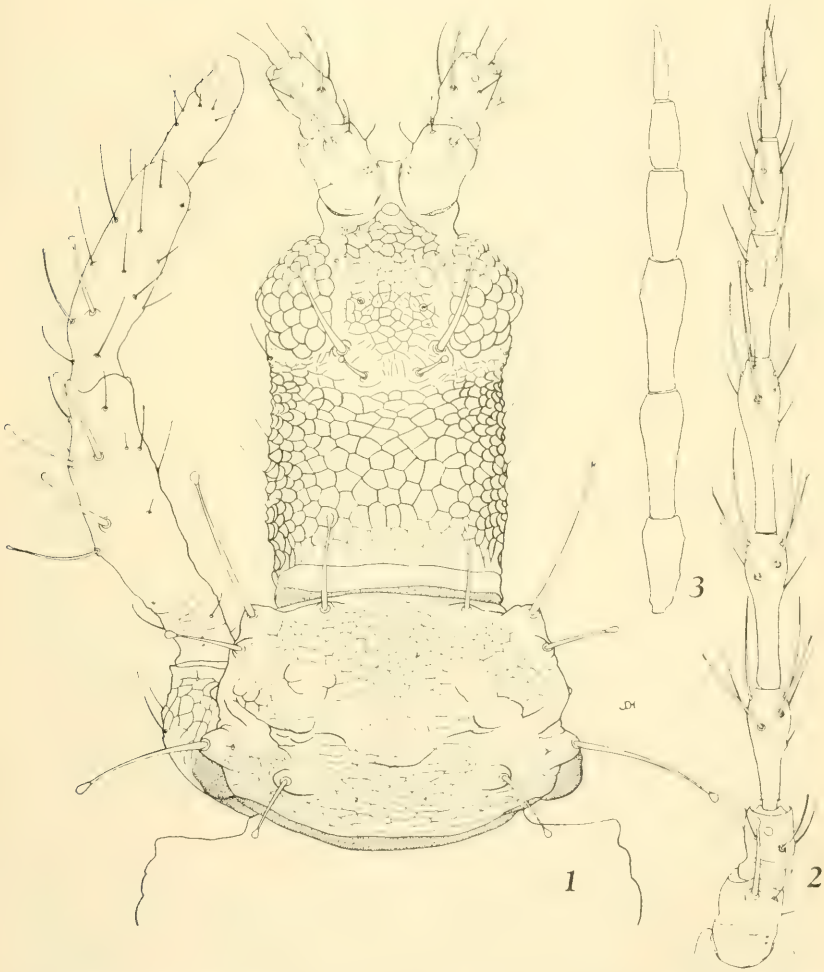
Abdomen normal, broadest at segment II; median tergite of I hat-shaped, about 77μ long medially and 230μ wide, not connected with the lateral tergites; terga III-VIII without a pair of pores on antecostal line; abdomen heavily reticulate over most of surface, both dorsally and ventrally; most major setae very similar to those on prothorax, knobbed like them, and brownish yellow in color, terga I and II each with one pair, III with two, IV-IX each with three. **Tube** (segment X, only) less than twice as long as head and nearly 6 times as long as greatest basal width (which is across the basal collar), this dimension fully 2.8 times the width of the narrowed tip; surface with numerous gray clothing hairs, all pointed, the longest considerably exceeding the greatest width of tube; extreme base of tube reticulate, remainder longitudinally ridged.

Measurements of female (holotype), in mm.: Length about 2.5 (partially distended, 2.64); head, total length 0.308, width across eyes 0.192, across postocular notch 0.174, across cheeks just behind eyes 0.176, least width near anterior third of cheeks 0.167, at basal third of cheeks 0.171, in front of basal collar 0.160, across basal collar 0.162; pronotum, median length 0.173; width of prothorax (inclusive of coxae) 0.326; mesothorax, width across anterior angles 0.335; metathorax,

greatest width 0.419; fore wings, length 1.10; abdomen, greatest width (at segment II) 0.420; tube (X, only), length 0.602, width across basal collar 0.106, subbasal width 0.101, least apical width 0.037, terminal setae 0.130; seta I on IX 0.102, II 0.118.

Antennal segments:	I	II	III	IV	V	VI	VII	VIII
Length (μ):	60	61	86	110	120	90	66	79
Width (μ):	46	37	31	32	33-34	28	22	16-17

Total length of antenna, 0.672 mm.



Zeugmatothrips pallidulus, sp. nov. Fig. 1: head, prothorax, and left fore leg; ♀, holotype (macropterous); all sculpture shown; × 92.5. Fig. 2; Same specimen, left antenna; all sculpture shown; × 92.5. Fig. 3: *Z. cinctus* Hood; outline of antennal segments III-VIII; ♀, paratype (macropterous); × 92.5.

Female, forma brachyptera.—Color and structure as in macropterous form, except for the short wings (about 0.259 mm.).

Male (brachypterous).—Length about 2.5 mm.; more slender and paler and somewhat more yellowish than female, but sculpture and structure not noticeably different; fore tarsi unarmed; sterna without glandular areas.

BRAZIL: Linha Facão, Santa Catarina, May, 1957, Fritz Plaumann, 1 macropterous ♀ (holotype), 12 brachypterous ♀ ♀ (including morphotype), and 1 male (allotype), from fallen leaves. The types are in the author's collection.

Superficially, this species resembles *Z. cinctus* very closely because of the pale base of the abdomen. Its true relationship, however, is probably more with *Z. gracilis*. From the former it may be readily known by the pale legs and the more slender antennae (compare Figs. 2 and 3); while from the latter it may be distinguished by the differently colored thorax and abdomen, the somewhat shorter antennae, the less rounded eyes, and the long, knobbed metanotal setae.

Zeugmatothrips cinctus Hood

Figure 3

Hood, 1952, Proc. Biol. Soc. Washington, 65:171.

This reference is introduced to keep the outline drawing of the antenna from being overlooked.

NEW RECORDS FOR THE RICE DELPHACID, SOGATA ORIZICOLA MUIR, IN THE UNITED STATES

(HOMOPTERA, DELPHACIDAE)

Muir (1926, Bull. Hawaiian Sugar Planters Assoc., Div. Ent., 18:1-51) described *Sogata orizicola* from a series of ten males and two females which were taken in association with rice at Blairmont, British Guiana. Additional Neotropical records for this species include Argentina, Colombia, Cuba, Costa Rica, and Venezuela. *S. orizicola* is now known from two localities in the United States, having been collected by the author at Belle Glade, Florida, on September 14, 1957 and at Bay Saint Louis, Mississippi, on September 3, 1958. In both cases the collections were made on field rice.

While the value of isolated new records is questionable, *S. orizicola* is of more than passing interest. Recent experiments by plant pathologists in Cuba and Venezuela have demonstrated that this species is the vector of "hoja blanca," a virus disease of rice. While the disease has not been found in our major rice growing areas, its eventual occurrence there is not unlikely. The collection at Belle Glade, Florida, was made on infected plants, while the specimens taken in Mississippi were associated with apparently healthy rice.—JAMES P. KRAMER, *Entomology Research Division, ARS, USDA, Washington, D. C.*

TWO NEW GLYPTOTERMES FROM THE PHILIPPINES

(ISOPTERA, KALOTERMITIDAE)

THOMAS E. SNYDER, *Research Associate, Smithsonian Institution, Washington, D. C.*

Fifty living species of *Glyptotermes* are known; they occur in all of the zoogeographical regions of the world except the Nearctic and Palaearctic. Two Ethiopian termites of these fifty are doubtfully placed in *Glyptotermes*. One fossil species has been described from Baltic amber. The sixteen known in Indo-Malayan species are from India, Ceylon, Malacca, Sumatra, Java, Sarawak, the Philipines, Formosa and Japan.

I have compared these termites with the other Indo-Malayan species and there are differences in size, size of head, color, number of segments to the antenna, shape of gula, pronotum, etc. I have named these new species, *G. franciae* in honor of F. C. Francia, entomologist, Forest Products Laboratory, College, Laguna, Philippines, and *G. magsaysayi* in honor of the late patriot and president of the Philippine Islands, Ramon Magsaysay.

These additions to the fauna bring the total number of known Philippine termites to 54. Keys are appended to separate the three known Philippine *Glyptotermes* in the winged and soldier castes; *franciae* is known only from the soldier caste.

Glyptotermes franciae, new species

Soldier,—Head brownish-yellow, with scattered long hairs, nearly twice as long as wide, front steeply sloping anteriorly, bilobed with deep v-shaped lobe. Eye spot hyaline, larger than an antennal pit. Left mandible with two marginal teeth at apex, one at middle, right mandible with two at middle of mandible. Gula wide at middle. Antenna with 12-13 segments, third segment not enlarged, shorter than 2nd or 4th segments. Pronotum wider than long, shallowly concave anteriorly, slightly emarginate posteriorly. Femora not swollen as in Kalotermes.

Nymph,—Mandibles of the *Glyptotermes* type.

Measurements:

Length of entire soldier:	8.50-10.00 mm.
Length of head with mandibles:	3.30 mm.
Length of head without mandibles (to anterior):	2.60 mm.
Length of left mandible:	0.90 mm.
Length of pronotum:	1.00 mm.
Length of hind tibia:	1.30 mm.
Width of head:	1.80 mm.
Width of pronotum:	1.80 mm.

G. franciae is larger and has a longer head than the short-headed *G. chapmani* Light, from the Philippines.

Type locality.—Mt. Makiling, Laguna, Philippine Islands.

Described from four soldiers collected with nymphs at the type locality on October 16, 1957 by F. C. Francia in *Canarium luzonicum*.

Holotype, soldier.—Cat. No. 64121 U. S. National Museum, paratypes at the same institution.

Glyptotermes magasaysayi, new species

Winged male adult.—Head yellow-brown, shining, longer than broad, with scattered long and short hairs. Eye black, nearly round, separated from the lateral margin of head by a distance less than its short diameter, and separated from the posterior margin by a distance three times its diameter. Ocellus large, hyaline, at an angle but close to eye. Mandibles of the *Glyptotermes* type.

Labrum light brown, pubescent.

Antenna pale yellow-brown, 13 segments, third segment slightly shorter than second or fourth, pubescent.

Pronotum slightly lighter colored than head. Twice as wide as long, shallowly and roundedly emarginate anteriorly, sides rounded, with long and short hairs.

Legs yellow, pulvillus between claws.

Wings whitish, yellowish in costal area, stippled. In forewing median and costal veins close to—and all three run parallel to—apex of wing; cubitus slightly below center of wing with 16 branches to lower margin, extends to apex. Upper margin of wing with hairs.

Abdominal tergites light yellow-brown, with scattered long and short hairs.

Measurements.—

Length of entire winged male adult	8.50 mm.
Length of entire dealated male adult	6.00 mm.
Length of head (to tip of labrum)	1.40 mm.
Length of pronotum (where longest)	0.60 mm.
Length of hind tibia	0.80 mm.
Length of anterior wing	7.40 mm.
Diameter of eye (long diameter)	0.20 mm.
Width of head (at eyes)	1.20 mm.
Width of pronotum	1.20 mm.
Width of anterior wing	1.90 mm.

Soldier.—Head yellow-brown, with scattered but sparse long hairs, longer than broad, front steeply sloping anteriorly, shallowly roundedly bilobed. Eye spot hyaline, larger than antennal pit. Both mandibles with two apical marginal teeth. Gula fairly wide at middle. Antenna with 11 segments, third segment not enlarged, shorter than second or fourth segments. Pronotum lighter colored than head, wider than long, shallowly concave anteriorly. Hind femora not swollen.

Measurements.—

Length of entire soldier	6.50 mm.
Length of head with mandibles	2.60 mm.
Length of head without mandibles (to anterior)	1.80 mm.
Length of left mandible	0.80 mm.
Length of pronotum	0.60 mm.
Length of hind tibia	0.80 mm.
Width of head	1.30 mm.
Width of pronotum	1.10 mm.

Type locality.—Caguiok, Mt. Makiling, Laguna, Philippine Islands.

Described from a series of winged adults and soldiers collected with nymphs at the type locality in *Caranga odorata* on December 24, 1957 by F. C. Francia.

Holotype, winged male adult.—Cat. No. 64191, U. S. National Museum; morphotype, soldier; paratypes at the same institution.

Keys to Philippine Glyptotermes

Winged

1. Fontanelle or head gland absent; no subsidiary tooth at base first marginal tooth right mandible; forewing scale usually not much longer than pronotum; branches between costal and subcostal veins; median vein heavy, close to costal veins (genus *Glyptotermes*) 2
2. Wing membrane stippled; antenna with 12 segments; small species, 7 mm. in length ..... *Glyptotermes chapmani* Light
   Larger species, 8.20 mm. in length, antenna with 13 segments ..... *Glyptotermes magsaysayi* Snyder

Soldier

No fontanelle; mandibles functional, used for biting; with marginal teeth; labrum not elongated; pronotum flat, broader than head (genus *Glyptotermes*) 1

1. Front of head steeply sloping, anteriorly roundedly but shallowly lobed; head short, length with mandibles 1.15 mm.; light yellow-brown; antenna with eleven segments ..... *Glyptotermes chapmani* Light
2. Front of head shallowly, roundedly lobed; head more elongate, length with mandibles 2.60 m.; yellow-brown; antenna with eleven segments ..... *Glyptotermes magsaysayi* Snyder.
3. Front of head with deep v-shaped lobe; head elongate, length with mandibles 3.30 mm; brownish-yellow; antenna with 12 to 13 segments ..... *Glyptotermes franciae* Snyder.

A PHRAGMITES GALL-MAKER NEW TO NORTH AMERICA

(Diptera, Chloropidae)

In material recently received for identification were two females of *Lipara lucens* (Meigen), New Haven, Conn., Mar. 27, 1931 (B. H. Walden). This common European species is easily distinguished from all Nearctic chloropids by its comparatively large size (6-8 mm.), bulky body, and dense covering of appressed yellowish hairs on mesonotum and scutellum. The larvae cause a large, cigar- or spindle-shaped terminal stem gall in the giant reed, *Phragmites*. The latter is widely distributed in North America but the gall-forming chloropid has not hitherto been recorded.

A related European chloropid, *Lipara similis* Schiner, was intercepted at Hoboken, N. J., April 2, 1946, in *Phragmites* packing from a ship from Holland. It is not at all improbable that *L. lucens* was introduced in the same way, but it is not known whether the species is actually established. The specimens recorded here were apparently collected rather than reared. I am informed by Dr. Neely Turner of the Connecticut Agricultural Experiment Station that the way the label is written indicates that Mr. Walden collected them personally.—Curtis W. Sabrosky, *Entomology Research Division, ARS, USDA, Washington, D. C.*

THE ELEPHANT LOUSE, HAEMATOMYZUS ELEPHANTIS PIAGET, 1869, ON WILD AFRICAN ELEPHANTS AND WARTHOGS[1] [2]

(MALLOPHAGA, HAEMATOMYZIDAE)

HARRY HOOGSTRAAL, *Head, Department of Medical Zoology, U. S. Naval Medical Research Unit Number Three, Cairo, Egypt*

In reviewing the taxonomy, distribution, and host relationships of the elephant louse, *Haematomyzus elephantis* Piaget, 1869, Ferris (1931) stated, "Apparently all the specimens thus far taken of this species have been from animals in captivity. It is evidently normal to the Indian elephant, and whether the original record from African elephant, and above all, that from rhinoceros, indicate anything more than purely chance occurrences in zoological gardens remains to be determined."

On 1 August 1956, Mr. Makram N. Kaiser of the NAMRU-3 staff examined a warthog, *Phacochoerus aethiopicus* subsp., at Maji ya Chumvi, Meru District, Kenya, at about 4800 feet elevation, a moment after the animal's death. He collected approximately 125 imature and adult *Haematomyzus elephantis* [together with one male, four females and nine nypmhs of *Haematopinus phacochoeri* Enderlein (P. Johnson, det.)] from hairs on all parts of the animal's body but chiefly on the mane and head. Maji ya Chumvi is a salty water hole in a widely scattered acacia savannah. A few days previously, an elephant, *Loxodonta africana* subsp., shot in Meru Forest, an indigenous woods about ten miles from the water hole, had yielded only a single specimen of the same species of louse in spite of diligent search for others. Another elephant examined in the same locality was entirely free of lice.

Haddow (1957a) noted a heavy infestation of *H. elephantis* on a warthog shot in 1956 in Karamoja District, Uganda, and stated especially that the host record was an accurate one. Reid (1954) collected only two specimens of *H. elephantis* on an elephant near Yirol in the southern Sudan and stated that no other lice were found on seven other elephants that he examined in this area. Hopkins (1938) reported on specimens of *H. elephantis* from two elephants shot by Mr. T. W. Chorley in Ankole District, Uganda, and noted that Mr. Chorley had found none on two elephants shot in another district of Uganda. Bequaert (1930, p. 997) noted *H. elephantis* from an elephant at Api, Belgian Congo. While the Api elephants are captives in a work and

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[1] Research Report NM 52 08 03.13. The opinions and assertions contained herein are the private ones of the author and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

[2] This report is a contribution from the Scientific Working Party on Ectoparasites sponsored by the U.S. Naval Medical Research Unit Number Three and the East African Veterinary Research Organization, 1956, and was suggested by Dr. G.H.E. Hopkins of the Zoological Museum, Tring.

training farm, they are obtained in northeastern Belgian Congo. No elephant lice were found on "quite a number" of elephants shot in the Semliki Forest, Uganda, near the Congo border, between 1942 and 1948 (Haddow, 1957b).

This evidence establishes that *H. elephantis* occurs in nature in Kenya, Uganda, Sudan, and Belgian Congo, and that it normally infests warthogs as well as elephants. From recent statements by Mukerji and Sen-Sarma (1955) there appears to be little doubt that this louse also infests elephants in India. These authors, in addition to an excellent review of previous literature on anatomy and affinities of the insect, observe that these parasites are seldom seen on well groomed elephants and that they die within three hours when transferred to other mammals.

On the basis of the Indian observations noted above, it is possible that the large number of elephant lice found on African warthogs and the small number found on African and Asiatic elephants reflect differences in cleanliness of the two animals. If this is not the true explanation of abundance on warthogs it might be considered that warthogs are the true hosts of *H. elephantis* and elephants adventitiously acquire small infestations at common mud wallows. Yet *Haematomyzus*, so distantly related to all other lice, seems rather more a parasite of an isolated group like the Elephantidae, from which no other lice are known, than of Suidae. In zoological gardens infestations persist for some time on elephants.

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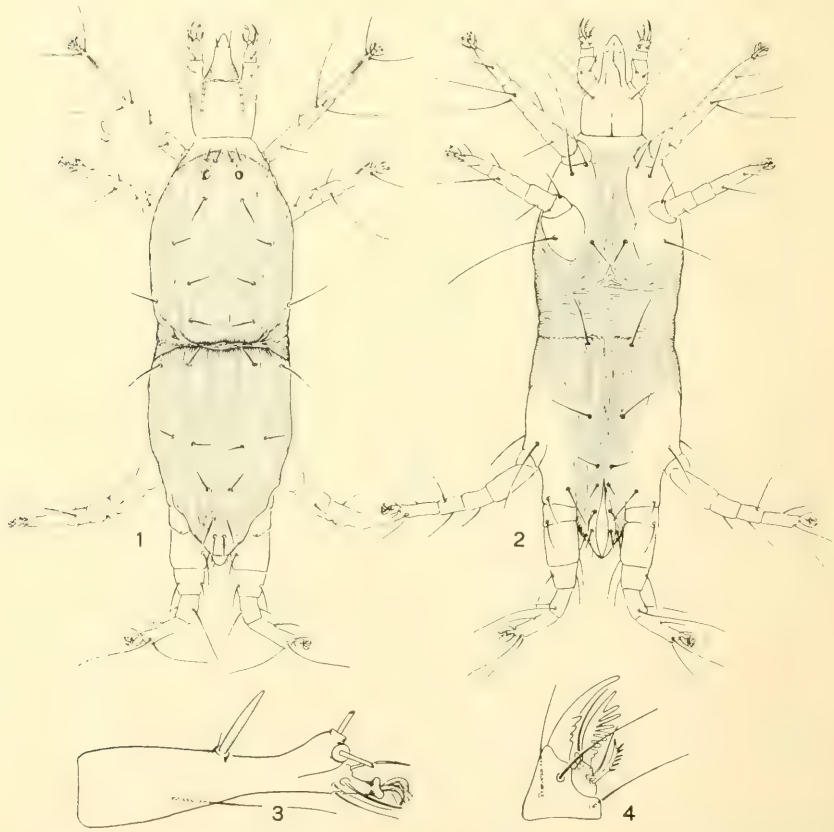
CHELACHELES STRABISMUS, A NEW GENUS AND SPECIES OF MITE FROM PORTUGAL

(ACARINA, CHEYLETIDAE)

EDWARD W. BAKER, *Entomology Research Division, A.R.S., U. S. Department of Agriculture, Washington, D. C.*

A small series of predaceous mites obtained from a flour mill in Portugal were sent to me by J. C. da Fonseca of the Brigada de Estudos de Defesa Fitossanitária dos Produtos Ultramarinos. On the basis of present generic standards (Baker 1949), these simple elongate cheyletids form a new genus, distinguished from all others by the complete absence of dorsal shields, by having truncated hysterosoma and a normal complement of palpal thumb setae.



Chelacheles strabismus, new genus and species. Fig. 1, dorsum of female. Fig. 2, venter. Fig. 3, tarsus I. Fig. 4, palpal thumb and claw complex.

Chelacheles, new genus

The palpi are normal; the thumb possesses two comblike, two sicklelike, and one short clublike seta. The body is completely covered dorsally and ventrally by fine striae, and is without a differentiated shield or plate; there are 14 pairs of dorsal setae, including the humerals. Legs I-II and III-IV are widely separated; tarsal claws and a padlike empodium with tenent hairs are present on all legs. Only females are known.

Type of genus: *Chelacheles strabismus*, new species.

Chelacheles strabismus, new species

The gnathosoma is normal, although somewhat elongate, with longitudinal striae; the peritremes are simple, inverted U-shaped, with seven pairs of segments; the palpal femur is longer than wide; all segments have simple setae; the palpal claw has three basal teeth; the palpal thumb has two comblike, two sicklelike, and one short clublike, setae the comblike setae are distinctive in having strong teeth which are fingerlike on the larger. The body is completely covered with fine striae; there are 14 pairs of dorsal and humeral setae, the dorsal setae being short, lanceolate, serrate; a single pair of closely set eyes is present; the propodosoma and hysterosoma are separated by a deep suture; the hysterosoma does not extend beyond femora IV. The legs are normal in that they possess claws and empodia; they are distinctive in having coxae I-II and III-IV widely separated, with the fourth pair pointing directly to the rear; coxae I-II and III-IV are united to form a characteristic pattern. Length, including rostrum, 427 μ; width 115 μ.

Holotype, U. S. National Museum No. 2462, collected in flour mill, Lisbon, Portugal, in 1952 by J. C. da Fonseca. Eighteen paratypes have the same data.

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A NEW KETHOPS FROM NEW MEXICO, WITH A KEY TO ITS CONGENERS

(CHILOPODA, SCOLOPENDROMORPHA, CRYPTOPIDAE)

RALPH E. CRABILL, JR., *Smithsonian Institute, Washington, D. C.*

Among the Scolopocryptopinae the members of *Kethops* superficially seem the least likely of constituents. Their diminutive size and pale color, their suturation, their lack of prehensorial plates and denticles, and their remarkable rear legs, which are almost identical with the type found in the Cryptopinae, all suggest a very close affinity with, if not proper inclusion within, this latter subfamily despite the discrepancy in pedal segments between the two groups.

However, an examination of the maxillae of *euterpe*, the new species, shows them to be essentially identical with their counterparts in

the other Scolopocryptopine genera, and fundamentally unlike those of the remaining two subfamilies. Whether the similarities shared by *Kethops* and, for example, *Cryptops* can be explained on the bases of evolutionary conservatism, parallelism, or convergency remains uncertain in our present state of knowledge.

The known distribution of the genus is restricted to Utah and New Mexico, where the present species was discovered.

In this genus, if the question of whether or not the cephalic plate overhangs part of the first pedal tergite is really meaningful systematically, then the new species seems most like *atypa* Chamberlin, 1943, from which it differs in many respects, e.g. its possession of a first tergital cervical suture, its total lack of cephalic sulci, its possession of ventral tibial spines. It differs from *utahensis* Chamberlin, 1912, in lacking cephalic sulci and a diastemate tibial ridge on the ultimate legs in addition to having an overlapped first tergite. This last feature plus its possession of distinct ventral furrows or sulci on the ultimate legs distinguish *euterpe* from *leioceps* Chamberlin, 1925.

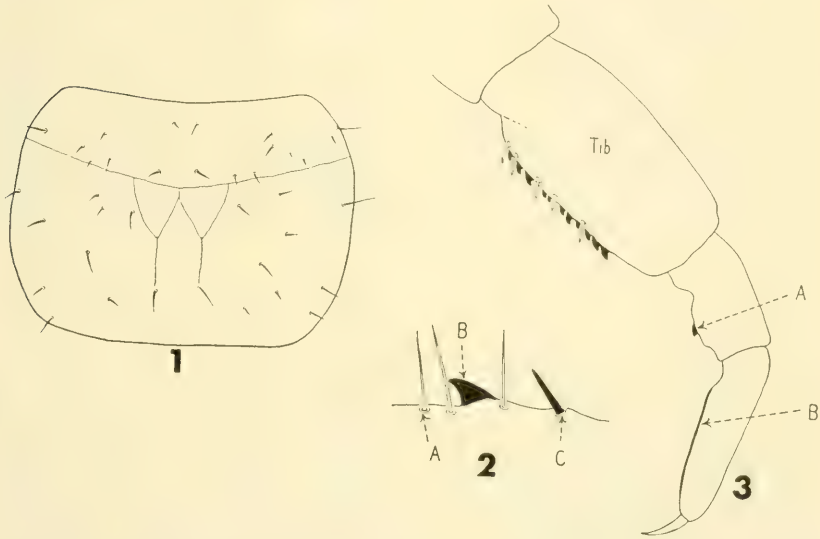
Kethops euterpe, sp.n.

Figures 1, 2 and 3

Type: ♂ ?. New Mexico: Otero County, Cloudcroft. July 26, 1948. George E. Ball and Howard E. Evans, leg. Deposited in the U. S. National Museum: Myriapod Type Number 2454.

Total length: 27 mm. **Antennae:** Sordid yellow; 3.2 mm long; proximal four articles distinctly less setose than those remaining. **Cephalic plate:** Sordid yellow; 1 mm long, greatest width 0.93 mm. Sides straight on posterior two-thirds, anteriorly narrowing to meet truncate frontal margin; posterior corners rounded; posterior margin straight, overhanging first pedal tergite but leaving its cervical suture exposed. Without sutures or sulci. Very sparsely setose. **Clypeus:** Enclosed anteriorly and laterally by a broad band of sordid white, this enclosing a yellowish subtriangular central area extending from labrum nearly to antennal insertions. Prominent postantennal setae 5, in a subcircular group postero-medial to antennae; central area with a few irregularly dispersed setae; with 11 setae linearly disposed anterior and adjacent to labrum. **Labrum:** Midpiece prominent, with the usual pointed spine, completely fused with sidepieces without trace of divisions; ventral surfaces of sidepieces without setae, their latero-posterior margins with a few short delicate fimbriae. **First maxillae:** Essentially as in *Scolopocryptops*, the coxosternum on each side beneath the telopodite without an inverted Y-shaped suture (as there is in *Theatops*); the two sides of the coxosternum meeting narrowly in a minute articulation. **Second maxillae:** The claw as in *Scolopocryptops*, i.e. its ventral edge straight, undissected, the entire length of its dorsal edge divided into a series of delicate broad blunt teeth or fimbriae, its apex pointed, not bifid as in *Cryptops* or *Theatops*. **Prehensors:** Sordid yellow, dull; without denticles, sclerotized plates or similar appurtenances. Sparsely clothed with long pale setae. **Prosternum:** concolorus with prehensors. Without chitin-lines, sclerotized teeth, plates or like appurtenances.

Sternites: (excluding the ultimate pedal): Yellowish-white; virtually glabrous; coarsely reticulate; shallowly punctate. Median longitudinal sulci on 2 through 21, becoming progressively shallower on successive sternites. Submarginal sulci pronounced on sternites 1 through 22. **Tergites** (excluding the ultimate pedal): the first (fig. 1) yellowish, its cervical suture complete and conspicuous, this giving rise posteriorly to a W-shaped sutural configuration from whose posterior angles a pair of incomplete paramedial sutures arise; remaining tergites yellowish-white, each (2 through 22) with a pair of complete



Kethops euterpe, sp. n. Fig. 1. First pedal tergite; suturation and the more prominent setae shown. Fig. 2. Section from tibial ridge of ultimate leg—A, a seta; B, a spine; C, a spur. Fig. 3. Ultimate leg. (right, inner surface uppermost) —A, first tarsal ventral spine; B, second tarsal ventral blade.

paramedian sutures; lateral margins extremely vague, present on the first 13 to 15 tergites. Sparsely setose. **Legs** (excluding the ultimate pedal): Inner surfaces whitish, outer yellowish. Vestiture heavier on about the first eight, thereafter becoming lighter on successive legs. Tarsi 1 through 22 each unipartite, without trace of division; all pretarsi but the ultimates with two accessory (setiform) claws; conspicuous plextrotaxy, VTiA = 1 — 20, VTiM = 1 — 21, VTaM = 1 — 21. **Ultimate pedal segment:** Tergite yellow; not suturate or sulcate; posterior margin not indented, subtruncate; its setae sparse, without spines or spurs. Sternite longer than wide, sides gently convergent to rounded rear margin, this not sulcate, with a few scattered stout setae. Pseudopleura, each with 25-30 round pores in a band-like porigerous area occupying its lower third; pore-free areas each with about 15 strong, scattered spurs; each ventral margin expanded into a strong flange that is continuous

with the pseudopleural spine, ventrally on each flange a single strong spur, each inner postero-dorsal pseudopleural margin (above the spine proper) with a linear series of 3 small strong spines. **Legs:** Prefemora, each with a longitudinal glabrous sulcus ventrally and an abortive postero-dorsal sulcus; the ventral sulcus forming two ridges, the inside ridge with 3 linear spines[1] (fig. 2), the outer ridge with many spurs but without spines, inner and outer lateral surfaces with no spines but with numerous spurs; femora, each with a longitudinal ventral setose sulcus and an abortive postero-dorsal sulcus, ventrally the inside ridge with spines (r., = 3, 1 = 4), the outer ridge with only scattered spurs and setae, inner and outer lateral surfaces with a few scattered weak spurs but with numerous setae; tibiae (fig. 3), each proximally deeply excavate, the inner margin expanded into a prominent broad ridge bearing a linear series of stout spines (1. = 9, r. = 10), spurs and setae, this ridge not diastemate (as in *utahensis*), inner lateral surface with only a few spurs, outer lateral surface without spurs, with only setae; first tarsus (fig. 3) excavate proximally, ventrally with one robust broad spine, entire article subdensely setose, without spurs; second tarsus totally without spurs or spines, ventrally with a long smooth blade-like ridge, the entire article subdensely setose; pretarsus strong, deeply pigmented.

Key to the Known Members of Kethops

1. Rear margin of cephalic plate overlapping anterior margin of first pedal tergite. First pedal tergite with or without a cervical suture. Cephalic plate without a posterior transverse sulcus 2
   Rear margin of cephalic plate not overlapping first pedal tergite. First pedal tergite with a cervical suture. Cephalic plate with or without a posterior transverse sulcus 3
2. Distal tarsal article of ultimate leg ventrally with (3) distinct spines. Proximal tarsal article with a row of (6) distinct spines. Ultimate tibiae, femora, and prefemora ventrally without spines First pedal tergite without a cervical suture ..... *atypa* Chamberlin
   Distal tarsal article of ultimate leg ventrally without spines, instead with a smooth blade-like ridge. Proximal article with one low spine. Ultimate prefemora, femora, and tibiae each with ventral spines. First pedal tergite with a distinct cervical sulure ..... *euterpe*, sp.n.
3. Cephalic plate with a transverse posterior sulcus from which two long divergent sulci arise and pass forward. Ultimate prefemora and femora ventrally sulcate ..... *utahensis* Chamberlin
   Cephalic plate without sulci. Ultimate leg articles ventrally nonsulcate ..... *leioceps* Chamberlin

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[1] Throughout this paper, as in my other publications, *spines* and *spurs* are intended to mean two different things. Like a seta, a spur is articulated, hence movable, but much more robust (fig. 2, C). Unlike either, a spine is always unarticulated, hence immovable (fig. 2 B). Typically, it is merely an extension of the exoskeleton, though in some cases it may possibly represent a spur that has lost its free articulation and attendant ability to move.

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Vol. 60 DECEMBER, 1958 No. 6

NOTES ON THE TAXONOMY AND HABITS OF CRYPTOCHAETUM NIPPONENSE (TOKUNAGA) IN JAPAN

(DIPTERA, CRYPTOCHAETIDAE)

RICHARD H. FOOTE[1] and PAUL H. ARNAUD, JR.[2]

An interesting fly with annoying habits was encountered by the junior author while he was collecting near Kyoto, Japan.[3] Adults behaved like *Hippelates* of the family Chloropidae, flying close to his face and head, but grossly resembled a species of black fly, or Simuliidae. A later examination showed these flies to belong to the genus *Cryptochaetum*. It is the purpose of this paper to direct the attention of American entomologists to the habits of certain members of this little-known genus, and to add another species to it.

Male specimens were referred to the senior author for identification. These males are conspecific with *Hippelates nipponensis* Tokunaga (1944)[4]. Since most workers do not have access to the original description of this species, we include a redescription of the male and effect its transfer from *Hippelates* to *Cryptochaetum*.

Cryptochaetum nipponense (Tokunaga), new combination

Cryptochaetum grandicorne Rond.: Coquillett, 1898, Proc. U. S. National Museum 21(1146): 340 (misident.); Nawa, U., 1920, Konchu Sekai 24: 267 (misident.); Koizumi, 1954, Kontyu 20(3/4): 73 (misident.).

Cryptochaetum sp.: Nawa, Y., 1904, Konchu Sekai 8: 246, fig.; Koizumi, 1952, Kurashiki-Kontsyu-Dokokai-Kaiho 1:2.

Hippelates nipponensis Tokunaga, 1943, Iyo Konchu Gaku 2: 1075.

Male: **Head.**—Frontal triangle (fig. 1) shiny, extending full length of front, apex broadly rounded and as wide as distance between inner surfaces of antennae; with short hairs, the socket of each hair in a shallow depression of the integument;

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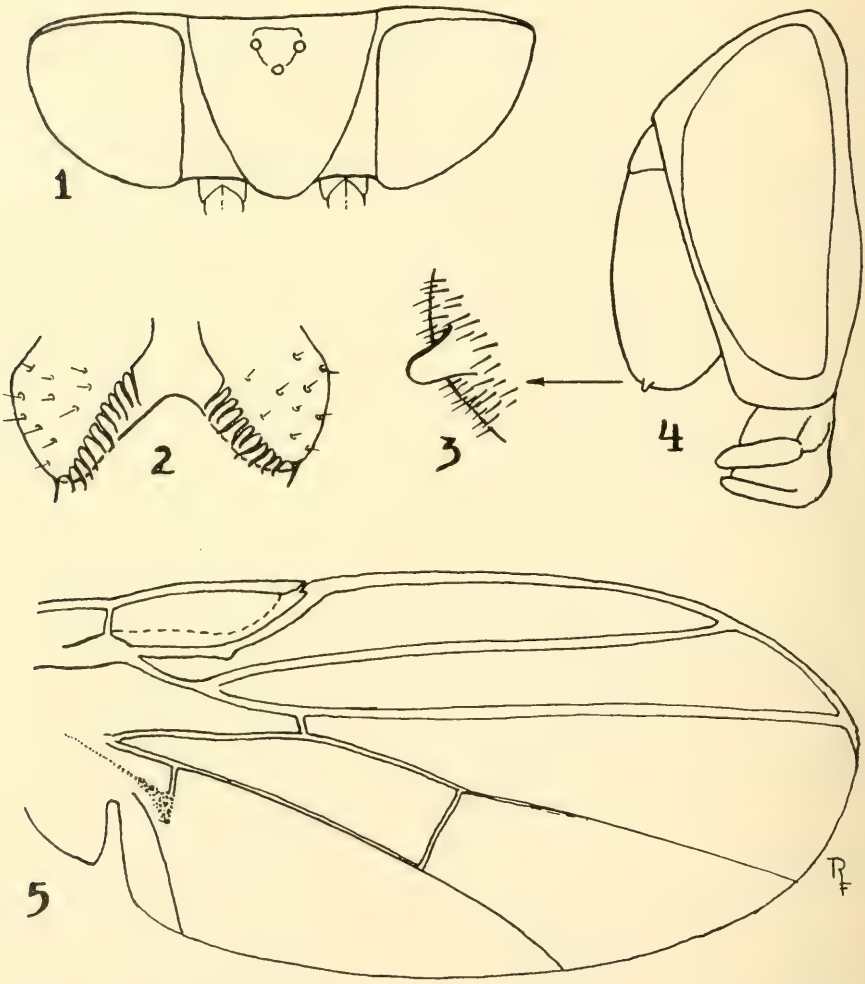
[1]Entomology Research Division, A.R.S., U.S.D.A., Washington, D. C.

[2]California Department of Agriculture, Sacramento.

[3]The specimens were collected while the junior author was under contract No. DA-49-007-MD-558 between Stanford University and the Medical Research and Development Board, Office of the Surgeon General, Department of the Army, 406th Medical Laboratory, APO 343, San Francisco.

[4]C. W. Sabrosky provided the first clue to the true identity of these flies and translations of several important papers from the Japanese. Teiso Esaki, Kyushu University, and M. Tokunaga and M. Sasakawa, Saikyo University, Kyoto, made additional literature references and their translations available.

parafrontal areas dull black, more finely haired than frontal triangle. Eyes red, bare; ocelli red, separated from each other by twice the diameter of one ocellus. Post verticals erect, short but considerably stouter than hairs on frontal triangle. Face brownish-black in certain lights, in others with a bright green metallic luster, surface very finely granulated, subshining. Antenna (figs. 3 and 4) 0.90 to 0.95 times as long as face, third segment covered with minute hairs, rounded at tip, the minute apical spine easily visible in most specimens. Labellum (fig. 2) with numerous spines as shown.



Cryptochaetum nipponense (Tokunaga), male: fig. 1, dorsal view of head; fig. 2, anterior view of labellum; fig. 3, enlarged view of apical spine of antenna; fig. 4, lateral view of head; fig. 5, dorsal view of right wing.

Thorax.—Shining, with a metallic blue-green luster, punctures at bases of hairs about as deep and numerous as those on frontal triangle. Sternopleuron and pteropleuron dark brown and shining. Scutellum broadly rounded apically, 0.45 times as long as thorax, with same metallic luster and punctation as thorax; hairs at apex not differentiated. Femora and tibiae dark brown, with parallel rows of short, stout spines, those at apex of each tarsomere longer than those on shaft. Wing (fig. 5) membranes with greenish and purplish reflections; proportion of wing length to width, 9 : 4. Costa extending only very slightly beyond R_5 and terminating distinctly before tip of wing; R_1 with a distinct angle; R_{2+3} and R_{4+5} parallel for two-thirds of their lengths, then diverging to the margin; r-m crossvein very short, situated at distal fourth of discal cell at about same level as junction of R_1 with costa; m-cu crossvein slightly sinuate, situated at nearly right angles to longitudinal axis of wing, almost twice as long as distal portion of Cu_1 Anal vein as shown. Halter black.

Abdomen.—Wide and somewhat flattened in pinned or dried specimens; shining and with punctation and coloration as on thorax.

Distribution and specimens examined.—Type locality, Nishi Kamo, Kyoto, Japan (collected May 13, 1938). Types are presumably in the collection of the Department of Entomology, Kyoto University, but were not examined in this study. The junior author took this species at Arashiyama, Kyoto, on May 22, 1955, and at Otsu, Shiga Pref., on May 30, 1955. The senior author examined 36 males from the former and 25 males from the latter locality. Ten specimens found in the National Collection with the label "Japan, Mitsukuri" are presumably those presented to the U. S. National Museum by the Imperial University of Tokyo and recorded by Coquillett (1898) as *C. grandicorne* Rond. They agree very well with males collected by the junior author.

Taxonomic discussion.—In Thorpe's (1941) key *C. nipponense* runs to the very closely related *iceryae* (Will.) or to *pariceryae* Thorpe, depending upon whether one considers the r-m crossvein to be proximal or distal to the junction of R_1 with the costa. The most reliable means of separating *nipponense* from *pariceryae* is the sinuate m-cu crossvein. In *pariceryae* the posterior end of this vein is abruptly curved toward the base of the wing just before its junction with Cu_1. In *nipponense* this crossvein is almost twice as long as that portion of Cu_1 lying between it and the wing marking; in *iceryae* it is distinctly shorter than this distal portion of Cu_1. The r-m crossvein of *iceryae* is distinctly proximal to the junction of R_1 with the costa.

The genus *Cryptochaetum* has been assigned by various authors to three existing families—Agromyzidae, Drosophilidae, and Chamaemyiidae. On account of its peculiar habits and morphology, it appears to have few affinities to any of these, and until further morphological studies, especially of the genitalia, can be made, the authors prefer to regard it as a separate family, following Menon (1949) and others.

At least 16 species of *Cryptochaetum* have been described. The most important focus of the genus appears to be tropical Africa with sev-

eral species occurring in the Oriental and Palaearctic Regions. As far as known, larvae are exclusively parasitic on monophlebine coccids (family Margarodidae) and exhibit much more striking interspecific morphological differences than adults. The most complete information about the morphology and biology of a species in the genus is found in Thorpe's (1930) account of *C. iceryae* (Will.), a species introduced into California and studied as a parasite of economic importance in the control of scale insects in that State.

Habits.—Howlett (1909, p. 623) was apparently the first to record the *Hippelates*-like habit of *Cryptochaetum*. He stated that one species (thought to be closely related to *C. aenescens* de Meijere) was an annoying eye fly in the jungle at Pusa. Adults were often found on stems or leaves or in crevices in tree trunks in small groups of about six. Bezzi (1919) described *C. fastidiosum* from the Philippines; R. C. MacGregor, who collected the specimens, sent them to Bezzi with a note reading, "A pest, flies into the inner corner of a person's eye." Thorpe (1930) wrote an extensive account of the biology of *C. iceryae*, in which he noted the two references mentioned above; he did not observe this habit in males in his rearing cages in California. The terms "mematoi"[5] and "kuro me matoi" are used by the Japanese to designate any fly that has the annoying habit of flying about a person's face, according to Tokunaga (1943) and Koizumi (1952). In Japan, this habit was observed by both Y. Nawa (1904) and U. Nawa (1920) in *Cryptochaetum* species, presumably *nipponense* (Tokunaga). Tokunaga (1943) reported *nipponense* to be active in the spring, and that adults bite with "powerful, toothlike projections" on the ridges of the labellum, sometimes licking secretions and sucking blood. There is usually some pain which disappears shortly after such an attack. Our studies indicate that the numerous spinelike projections on the surface of the labellum (fig. 2) may enable these flies to inflict some skin damage.

On May 22, 1955, while collecting Diptera along a steep mountain slope over the Hozu River near Arashiyama, Japan, the junior author encountered a number of *C. nipponense* adults flying about his face. Other people in the vicinity were waving their hands in an apparent attempt to drive insects, presumably also of this species, from their faces. Many Japanese hikers passed by him during the next two hours, and flies were following each of them as well. The flies followed him to a spot in partial shade about 200 feet above the river. The day was warm and humid, with a very slight breeze, and was alternately sunny and cloudy. A total of 536 specimens was collected by net, flying about his person. Between 1230 and 1330 hours, the first hour of collecting, 282 specimens were caught; from 1347 to 1402 hours, another 120 adults were netted; and an additional 134 specimens were obtained

[5]*Me* means "eye" and *matoi* means "delusion, perplexity." Hence a mematoi is something that deludes, perplexes (or bothers) the eye. *Kuro* means "black."

by net between 1413 and 1428 hours. *C. nipponense* males were still very abundant at the conclusion of this activity.

On no occasion did the flies bite. Adults flew between eyeglasses and eyes and occasionally into the eye itself. One adult entered the nose.

There are no published results of investigations on the habitat of the immature stages of *nipponense*. If this fly is found to have parasitic stages in its life history, its pestiferous habits should be weighed in any decision to introduce it for purposes of biological control.

We can find no reference incriminating any species of the genus in the transmission of a disease.

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CORRECTION

Line 36, page 179, no. 4, vol. 60 of the *Proceedings* should read as follows: "*Generic Characterization.*—Medium to large-sized dolichopodids. First antennal joint . . ."— Ed.

NOTES ON NORTH AMERICAN PIOPHILIDAE

(DIPTERA)

This family, like the Sepsidae, contains a large proportion of very widely distributed species. The commonest forms, at least in eastern North America, are apparently the same as those of Europe. Willi Hennig's excellent monograph of the Palaearctic speices (1943, in Linder, Die Fliegen d. pal. Region, fasc. 40:1-32, pls. I-III) makes it obvious that many of the species previously considered as Nearctic are synonymous with Palaearctic species, as Duda pointed out as long ago as 1924 (Konowia 3:97-113, 153-203). Consequently, determination of our material should be done first with the Hennig work and secondarily with the 1924 paper by Melander (Psyche 31:78-86) for the several apparently purely Nearctic species.

Sabrosky recently published a note (1958, Ent. News 69:174) on two far-northern species, and I wish now to add the following.

Piophila (Protopiophila) latipes Meigen.

Mycetaulus hornigi Cresson, 1919, Proc. Acad. Nat. Sci. Philadelphia 71:193. **New Synonymy.**

The complete synonymy of this very widespread species is given by Hennig, who also cites the distribution: Europe (France, Germany, Hungary, Croatia, Corsica), Oriental Region (Calcutta, Kurseong, Sumatra, Celebes, Philippine Is., Formosa), New Guinea, Fiji, Australia (Sydney). I have seen Cresson's type, from Philadelphia, Pa., and have a number of specimens taken from rotten cadavers of small animals in Wayne County, Mich. (Detroit and Trenton). My material agrees well with the Duda description repeated in Hennig.

Piophila (Allopiophila) vulgaris Fallén

I have a female specimen from Sodus Point, New York, which agrees very well with the Duda-Hennig description. It appears likely that *P. oriens* Melander and Spuler may be a distinct species.

Piophila (Mycetaulus) costalis Melander, 1924, Psyche 31:79

A female specimen, kindly presented to me by its collector, Paul H. Arnaud, Jr., is from Pinecrest, Tuolumne County, Calif., Aug. 11, 1948, and agrees well with Melander's description of a male from Mt. Hood, Oregon. The abdomen is wholly black and appears dull due to a very fine shagreening. *P.* (*M.*) *bipunctata* Flln., according to Hennig, has the abdomen shining black, with the basal two segments largely brownish, a condition I also find in eastern North American specimens in my collection.

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A REVIEW OF THE GENUS GASTROPS WILLISTON, WITH DESCRIPTIONS OF TWO NEW SPECIES

(DIPTERA, EPHYDRIDAE)

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Four species have been described in the American genus *Gastrops* Williston. It is the purpose of this paper to give additional characters for their recognition, to give additional distribution records, to describe two new species, and to present a diagnostic key.

Genus **Gastrops** Williston

Gastrops Williston 1897, Kansas Univ. Quart. 6:3 (type species: *niger* Williston, monobasic).

This genus belongs in the subfamily Parydrinae Wirth & Stone (1956, *in* Usinger, Aquatic Insects of California, p. 407). The subfamily name Napaeinae Cresson (1930, Trans. Amer. Ent. Soc. 56: 100), is invalid because it is based on a homonym: *Napaea* Robineau-Desvoidy 1830, not Hübner 1819, Lepidoptera). Although Cresson revised the North American Parydrinae in 1949 (Trans. Amer. Ent. Soc. 74:225-260), his untimely death put an end to his study of the subfamily from other regions, including the Neotropical, where all but one of the *Gastrops* species are found. Species of *Gastrops* greatly resemble those of *Lytogaster* Becker in their subglobose abdomen, but can be separated by the rounded or subconically swollen upper face, which is set off from the apronlike lower face, and by the plumose arista.

KEY TO THE SPECIES OF GASTROPS WILLISTON

1. Wing spotted or with fuscous bands at apex of first vein and along posterior crossvein 2
   Wing hyaline, without infuscated pattern 3
2. Wing with many fuscous spots; second vein with a large distal spur vein (North America) ..... **nebulosus** Coquillett
   Wing without discal spots, but with broad fuscous band from apex of first vein to anterior crossvein and infuscation along posterior crossvein; second vein without distal spur vein (Costa Rica) ..... **fuscivenosus**, n. sp.
3. Femora black 4
   Femora yellow (Peru) ..... **flavipes**, n. sp.
4. Smaller species (wing 2-3 mm. long); thorax subshining, with coarse, sparse golden to coppery pollen, vittae scarcely evident; scutellum very convex; arista with 8-10 rays 5
   Large species (wing 4.0 mm. long); thorax pollinose with two prominent gray dusted stripes; scutellum flattened; arista with 12-14 rays (Brazil and British Guiana) ..... **willistoni** Cresson
5. Tibiae uniformly yellowish-brown; hairs on mesonotum, scutellum and abdomen short and semi-appressed (Texas to Argentina) ..... **niger** Williston
   Tibiae blackish, at least on a broad subapical band; hairs on mesonotum, scutellum and abdomen very dense and subereet, about half as long as scutellar bristles (Paraguay, Bolivia, Panamá) ..... **auropunctatus** Hendel

Gastrops nebulosus Coquillett

Gastrops nebulosus Coquillett 1900, Canad. Ent. 32:34 (male, female; North Caroline, Georgia).

This species was briefly redescribed by Cresson (1949, Trans. Amer. Ent. Soc. 74:251) and distribution records were added by Sturtevant and Wheeler (1954, Trans. Amer. Ent. Soc. 79:206). It is easily recognized by the maculate wings.

Recorded distribution.—North America from Massachusetts to Michigan, Missouri, Florida and Texas.

Gastrops fuscivenosus Wirth, new species

Male, female.—Length 2.1 mm. Wing 2.3 mm. long. Shining black; antenna, sides of clypeus, mouthparts, trochanters, tibiae and first four tarsomeres yellowish-brown; halter black, base of stem yellow. Wing with membrane yellowish, veins darker brown; a prominent dark brown cloud from apex of first vein to anterior crossvein; posterior crossvein broadly margined with brown infuscation; in some specimens small brown spots present also at wing margin at apices of third and fourth veins; the veins in areas of the brown clouds blackish. Face, frons, mesonotum, pleura and scutellum rather uniformly covered with very sparse, coarse, brown pollen; median facial tubercle polished; also the sternopleuron. Abdomen shining with metallic reflection, surface scrobiculate, with sparse brown pollen except lines on posterior margins of segments; fourth tergum with a sublateral pair of small polished areas on posterior margin. Mesonotum, scutellum and abdomen with sparse, short, semi-appressed black hairs; hairs of legs very short compared with other species.

Arista with 7-10 rays; frons at level of hind antennal margin 0.50 times as wide as total width of head; cheek not quite 0.3 as wide as eye height; scutellum rather flat dorsally with prominent apical tubercles broadly separated; wing with third costal section 1.5 times as long as second; last section of fourth veing 1.6 times as long as next to last.

Holotype male, Higueto, San Mateo, Costa Rica, P. Schild, collector (Type no. 64215, U.S.N.M.). Paratypes 12 males and females: Costa Rica, 1, same date as type; 11, La Caja, 8 kil. w. San José, Schmidt, 1930 (5 returned to Deutsches Ent. Inst., Berlin; 2 in U.S.N.M., 2 in Academy of Natural Sciences of Philadelphia, 2 in British Museum (Natural Histoyr)).

This species is distinguished from all other species of *Gastrops* by the pattern of infuscation of the wings, with clouded areas from the tip of the first vein to the anterior crossvein and along the posterior crossvein, but without the numerous isolated spots in the wing cells characteristic of *nebulosus* Coqpillett.

Gastrops flavipes Wirth, new species

Female.—Length 2.4 mm.; wing 2.9 mm. long. Body black; lower demarcated portion of face, clypeus and mouthparts, antenna, fore coxa and all legs including femora, yellowish. Halter knob black, base of stem yellow. Wing yellowish-brown hyaline, the veins dark brown. Face, frons and dorsum of thorax shining with

very sparse, coarse, yellowish pollen allowing the integument to shine through except on sides of face. Sides of frons with violet reflections; a broad median and two broad lateral bands on mesonotum and all of scutellum brownish pollinose; mesofrons, a pair of sublateral mesonotal vittae and large areas in front of mesonotal suture and extending over pleura except for the polished sternopleuron, densely yellowish gray pollinose. Thoracic hairs very sparse but fairly long. Legs with hairs mostly yellowish and not very prominent. Abdomen subshining with metallic reflections, irregularly scrobiculate, with scattered, rather short black hairs arising from prominent punctures, with sparse brownish pollen, a prominent pair of sublateral spots on distal margin of fourth tergum with dense, grayish white pollen; posterior margins of terga not polished.

Third antennal segment broken off; frons at level of hind margin of antennal bases 0.50 as wide as total head width; facial tubercle not prominent, the protruding lower portion of face nearly half of total height of face; cheek only 0.3 of eye height; scutellum very convex dorsally and pointed behind, the apical tubercles scarcely developed; wing with third costal section 1.5 times as long as second; last section of fourth vein 1.4 times as long as next to last.

Holotype female, Perené, Peru, R. C. Shannon, collector (U.S.N.M. Type no. 64216).

The yellow femora will readily distinguish this species from all other species of *Gastrops*.

Gastrops willistoni Cresson

Gastrops willistoni Cresson, 1914, Ent. News 25:250 (male, female; Brazil, British Guiana).

This species can be distinguished by its large size (wing 4 mm. long), densely pollinose and vittate thorax, flattened scutellum which is broad apically with a prominent pair of tubercles, the arista with 12-14 rays and the unmarked wings.

New records.—**Costa Rica:** Higueto, San Mateo, P. Schild, coll. (det. Cresson 1946), 3. **Brazil:** Rio de Janeiro, Oct. 1943, Bertha Lutz (''parasita depostura de batrachio do genero *Eupemphix*'').

Gastrops niger Williston

Gastrops niger Williston, 1897, Kansas Univ. Quart. 6:3 (Grenada and Brazil; male, female).

This species resembles *auropunctatus* Hendel in having hyaline wings, black femora and arista with 8-10 rays, but differs in having uniformly yellowish-brown tibiae and shorter body hairs.

Recorded distribution.—Brazil, Grenada, Texas, Costa Rica, Mexico.

New records.—**Argentina:** Chaco, Colonia Benítez, 1-7 Dec. 1948, R. Golbach, 1; same, 3 Nev. 1949, M. Aczél, 2; Formosa, Mision Laishi, 13-15 Dec. 1948, 1; Formosa, Pirané, 29-31 Dec. 1948, R. Golbach, 1; Salta, Aguaray, 14-18 Feb. 1950, R. Golbach, 1; Tucumán, Lacavera, 23-28 Nov. 1951, Aczél-Golbach, 1. **Costa Rica:** Higueto, San Mateo, P. Schild, 5; La Caja, San Jose, Schmidt, 1930, 7. **Ecuador:** Los Rios, Guare, Aug. 1955, 2; Guayas, Taura, Dec. 1955, 1, El Oro, Machala, Dec. 1955, 1, all collected by R. Levi-Castillo. **El Salvador:** Apopa, 28

Feb. 1957, P. Berry, 1. **Grenada, W. I.:** 2 (these probably came from Williston's type series, although they are not so labelled). **Guatemala:** Quirigua, 7 May 1926, J. M. Aldrich, 5; La Providencia, Obispo, Apr. 1914, J. M. Aldrich, 4. **Mexico:** Oaxaca, 13 May 1938, R. Greenfield, 2. **Nicaragua:** Chinandega, coll. Baker, 1. **Panamá:** La Jolla, Mindi Dairy, Summit, Frijoles, Pedro Miguel, Mojinga Swamp, Sabanas, 13. **Trinidad:** Montserrat, 29 June 1905, A. Busck, 1. **Venezuela:** Caife, Jan. 1943, P. Anduze, 20; Barinas, Santa Rosa, Feb. 1943, P. Anduze, 18.

Gastrops auropunctatus Hendel

Gastrops auropunctata Hendel 1930, Konowia 9:145 (Bolivia, Argentina; male, female).

Very closely related to *niger* Williston, but separated by the dark tibiae and its much hairier appearance. The hairs on the mesonotum, scutellum and abdomen are long, black, and suberect, about half as long as the bristles (Hendel gives ⅔ to ¾).

There are 8 rays on the arista. The wing membrane has a somewhat darker infuscation behind the apex of the first vein. The mesonotum bears two mesal and two lateral longitudinal dark-brown vittae, with a sublateral pair of noticeable grayish pollinose vittae between.

New records.—**Bolivia:** Huachi Beni, Sept., W. Mann, Mulford Bio. Exp. 1921-22, 1; Covendo, Aug., W. Mann, Mulford Bio. Exp. 1921-22, 1 (these were misdetermined and reported by Cresson as *niger* Williston). **Ecuador:** El Oro, Puerto Bolívar, Dec. 1955, 1; Guayas, Balao, Dec. 1955, 1, all collected by R. Levi-Castillo. **Panamá:** Gatun, C. Z., A. H. Jennings collector, 2; Paris, 23 Oct. 1952, F. S. Blanton, 9. **Venezuela:** Barinas, Santa Rosa, Feb. 1943, P. Anduze, 2.

BOOK NOTICE

THE ENTOMOLOGICAL PUBLICATIONS OF CHARLES HENRY TYLER TOWNSEND (1863-1944): With Lists of his New Generic and Specific Names. Paul H. Arnaud, Jr.; Microentomology 23(1):1-63; 1 plate. $1.25.

In this fine and useful work, Mr. Arnaud has brought together all of the known papers of Townsend, together with separate lists of the Townsend genera and species. For the first time the works of this prolific Dipterist have been effectively referenced under one set of covers.— Ed.

SOME SPECIES AND GENERA OF THE FAMILY ASILIDAE
(DIPTERA)

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In this paper are several descriptions of species and genera of robber flies.

Cophinopoda, new genus

Type of genus: *Asilus chinensis* Fabricius, 1794. There is a second species to which one of the older names in synonomy under *chinensis* may apply.

Large flies related to *Ommatius* Wiedemann. They are characterized by the wide, more prominent face, densely beset with long, bristly pile over the middle and on the cheeks. The low mesonotum, the strong bristles on the scutellum, long, ventral prongs of male superior forceps and process of the hypandrium, as well as a patch of characteristic hairs immediately above the halteral base further characterize these flies. Length, 30 mm.

Head.—The head is similar to that of *Ommatius.* Occiput is moderately prominent throughout; upper bristles are short and stout and confined to the upper corner of eye. Proboscis longer than the face. Face extensive and more strongly extended below but gradually produced; beneath antenna it is about one-fourth the head width, strongly divergent below to more than one-third the head width.

Thorax.—The mesonotum is low and pollinose, broadly covered by numerous, suberect setae, especially anteriorly; acrostical bristles undifferentiated and dorsocentral bristles only so posteriorly. Lateral bristles consist of 2 notopleural, 1 supraalar, 1 postalar and 1 pair on scutellum. All of these bristles are stout and long. Base of scutellum on each side with a tuft of pile over the halteres. Prosternum dissociated.

Legs.—The legs are generally similar to those of *Ommatius* including claws and pulvilli. The bristles of the legs are remarkably stout, blunt, and almost spike-like; the hind femur has 6 dorsolateral, 6 dorsomedial and 1 dorsal pair at the subapex, besides 7 ventrolateral and 7 ventromedial bristles.

Wings.—The posterior branch of the third vein ends almost at the wing apex and both the first and second posterior cells are wide at the margin. The second posterior cell is strongly widened at the base and twice as wide as the end of the discal cell.

Abdomen.—The abdomen is stout, especially at base and gently tapered; the pile is short, appressed, setate; sides of first tergite with 7 stout bristles. Males with 8 well developed tergites. Superior forceps with a distilateral, flattened wing curved towards midline and bearing a long, slender, ventral, sigmoid, apically hooked process. Hypandrium with long, apical process. Female terminalia consists of a flat, quadrangular plate with medial crease and it has a posterolateral corner extension of the eighth sternite.

Molobratia, new genus

Type of genus: *Asilus teutonus* Linné, 1767.

I am indebted to the kindness of Mr. H. Oldroyd of the British Museum (Natural History) for calling to my attention the fact that this species, *teutonus* Linné, hitherto regarded as the type of the genus

Dasypogon, is not in fact the type of *Dasypogon* Meigen. The type of *Dasypogon* is *Asilus diadema* Fabricius, 1781, by designation of Latreille, 1810. Since *Asilus diadema* is also the type of *Selidopogon* Bezzi, 1902, and for the earlier *Cheilopogon* Rondani, 1856, both these names must sink. Hence a new name is required for *Asilus teutonus* Linné and the characterization as given here includes also *Dasypogon japonicum* Bigot, 1878.

Flies of medium size or larger, with drooping aspect of head and abdomen. They are relatively bare with long legs and the front tibia and tarsi are unusually lengthened; anterior tibia bears at apex a greatly elongate protuberance. Spines absent on the female terminalia. Length, 25 mm.

Head.—The face is moderately prominent throughout but never strongly extended or gibbous and is not quite plane in profile. Occiput nowhere prominent but its pile everywhere stiff and bristly in character. Proboscis stout and laterally compressed. Palpus clearly of 2 segments. Antenna moderately elongate; third segment longer than the first 2 segments combined, sometimes laterally compressed, generally attenuate apically and with long, conspicuous, dorsal bristles; the third segment bears a well developed, pointed microsegment with apical spine. The face varies from one-fifth to one-third the head width; it bears scanty, stiff pile, long or short over the middle and numerous, slender or stout, long bristles on the lower third. Ocellarium low but prominent with 3 pairs of bristles.

Thorax.—The mesonotum is low and rather bare with a well developed band of bristly, dorsocentral pile and more scattered acrostical pile. Lateral bristles consist of 5 notopleural, 5 to 7 supraalar, 3 to 5 postalar, and scutellum either without bristles or pile or with several pairs of long, slender bristles; humerus without bristles. Prosternum dissociated.

Legs.—The legs are elongate, especially on the anterior tibia and tarsus. Femora relatively slender. The hind femur bears short, stout bristles which consist of 5 to 7 dorsomedial, 5 dorsolateral, and 6 or 7 on each side below and a dorsal pair at apex. Anterior and middle femora with 7 to 11 bristles. Anterior tibia at apex with exceptionally long and characteristic protuberance and heavy, stout spine at its apex; anterior basitarsus with ventral swelling and denticles. Claws sharp; pulvillus long.

Wings.—The marginal cell, all posterior cells and anal cell widely open.

Abdomen.—The more or less cylindroid abdomen is slightly flattened across the middles of the tergites. Males with 7 tergites, the seventh reduced; females with 8 tergites, the last considerably reduced. Male terminalia rotate, the epandrium large and quite uncleft. Female terminalia inconspicuous, the lamellae large and spines absent.

Opocapsis, new genus

Type of genus: *Laphria dioctrioides* Walker, 1860.

Very small flies belonging to the tribe Atomosini of the subfamily Laphriinae. They are readily distinguished by the presence of only 4 posterior cells on the wing. Apparently related to *Clariola* Kertesz, which has 5 posterior cells. Length, 5.5 mm.

Head.—The face is quite plane with the eye except for a minute extension on the lower part; anteriorly it is quite narrow, with 2 fine bristles above and 2

somewhat longer bristles below. Palpus of 2 segments, the first minute and the second small. Proboscis minute, barely protruded beyond face and not constricted in the middle. Antenna elongate; the third segment is longer than the first 2 segments combined and tapered from the base to a comparatively fine point at the apex; in the middle it bears a deep incision with basal, spinous bristle.

Thorax.—The mesonotum is polished and shining, apparently without acrostical elements and with a single row of fine, scanty, suberect, dorsocentral hairs. Lateral bristles are slender and consist of 1 notopleural, 1 supraalar, 1 delicate postalar, and on the scutellum 1 pair of quite long, rather stout, closely adjacent bristles. Post metacoxal area fully chitinized.

Legs.—The hind femur is slightly lengthened and rather distinctly thickened; of slender bristles it bears 3 laterally, 1 dorsally at apex, 1 medially at apex, 3 very slender, long, anteroventral bristles, besides 2 or 3 quite long, slender, ventromedial hairs. Claws short, sharp; pulvilli nearly as long as claws; empodium long and basally stout.

Wings.—One posterior cell is missing and it appears to be the third; all other posterior cells open maximally. Anal cell closed with a short stalk; marginal cell likewise. The ambient vein ends at the middle of the anal cell; alula quite narrow.

Abdomen.—The abdomen is slender and subcylindrical though slightly flattened on first 2 or 3 tergites; it is strongly punctulate, slightly but gradually widened. Sides of first tergite with 4 rather stout, white bristles in a vertical row; middle of sides of second to fourth tergites, each with a rather long, distinct, slender bristle. Seven tergites in male. Male terminalia small, inconspicuous, hidden by the cupped abdominal apex.

Zabrotica, new genus

Type of genus: *Zabrotica clarkei*, new species.

Small, cylindroid, short pilose flies, belonging to the Dasypogoninae and related to *Hypenetes* Loew. From *Hypenetes* they are readily separated by the quite different third antennal segment, which is not sharply constricted and attenuate at the base. Male terminalia with 2 long, curved, blunt processes. Length 11 to 13 mm.

Head.—The face is nearly straight, vertically visible in lateral aspect only below. Occiput weakly developed above, more prominent below. Proboscis short. Palpus of 2 segments. Antenna short, the third segment laterally flattened and gradually expanded from the base but rarely more than twice as wide at any point as its basal width; apex slightly narrowed. The face below the antenna is one-fourth the head width. The face bears a rather dense, vertical band of stout bristles which are pale or black. Ocellar protuberance low, with 5 pairs of bristles.

Thorax.—The thorax is pollinose on the pleuron and lateral mesonotum; mesonotal pile is scanty, setate or bristly and both acrostical and dorsocentral elements are differentiated. Lateral bristles consist of 3 notopleural, 1 above wing but situated posteriorly, 2 on postalar callosity and 3 pairs on the scutellum.

Legs.—All femora moderately thickened. Bristles comparatively numerous. On the hind femur there is a transverse row of 3 chiefly medial apical bristles, 1 dorsal subapical, 4 dorsolateral, 4 lateral, 5 ventrolateral and 7 ventromedial bristles. Middle femur with fewer bristles. Anterior femur with 4 dorsal bristles, besides 1 or 2 posterodorsal bristles near outer third. Anterior tibia without spine at apex. Claws sharp, empodium thick at base, pulvilli long and slender.

Wings.—The marginal cell is open; anterior branch of third vein ends well above wing apex. Fourth posterior cell closed with a long stalk. Anal cell closed in margin. Ambient vein complete.

Abdomen.—The abdomen is cylindroid and tapered. Pile is abundant but flat appressed, coarse in males; middles of tergites largely bare. Tergite one with 5 or 6 pairs of bristles. Eight tergites in each sex. Epandrium emits on each side a long, obtuse process; hypandrium emits a single long, curved process. Spines on the acanthophorites.

Zabrotica clarkei, new species

Very dark brown, feebly shining, with abundant brownish yellow pollen.

Length, 12 mm.

Male. *Head.*—The head is black, densely covered with brownish yellow pollen on the front, anterior part of ocellarium, a narrow stripe between the ocelli behind and the whole occiput. On the face there is dense, coarse pubescence of the same color, which extends to a more limited extent over the middle portion of the face among the dense bristles of the mystax. The gibbosity of the face occupies perhaps a little more than three-fourths of the face and is established a little abruptly a short distance beneath the antenna. The middle half of the face on this gibbous portion is densely covered with numerous, slender, long, black bristles laterally and dorsally but with nearly 20 equally long, stout, white bristles in the middle of the lower part. Palpus black with slender, black bristles. Proboscis black, attenuate apically, heightened by the strong, basal carina ending beyond the middle. Pile of occiput white, long, fine, rather abundant and wavy. Upper occiput beginning at the middle with 14 pairs of rather strong, black bristles. Ocellarium with 4 pairs of quite long, moderately stout, black bristles, 2 of them placed behind. Sides of front with 2 rows of 15 quite long, more slender, black bristles or bristly hairs and a tuft of 5 fine, black hairs in front of each antenna.

Thorax.—The thorax is brownish black, densely covered with coarse, brownish yellow micropubescence in several shades and with the apparent bare areas of the opaque mesonotum reddish to golden brown pollinose. There is a conspicuous acrostical row of many strong, slender, black bristles, also a presutural differentiation of still stronger and still longer dorsocentral bristles; 5 long and 2 short bristles lie in front of the suture, 4 long and several short bristles lie behind the suture. Lateral bristles are black and rather strong. There are 3 notopleurals in a row, 1 postsupraalar and on the post callus 2 yellowish white, long, stout bristles and 3 weaker, black bristles. Scutellum concolorous and pubescent like the mesonotum, its margin with 3 pairs of stout, long, black bristles. No pile on the disc. From oblique light half of the scutellar disc appears bright, brassy pubescent, the other half dark and the prescutellar area appears to have 2 bright stripes of such pubescence, together with a basolateral spot and from the opposite side these spots and scutellar pattern change position. Halteres dully brownish yellow. Pleuron somewhat reddish over the middle coxa, the whole surface densely brownish yellow micropubescence. Metapleuron with a vertical row of 8 stout, whitish bristles and 4 similar hairs.

Legs.—The coxae are brownish black, the femora all tend to be dark reddish brown and shining with the dorsal surface obscurely blackish. The pile is loose, coarse, subappressed and whitish. The bristles are pale yellow, almost limited to the hind femora and tibia, rather short but quite stout. Hind femur with 7 lateral

bristles, 4 ventrolateral, 2 distal ventral medial bristles, besides 5 other long, white hairs. At the apex there are 2 dorsomedial bristles side by side, 1 dorsolateral bristle and a larger one behind. All tibia light reddish brown. Hind tibia with 4 dorsolateral, 3 dorsomedial, 3 ventrolateral bristles and ventromedially 2 short, black bristles. Middle femur with a stout, white bristle anteriorly at the outer fifth, a smaller one before the middle and a stout bristle posteriorly near the apex. Middle tibia with 5 anterodorsal, 4 shorter, darker, dorsal bristles, 5 posterior and 2 posteroventral bristles besides 2 ventral distal bristles. Anterior femur with only 1 stout, reddish bristle posteriorly near the subapex. Bristles of its tibia similar to the middle tibia but shorter. Claws only moderately sharp, black, widely reddish at the base, pulvilli long, with parallel sides, the empodium long and sharp.

Wings.—The wings are hyaline, villi absent. Marginal cell widely open, posterior cells maximally open except the fourth which is closed with a long stalk; anal cell widely open, the ambient vein stout.

Abdomen.—The abdomen is slender and tends to be a little compressed laterally. It is dark, sepia brown and densely, brownish yellow pollinose, with a tendency towards slightly bare areas and change in pattern with a change in direction of light. From above obliquely the posterior corners appear to have large triangles of pollen. Pile fine, scanty, loose, yellowish white, subappressed, finely attenuate. There are a few longer hairs on the sides of the first 3 tergites and the first tergite bears 5 or 6 weak, yellow bristles, sometimes with 1 more stout, reddish bristle. Sternites concolorous with the mesonotum similarly pollinose but with wider, bare, posterior margins. Those of the first to fourth sternites each with a right bright, diffuse, small, medial, posterior spot of paler pollen, which stands out from the background. Terminalia reddish brown, the long processes of the fully cleft epandrium darker and the hypandrium darker. Basal portions more light reddish.

Type.—Male, Oroya, Peru, May 7, 1914, C. H. T. Townsend collector. In the United States National Museum. Named in honor of Dr. J. F. Gates Clarke.

Margaritola, new genus

Type of genus: *Margaritola mirabilis*, new species.

Peculiar flies, small and robust with short, rather high thorax, quite wide head with prominent, goggle-eyed appearance. It has exceptionally broad, generalized wings and a very long antenna composed chiefly of the microplumose microsegments which are longer than the third segment itself. Length 6 mm. without antenna.

Head.—The head is of medium length; in profile the upper face is quite short, almost plane with the eye and strongly retreating below. Occiput is poorly developed. Proboscis exceptionally small, short, robust, obtuse, and not extended as far as the face. Palpus large, elongate with small, short, basal segments. The antenna is exceptionally elongate, nearly twice as long as the head and slender. First 2 segments each quite short, subequal and bead-like. The third segment, microsegments included, is at least 5 times the combined length of the first 2 segments. The third segment proper is not as long as the 2 microsegments but nearly as long as the second and ultimate microsegment. Both microsegments and end of third segment bear dense, long micropubescence. In anterior aspect the head is quite wide, the face below the antenna is one-fourth the head width; upper third of face bears not very dense, coarse pubescence. Remainder is polished and bare,

except for similar sparse pubescence bordering the small, nearly horizontal subepistoma. Upper face with no pile; middle face with 3 or 4 long, bristly hairs of weak bristles. Lower retreating face with 3 or 4 similar hairs on each side. Front extremely short, the vertex a little widened, and scarcely excavated, though the eye rises above the vertex; the ocellarium is quite large and high with vertical sides.

Thorax.—The thorax is short and rather high, the mesonotum moderately high and convex, abrupt anteriorly, densely covered with coarse, undifferentiated, suberect pile; lateral bristles absent. Prosternum fused laterally.

Legs.—The legs are short, especially the femora; the first 4 femora are distinctly stout. The slightly longer hind femur only moderately stout, densely covered with rather long, fine appressed pile and a few, weak, slender bristles; it has very weak, ventrolateral bristles and 4 much longer, equally slender, ventromedial bristles. Hind tibia with 2 lateral bristles at the middle and beyond and in nearly the same position 2 ventrolateral bristles besides 2 ventromedial bristles and 2 others near the apex which are erect. Hind basitarsus with dense, erect, glandular-tipped pile. Claws small, straight, sharp and hooked at the immediate apex. Pulvillus well developed.

Wings.—The wings are exceptionally broad, being little more than twice as long as wide. The marginal cell quite widely open the first vein and the costa are all much stouter than the remaining veins. The 2 branches of the third vein end almost an equal distance above and below the wing apex. All posterior cells open maximally; the discal cell is short and broad, the short anterior crossvein enters the middle of this cell. Anal cell very widely open. Alula narrow and ambient vein complete.

Abdomen.—The abdomen is rather wide with the base perhaps not quite as wide as the mesonotum but with the third tergite, however, fully as wide as the mesonotum. The abdomen is comparatively short; males with 7 tergites, the seventh half as long as the sixth, the third a little more than half as long as the second, and the eighth totally concealed beneath the seventh. The male terminalia are recessive and the basally, at least partially split, epandrium is largely tucked beneath the last tergite. Remainder of terminalia rather deeply recessed within the epandrial hood and reminiscent of the Stichopogonini, to which it is nowise related.

Named for my wife, Marguerite Chappell Hull, who has collected many flies and who has greatly aided me in my work with Diptera.

Margaritola mirabilis, new species

Abdomen broad, light brownish orange; wings exceptionally broad and brown. Length, 7 mm. including the antenna.

Female. Head.—The head is quite black, for the most part polished and shining, and exclusive of the occiput, with only a small portion micropubescent or pollinose. Face not very high, gently rounded, retreating below with a large, short, oval, transverse, bare area occupying at least two-thirds of the lower face and not quite reaching the eye margin on each side. Remainder of face, cheeks, eye margins and the anterior border of the very small, horizontal subepistoma coarsely whitish micropubescent, arising from the bare area and widely separated. There is a tuft of 6 rather long, but extremely fine, pale yellow, bristly hairs extended straight outward. Palpus comparatively large, elongate, cylindrical, of 2 segments, the apex slightly narrowed; the apex bears 3 and the ventral surface bears in 1 row 6 slen-

der, yellow, bristly hairs as long as those of the face. Proboscis somewhat laterally compressed, much shorter than the face and extended horizontally forward. Front and vertex bare except for a narrow line of coarse pubescence along the eyes. Ocellarium moderately high and steep with 3 pairs of slender, yellowish, bristly hairs and a tuft of 2 on each side immediately behind. Antenna quite elongate, slender, black, the basal half of the second segment with reddish sepia east to the dense, but extremely short pubescence. Beyond the middle the pubescence becomes a little more coarse or loose, equally dense and more blackish. Pile of the first 2 segments bristly and reddish. First 2 segments minute and subequal, the third segment bears 2 microsegments which together are longer than the first segment and of equal thickness. The first microsegment is no longer than the first antennal segment. There is some evidence that the apex of the second microsegment may be subdivided but it is obscured by the pubescence.

Thorax.—The thorax is black, dully shining. There is a triangle of greyish yellow, coarse pubescence medial to the humerus which extends backward as a medial vitta, widening and confluent with the other half before the scutellum, and laterally extended behind the humerus to broadly connect a similar stripe on the lateral margin. These triangles almost connect at the base of the pronotum. The lateral stripe runs narrowly in front of the post callus which is bare dorsally, but pubescent below. The broad area in front of the scutellum is flecked with bare spots. Scutellum gently convex to the sloping edge of the rim, shining black and thinly grey pollinose, mostly bare in the middle with a trace of a median spot of pubescence. Pleuron rather uniformly greyish yellow micropubescent. Pronotum with reddish brown pollen.

Legs.—The legs are wholly light brownish orange, except the last 3 segments of all of the tarsi, which are dark reddish brown, pile and bristles yellow. All femora are a little stout. Hind tibia a little swollen from the base to the apex and rather large at the apex. Hind basitarsus long and stout with dense, erect fringe of pale, ventral sensory hairs. All bristles are extremely weak, being scarcely more than bristly hairs except on the middle tibia where they are a little more prominent and those of the first 3 tarsal segments are more prominent. Hind femur with 3 quite long, ventromedial, bristly hairs along the middle, 5 ventrolateral, also along the middle, its tibia with 2 lateral, 2 dorsal, 3 ventrolateral and 2 ventral. Middle tibia with 3 rather long, ventral, 2 anterior bristles and 4 short, dorsal bristles.

Wings.—The wings are unusually broad and uniformly tinted with medium dark, reddish sepia brown. Marginal cell and all posterior cells widely open, including the anal cell.

Abdomen.—The abdomen is only slightly convex, the first 2 tergites being slightly flattened over the middle. The first 4 tergites have nearly parallel sides but are a little the widest on the second and third tergites where they are fully as wide as the thorax. Remaining tergites only a little narrowed. Seven tergites present, the seventh half as long as the sixth. Female terminalia short, obtuse, barely protruding beyond the seventh tergite. The whole abdomen is light brownish yellow or orange with minute, scanty, appressed pile which becomes a little longer, more dense and suberect on the side margins. No bristles present.

Type.—Female, Lourenco Marquez, Africa, November 6, 1902, C. W. Howard collector. In the collections of the United States National Museum.

A NOTE ON SWARMING AND EMERGENCE OF ANTS

(HYMENOPTERA, FORMICIDAE)

Swarms of *Myrmica emeryana* Forel were observed at intervals of about 100 yards for a distance of nearly 5 miles while I was driving along U. S. Highway 12 between Black River Falls and Tomah, Wisconsin, on August 29, 1958. As the car approached the swarms they had the appearance of large clouds of black smoke drifting across the highway from the tops of the pine trees that densely lined the right-of-way. However, in most instances when the car drew alongside, each swarm was found to be suspended in the air above the 25-foot wide parkway between the pavement and the trees. The swarms were of various shapes and sizes, but most were spherical aggregations approximately 10 feet in diameter. They were uniformly at tree-top height, which was estimated at 40 feet. During a stop to make a collection, many winged ants were seen on the ground alone or mating. The random sample of specimens had a 4:1 ratio of males to females. The sandy soil of the parkway contained numerous colonies of *Lasius neoniger* Emery among a sparse growth of grasses and weeds. Worker ants of these colonies appeared to be scavenging on individuals of *M. emeryana.*

The swarming locality was driven into soon after leaving a heavy rain storm. The air was muggy, and the sky heavily overcast but rain apparently had not yet fallen in the swarming area. Observations were made at 2:30 p.m. Standard Time.

On July 26-28, 1958, an emergence of winged males and females of *Lasius sitkaensis* Pergande was observed at Ruidoso, New Mexico, elevation 7,000 feet. Ant colonies had not been noticed in a well-traveled pathway prior to the appearance of the alates at newly opened entrance holes. The emergence followed early afternoon showers. Alates were clustered around emergence holes until late afternoon, dispersing gradually by flying away singly rather than swarming. Emergences on the second and third day occurred under conditions similar to the first day, but a noticeable reduction in the number of individuals took place on the successive days.

It was hypothesized that the observed activity was associated with environmental conditions of increased moisture and reduced light intensity. However, many different factors may be related to such activity, including "clock" rhythms reported on by McCluskey (Science 128:536, 1958).

The writer is grateful to Dr. W. L. Brown, Jr., for identifying the species of ants. Specimens of the ants are deposited in the Harvard Museum of Comparative Zoology.

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SOME ATTINE SYNONYMS AND TYPES

(HYMENOPTERA, FORMICIDAE)

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Studies in the European Forel, Santschi and Emery collections of attine or fungus-growing ants[1], supported by a grant from the National Science Foundation, have shown that a number of synonyms exist. Some in *Atta* and *Trachymyrmex* have been published (Weber, 1958, Ent. News 69:7-13 and 49-55) the present records are by genera listed below. These synonyms reflect not only the direct examination of types but a growing realization, based on field and laboratory studies, that considerable infraspecific variation is normal. The attine tribe as a group consists of spiny and ferruginous workers and it has been found true particularly that the exact proportons of spines and the color varies considerably within a colony. As so often has been the case, a description of a new species based on one or two known specimens can hardly picture the true situation. For this reason it should be useful to redescribe some species, indicate where the types now are and if possible to show where conspecific material may be found.

Cyphomyrmex rimosus ssp. minutus Mayr

1862. *Cyphomyrmex minutus* Mayr, Verh. Zool.-bot. Ges. Wien, 12:691.

Forel, Santschi and Emery were in agreement on the common *Cyphomyrmex* form as shown by the specimens so labeled in their collections. They placed them under *Cyphomyrmex rimosus minutus*. The proper name to be applied to it is another matter since their collections do not contain any types of Spinola or Mayr, the describers of *rimosus* (recorded from Pará, Brazil) and *minutus* (from Cuba).

The specimens listed by Forel, Santschi and Emery as *minutus* are the same form considered by the author (Weber, 1940, Rev. de Ent. 11:406-427 and *Ibid.*, 12:93-130) to be the widely distributed *rimosus* of the islands and shores of the Gulf of Mexico and Caribbean Sea and the mainland south to Brazil and Bolivia. In the Forel Collection is a pin marked "Cotypus" with the labels: "*C. Steinheili* ☿ Forel, Bresil; *C. rimosus* Spin. r. *minutus* Mayr, coll. A. Forel." The single worker is on a minuten nadeln with heavy iron salt spicules protruding from the high part of the thorax.[2] It has a thorax length of 1.09

[1] That of Forel in the Muséum d'Histoire Naturelle in Geneva, Switzerland; of Santschi in the Naturhistorisches Museum, Basel, Switzerland; and of Emery in the Museo Civico Di Storia Naturale, Genoa, Italy. The authorities of these museums were most helpful in making available their collections for study.

[2] The term "thorax", as used generally in myrmecology, is taken to mean the compact, rigid part separated from the head and petiolar node or nodes by sharp constrictions. The fact that in its development it may include the first abdominal segment need not obscure the primary concept of a well understood central structure that bears the legs (and wings in males and females). The term "alitrunk", used in place of "thorax", is inaccurate when applied to the wingless worker ant, is a longer word and does not appear to be an improvement.

mm. and total extended length of 3.01 mm. The postpetiolar node from above is 0.30 mm. long by 0.42 mm. wide. This also is the common form. It is probable that *minutus*, too, is a synonym of *rimosus* but this cannot be proved with existing evidence. From considerable collecting in the area the author has concluded that this is as variable a species as other attines have proven to be.

Cyphomyrmex rimosus ssp. **fuscus** Emery

1894. *Cyphomyrmex rimosus* var. *fuscus* Emery. Bull. Soc. Ent. Ital. 26:225.
1921. *Cyphomyrmex rimosus* var. *fuscula* Emery, Genera Insectorum, Fasc. 174, p. 342.
1938. *Cyphomyrmex rimosus* ssp. *curiapensis* Weber, Rev. Ent. 9:190. **New synonymy.**

Emery renamed this ant *fuscula* when *Trachymyrmex* was considered by him to be a subgenus of *Cyphomyrmex*. He had earlier in the same 1894 publication named an ant *T. urichi* subsp. *fusca*. Since there appears now no good reason to consider *Trachymyrmex* a subgenus of *Cyphomyrmex* his original name should stand. Aside from morphological evidence, the present ant cultivates a yeast-like fungus on insect excrement, the *Trachymyrmex* a hyphal form of fungus on vegetal substrate.

The Emery collection now contains two pins here, one with five workers bearing the labels: "F. 59, S. Cath., Schm; Cyphomyrmex rimosus Sp. var. fuscus Emery." The second pin, of two males, one alate female and two workers has the same "S. Cath. Schmidt" top label. The Forel collection contains as a "Cotypus" a pin of two workers labelled: "Cyphomyrmex rimosus var. fusca Em; S. Catharina."

These type ants are large, sharply sculptured *rimosus* with the occipital angles more produced than in *trinitatis* but with less acute posterior thoracic tubercles. The scapes surpass the occipital angles by their distal diameters. The antero-median impression of the gaster and squamate hairs are conspicuous. A direct comparison with cotypes of *curiapensis* shows that they are the same. The three castes of the latter were described in 1938.

Cyphomyrmex rimosus ssp. **transversus** Emery

1894. *Cyphomyrmex rimosus* subsp. *transversus* Emery, Bull. Soc. Ent. Ital. 26:226.
1901. *Cyphomyrmex rimosus* st. *olindanus* Forel, Ann. Soc. Ent. Belg. 45:337.
1938. *Cyphomyrmex rimosus* ssp. *venezuelensis* Weber, Rev. Ent. 9:188. **New synonymy.**

The Emery collection contains four pins in the type series, the leading pin bearing the labels: "Matto Grosso, Germain." It contains one dealate female and three workers. The postpetiolar node of the female from above is 0.32 mm. long by 0.52 mm. wide so that it is indeed transverse as the new name implied. The Forel collection contains a pin with one worker marked "Cotypus," from Matto Grosso, whose postpetiolar node is 0.22 mm. long by 0.30 mm. wide. The Forel collection also contains a pin marked "Typus" from Olinda, Brazil with two workers which presumably are the types of the synonym, *olindanus*.

A comparison of cotypes of *venezuelensis* with the workers in the Forel collection show them to be the same. A worker marked "Cotypus" and sent to me by Menozzi in the 1930's is from Matto Grosso (Germain) and may be part of the type series. It is small and with the postpetiolar node deeply impressed. Despite minor differences, *venezuelensis* is best considered a synonym.

Cyphomyrmex salvini Forel

1899. *Cyphomyrmex rimosus* race *salvini* Forel, Biol. Centr.-Amer. Hym. 3:40.

The Forel collection contained two pins, one of which was wrongly labeled "Typus." This one, with three workers, had six separate labels, reading from top to bottom: "Typus; Port Limon, Costa Rica, III 25.05, F. C. Paulmeier; Type No. AMNH; C. rimosus salvini For; r. C. salvini Forel; coll. A. Forel." The second pin, of one worker, has two labels: "C. rimosus, Spin. ☿ r. Salvini Forel; coll. A. Forel." It is unfortunate that it had no locality label; Bugaba, Panama (Champion) is the type locality. The total length of the worker, with head and gaster bent down, is 2.2 mm., thorax length 1.11 mm. and the occipital angles 0.10 mm. One of the Costa Rican workers had occipital angles 0.12 mm. long. The two pins were of the same species. The caste described and figured originally by Forel is the female but his figure compared with the workers in the Forel collection and those described below as *acutus* indicate clearly what the species is, regardless of where the female may be. When the type female and the female of *acutus* are found, the latter may be considered a synonym.

Cyphomyrmex salvini ssp. **acutus** Weber

1940. *Cyphomyrmex acutus* Weber, Rev. de Ent. 11:409.

The typical *salvini* worker, as listed above, is darker and more densely and finely punctate than the cotype of *acutus* with which it was compared. The latter has a much more acute post-ocular tubercle and the postpetiolar tubercles are more prominent. For these reasons *acutus* is temporarily retained as a subspecies although, when more specimens of both appear, *acutus* may turn out to be a synonym.

The best biological evidence for considering either *salvini* or *acutus* as a species separate from *rimosus* would be the finding of the fungus garden. If it consists of yeast-like masses of cells on insect excrement this would suggest that the ants belong to the *rimosus* complex which is unique in possessing this type of garden. If like *costatus*, e.g., in having a typical mycelium, the ants should be treated as a separate species.

Myrmicocrypta F. Smith

Myrmicocrypta collaris Emery

1913. *Myrmicocrypta collaris* Emery, Ann. Soc. Ent. Belg. 57:252.

1913. *Myrmicocrypta corniculata* Emery, Ann. Soc. Ent. Belg. 57:253. **New synonymy.**

Although Emery described both species as new, these were each based on single alate females that still exist in the Emery collection. The *collaris* female, labeled "Vilcanota, Peru, Stug.; Myrmicocrypta collaris Em.", has an extended length as mounted of 3.62 mm. thorax 1.27 mm. and postpetiolar node from above of 0.26 mm. long by 0.47 mm. wide. The *corniculata* female, labeled: "Pachitea, Peru, Stdg.; Myrmicocrypta corniculata Em," has an extended length as mounted of 3.6 mm., thorax 1.16-1.20 (difficult to see exactly) and a postpetiolar node from above of 0.27 mm. long by 0.47 mm. wide. Both specimens were evidently from the collector, Staudinger. A direct comparison of the two shows that they are conspecific and that slight differences in wings and the occipital area are not significant. Since *collaris* was described first, this name should stand.

Direct comparisons with specimens of *ednaella, longinoda, occipitalis, spinosa, unidentata* and *urichi* show these to be distinct.

Myrmicocrypta squamosa F. Smith

1860. *Myrmicocrypta squamosa* Smith, Jour. Ent. 1:74.

1934. *Myrmicocrypta buenzlii* Borgmeier, Arq. Inst. Biol. Veget. Rio de Janeiro, 1:104. **New synonymy.**

The Forel collection contains a pin of three workers labeled: "M. squamosa Sm., ☿, Ypiranga, São Paulo (Ihering)" that agree well with Trinidad specimens of *buenzlii*, whose type locality is Surinam. Since Smith's descriptions were often worthless, the continental myrmecologists went to some pains to determine what they applied to. If Forel's concept is correct in this instance, *buenzlii* becomes a synonym.

Mycetophylax Emery

1913. *Cyphomyrmex* subg. *Mycetophylax*, Emery, Ann. Soc. Ent. Belg. 57:251.

1956. *Paramycetophylax*, nov. gen. Kusnezov, Idia, Agosto-Sept., p. 24. (Minist. Agric. y Ganaderia, Buenos Aires.) **New synonymy.**

The new genus, *Paramycetophylax*, was based on *bruchi* described below and is discussed there.

Mycetophylax bruchi Santschi

1916. *Sericomyrmex bruchi*, Santschi, Physis, 2:183.

1922. *Mycetophylax bruchi*, Santschi, Bull. Soc. Vaud. Sc. Nat., p. 355.

1956. *Paramycetophylax bruchi*, Kusnezov, Idia, Agosto-Sept., p. 24. (Minist. Agric. y Ganaderia, Buenos Aires.) **New synonymy.**

Santschi dedicated a number of ants to Carlos Bruch. Several were attines and he later placed them in other attine genera so that confusion is sometimes possible. Fortunately the Santschi collection still contains a type ant labeled "*Mycetophylax bruchi* Sants.; Argentine; Puerto Madryn (Biraben)" which is No. 3450 in the collection. This is a worker with a thorax, excluding neck, of 1.32 mm., or length with neck of 1.39 mm. The postpetiole from above is 0.30 mm. long by 0.41

mm. wide. The head back of the eyes is 0.91 mm. and it is 1.01 mm. from occiput to the anterior border of the clypeus. The head appears squarish. I noted it at the time as "a good *Mycetophylax* but with large, acute inferior pronotal tubercles as in ants of other related genera and with a very slight anterior pronotal median gibbosity (not tubercle)." Santschi's type of *pauper* is similar but his *cristatulatus* has a strikingly high median gibbosity or obtuse tuberosity on the median pronotal area. Kusnezov bases his descriptions of *Paramycetophylax* on Santschi's same Puerto Madryn species and figures the head of a worker. Considering the Santschi type, it would appear that unless attine genera are to be broken up into many on the basis of minor distinctions, the new genus name would be a synonym. In this particular case the ant has a character somewhat transitional to that of other genera.

Mycetophylax emeryi Forel

1907. *Myrmicocrypta emeryi* Forel, Intern. Sc. Rev. Genevo 4:144.
1948. *Mycetophylax hummelincki* Weber, Ultgaver. Natuurwet. Stud. v. Suriname en Curacao 3 (No. 14): 78. **New synonymy.**

A cotype worker in the Santschi collection from Cienaga, Colombia (Forel) has the same color and structural characters as *hummelincki*. The Wheeler and Santschi descriptions, used as a basis for describing *hummelincki*, proved unreliable.

Mycetophylax emeryi ssp. **bolivari** Weber

1948. *Mycetophylax bolivari* Weber. Ultgaver. Natuurwet. Stud. v. Suriname en Curacao 3 (No. 14): 78.

Considering the specimens so far known, *bolivari* is best considered to be a geographical subspecies of *emeryi* differing in much paler color. It is primarily a pale ferruginous with head slightly darker.

Sericomyrmex Mayr

Sericomyrmex amabalis Wheeler

1925. *Sericomyrmex amabalis* Wheeler, Biol. Bull. 49:166.
1931. *Sericomyrmex bierigi* Santschi, Rev. de Ent. 1:279. **New synonymy.**

The Santschi collection contains under *bierigi* three pins labeled: "Panama, La Conception, 16.vii.30, Bierig," and one labeled: "Panama, France Field, Bierig 1.vi.30." These type ants agree exactly with dark specimens of *amabalis* from the latter type locality, Barro Colorado Island, Canal Zone. Santschi lacked specimens of *amabalis* for comparison and was unaware of the marked color and size differences since found by the present writer to be common in this species although not present in Wheeler's type series. Specimens taken in March 1957 on Barro Colorado Island were a dark brown. To the distribution of the species may also be added specimens collected at Turrialba and Bataan, Costa Rica (N.A.W.).

Acromyrmex Mayr

Acromyrmex (Moellerius) landolti Forel

1884. *Atta* (*Acromyrmex*) *Landolti* Forel, Bull. Soc. Vaud. Sc. Nat. 20:357.

Unfortunately the types of *landolti* were not seen in the Forel collection. Under *balzani* this collection has specimens from Paraguay (Fiebrig). In the Santschi collection, however, the ants labeled as this and the ants of *balzani* and its forms prove to be of one species. The Emery collection *landolti* also are of the same species as *balzani*. Specimens collected by the author at Rio Porce, Colombia in 1938 as typical *landolti-balzani* and may well be similar to the types of *landolti*, which came from Colombia. In the keys that Emery, Forel and Santschi used for separating the species of *Acromyrmex* the two key out together and are separated on minor distinctions. It would appear, therefore, that *balzani*, described six years later, is the synonym or at most a subspecies of *landolti*. Because the types of *landolti* were not studied, *balzani* is retained until better proof is at hand.

Acromyrmex (Moellerius) balzani Emery

1890. *Acromyrmex* (*Moellerius*) *balzani* Emery, Ann. Soc. Ent. France, 10:67.

There are four pins in the Emery collection, the first, containing eight workers of differing sizes, jumbled together, bearing the labels: "Paraguay, Balzan; Atta Balzani Em. n. sp." As described under *landolti*, this may be same as that species. The eight workers were compared with the subspecies named by the author as follows:

A *planorum* cotype (Rev. de Ent. 1937, 7:409) lacks the epinotal tubercle and the well developed horseshoe-shaped ridge on which are the median anterior pronotal tubercles; it is much paler.

A *myersi* paratype with thorax 2.60 mm. (Rev. de Ent. 1937, 7:408) has fewer striae on the frons, has larger occipital tubercles and higher median anterior pronotal tubercles.

A *pampanus* cotype (Rev. de. Ent. 1938, 9:200) has the striae of the frons less extensive and the occipital spine rises more abruptly.

Santschi's var. *multituber* holotype, a maxima with thorax 2.71 mm. (Bull. Soc. Vaud. Sc. Nat. 54:362) has the frons densely and finely rugulose between the carinae.

Santschi's var. *senex* cotypes from Pirapora, Brazil (Rev. Mus. Paulista, 1923; 13:19) have a fine, dense rugulosity generally distributed over the head and on part of the thorax. The thorax length of the maxima is 2.58 mm. and it has a well developed inferior mesonotal spine as in *myersi*.

The above differences seem minor and it is possible that these forms are synonyms of a widely distributed and variable species which should be called *landolti*.

THE PROBLEM OF COLOR VARIATION IN PODABRUS

(COLEOPTERA, CANTHARIDAE)

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Within the genus *Podabrus* there are many instances of troublesome color variations among species which show little intraspecific structural difference. In some instances these color variants have been described as full species or as subspecies. I have studied two cases of this type in an effort to arrive at a working hypothesis for future study to determine the exact nature of these differences.

The West Coast forms *Podabrus comes* Lec., *P. pruinosus pruinosus* Lec., and *P. pruinosus diversipes* Fall are identical in structural morphology. The only observable difference is color variation involving the legs, antennae, occiput, and the last two or three abdominal sternites. In *comes* these parts are essentially rufous, in *pruinosus pruinosus* strongly melanized, and in *pruinosus diversipes* exhibit all degrees of gradation. Certain relationships between various darkened structures may be noted. Specimens closest to the rufous condition have increasingly darker tibiae, tarsi, and antennae. When these structures reach nearly maximal melanization the femora, except for the distal tips, become progressively darker. Finally, in some examples the terminal sternites of the abdomen become dark. The procoxae apparently do not become melanistic. The combined range of these forms extends from southern California north to British Columbia with a few captures in western New Mexico and Nevada. Strongly melanized specimens are much more common in the northern parts of the range and also in the higher altitudes of mountains. The rufous type is more common in the lowlands of the southern part of the range. Most examples of the lighter type, however, show at least some evidence of melanization. There is an extensive zone of intergradation from northern California to southern Washington.

The above observations indicate that these nominal species form a natural unit best expressed by the names *P. pruinosus pruinosus*, *P. pruinosus diversipes*, and *P. pruinosus comes*.

The Mississippi Valley species, *P. tomentosus* Lec., also shows color variation. Western specimens in the hot, dry Great Plains region have flavous elytral margins whereas eastern members of the species have totally black elytra. A gradational zone may be plotted as extending from Minnesota through Illinois, then southward. An exceptional capture with flavous elytral borders was made from Ohio in a series having entirely black elytra.

In both *P. pruinosus* and *P. tomentosus* these color variations parallel Glogers' Rule as applied to invertebrates, since these beetles tend to be more melanistic in areas of increasing moisture and coolness: Dobzhansky (1933), Hovanitz (1941), Netolitzky (1931), Spieth (1938), Zimmermann (1931). Hot, dry surroundings shortly after

emergence and prior to hardening of the exoskeleton tend to retard melanin formation. This effect seems to be more pronounced if both the moisture and temperature factors are involved simultaneously. In the case of the West Coast species Fender (1949) noted that in the Willamette Valley of Oregon occasional colonies of the rufous type could be found. My hypothesis for this apparent irregularity is that members of these colonies may have emerged either late in the morning after the temperature had risen, later in the season, or during a warmer than average day early in the season. These possibilities will require controlled experiments to ascertain their validity. It would be expected that the northern dark types be found occasionally in the southern part of the range due to local environmental conditions inducing increased melanin deposition. This is actually the case; I have noted many specimens from the southern part of the range which show some melanization although never as much as in the truly dark populations of British Columbia.

Future study of this phenomenon will no doubt serve to further clarify the taxonomy of beetles in this group.

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DATE OF PUBLICATION, FIRST SUPPLEMENT, SYNOPTIC CATALOG OF NORTH AMERICAN HYMENOPTERA

Initial copies of the First Supplement to "Hymenoptera of America North of Mexico—Synoptic Catalog" (U. S. Dept. Agr., Agr. Monogr. 2; 305 pp.) were distributed to personnel of the Hymenoptera Unit in the Insect Identification and Parasite Introduction Laboratories in Washington, D. C., on October 8, 1958. The publication date on the title page, "September 1958," is erroneous.

Karl V. Krombein, *Editor, Entomology Research Division, A.R.S., U.S.D.A., Washington, D. C.*

THREE NEW SPECIES OF CUERNOLESTES MILLER

(HEMIPTERA, REDUVIIDAE)

JOE C. ELKINS, *7010 Alderney Dr., Houston 24, Texas*

In this paper three new species of *Cuernolestes* Miller are described, bringing the total of described species to four. Additional notes contributory to the knowledge of the genus are included.

Cuernolestes nanus, new species

Male.—Length, 5.04 mm. Highly polished, color generally stramineous suffused with dark amber laterally on pronotum and on hemelytra; meso and metathoracic femora lightly annulate apically; pleura, abdomen, legs and antennae sparsely pubescent.

Head with a spine ventro-laterally on each side before eye, another ventro-laterally on each side just behind posterior margin of eye, a seta on each side ventro-laterally juts before collum; intraocular suture distinct but very shallow; 1st rostral segment with two upward projecting spines; dorsum of jugum with an indistinct tubercle; length from anterior border of eye to tylus apex slightly more than longitudinal length of eye; 1st rostral segment attaining border of posterior ventro-lateral spines.

Pronotum with spine at each antero-ventral angle on each side, whose length is subequal to longitudinal length of eye; length of humeral spine 1.5 times longer than terminal rostral segment; mesonotal spine 1/3rd shorter than humeral spine; metanotal process very short; dorsal median spine of 1st tergite 1/5th longer than basal rostral segment.

Conformity of apical internal cell and surrounding veins of hemelytron as in fig. 1.

Prothoracic coxa with three ventral short spines; prothoracic trochanter with one long apical spine, one middle short spine and one basal very short spine; prothoracic femur with six long rather robust spines on inner upper surface, two long robust spines ventrally with several shorter spines; prothoracic tibia with three robust spines on dorsal surface; other legs spineless; metathoracic femur surpassing abdominal apex.

Connexival segments spineless.

Posterior border of male hypopygium (fig. 4) somewhat narrowed and lightly bisinuate; claspers directed anteriorly as is characteristic of this genus.

Female.—Unknown.

Specific name from Greek *vavus*, ὁ, a dwarf.

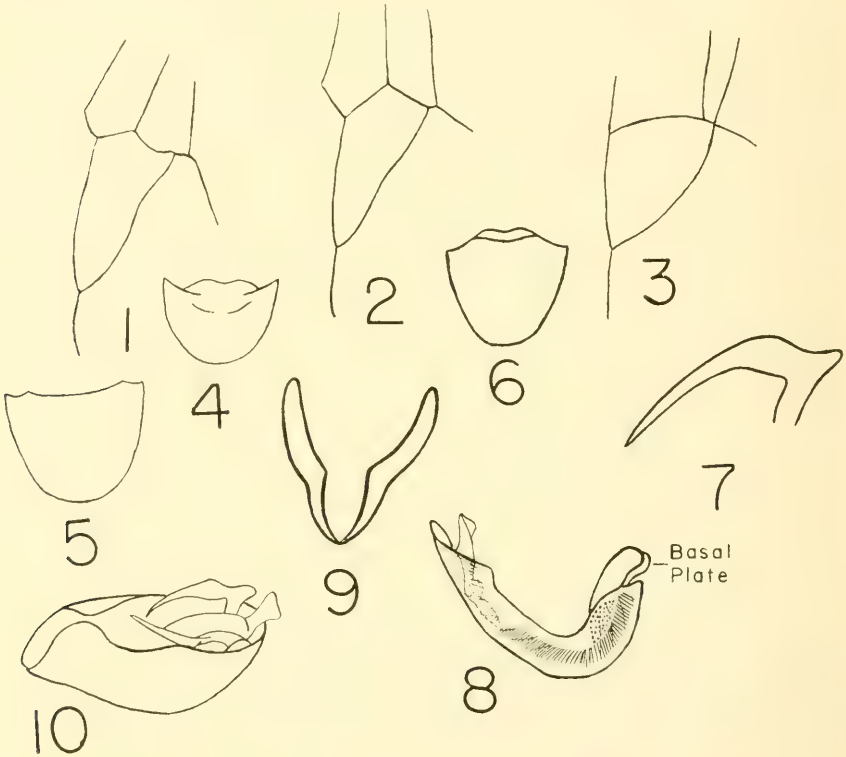
Holotype ♂, PHILIPPINE ISLANDS, San Jose, Mindoro, II-22-45, E. S. Ross. Deposited in the Calif. Acad. Sci. Collection.

Cuernolestes normae, new species

Male.—Length, 6.25 mm. High polished, general color dark amber suffused with stramineous on head and abdomen, legs light stramineous without annuli, hemelytra hyaline; pleura, abdomen, legs and antennae sparsely pubescent.

Head with a spine ventro-laterally on each side before eye, another ventro-laterally on each side just behind posterior margin of eye, a small seta on each

side ventro-laterally just before collum; intraocular suture indistinct; 1st rostral segment with two upward projecting spines; dorsum of jugum with a distinct small tubercle; length from anterior border of eye to tylus apex subequal to length of eye longitudinally; 1st rostral segment not reaching border of postocular ventro-lateral spines.



Cuernolestes nanus, n. sp.: fig. 1, apical internal cell and surrounding venation of hemelytron; fig. 4, male posterior hypopygial border. *C. normae*, n. sp.: fig. 2, apical internal cell and surrounding venation of hemelytron; fig. 5, male posterior hypopygial border. *C. bakeri*, n. sp.: fig. 2, apical internal cell and surrounding venation of hemelytron; fig. 6, male posterior hypopygial border; fig. 7, male clasper; fig. 8, aedeagus and basal plate; fig. 9, basal plate; fig. 10, genital capsule and claspers of male. *C. philippinus* Miller: fig. 3, apical internal cell and surrounding venation of hemelytron.

Pronotum with spine at each antero-ventral angle on each side, whose length is subequal to that of terminal rostral segment; length of humeral spine slightly longer than terminal rostral segment; mesonotal spine 1/4th shorter than humeral spine; metanotal process very short; dorsal median spine of 1st tergite 1/5th shorter than basal rostral segment.

Conformity of apical internal cell and surrounding veins of hemelytron as in fig. 2.

Prothoracic coxa with three ventral short spines; prothoracic trochanter with one long apical spine, one middle short spine and one basal very short spine; prothoracic femur with six long rather robust spines on inner upper surface, two long robust spines ventrally with several shorter spines; prothoracic tibia with three robust spines on dorsal surface; other legs spineless; metathoracic femur surpassing abdominal apex.

Connexival segments spineless.

Posterior border of male hypopygium (fig. 5) broad; claspers directed anteriorly as is characteristic of this genus.

Female.—Unknown.

Specific name in honor of my wife, Norma.

Holotype, ♂, BORNEO, Sandakan, Baker. Deposited in the U. S. National Museum.

Cuernolestes bakeri, new species

Length from 6 mm to 6.10 mm. Highly polished, color dark amber lightly suffused with stramineous ventrally on abdomen; legs light stramineous with annuli at apices of all femora; pubescence sparse on abdomen, pleura, antennae and legs.

Head with a spine ventro-laterally on each side before eye, another ventro-laterally on each side just behind posterior margin of eye, a small seta on each side ventro-laterally just before collum; Intraocular suture distinct; 1st rostral segment with two upward projecting spines; dorsum of jugum with a very distinct pointed tubercle; length from anterior border of eye to tylus apex subequal to length of eye longitudinally; 1st rostral segment not reaching border of postocular ventro-lateral spines.

Pronotum with rather long spine at antero-ventral angle on each side, length of spine subequal to, or slightly longer than, longitudinal length of eye; length of humeral spine variable from slightly shorter to slightly longer than terminal rostral segment; mesonotal spine less than length of humeral spine; metanotal apical process very short; dorso-median spine of 1st tergite very long, slightly longer than to subequal to length of 1st rostral segment.

Conformity of apical internal cell and surrounding veins of hemelytron as in fig. 2.

Prothoracic coxa with three ventral short spines; prothoracic trochanter with one long apical spine, one middle short spine and one basal very short spine; prothoracic femur with six long rather robust spines on inner upper surface, two long robust spines ventrally with several shorter spines; prothoracic tibia with three robust spines on dorsal surface; other legs spineless; metathoracic femur surpassing abdominal apex.

Connexival segments spineless.

Posterior border of male hypopygium (fig. 6) almost pointed, shallowly U-shaped; clasper as in fig. 7, directed anteriorly as is characteristic of this genus; basal plate (fig. 9) minute, lacking anterior bridge; aedeagus tubular, roughly C-shaped; phallosoma not dissected and everted.

Female IXth tergite pointed and directed posteriorly rather than vertical; VIIIth tergite and attendant gonopophyses also following this conformity of anterior pointedness.

Specific name in honor of the collector.

Holotype, ♂, PHILIPPINE ISLANDS, Surigao, Mindinao, Baker. Deposited in the U. S. National Museum. Paratypes, 2 ♂♂, 2 ♀♀, same data as holotype, 2 Elkins collection, 2 USNM.

All the species known in this genus seem to comprise a closely knit group. Until additional individuals are available for genital dissection, it would be unwise to venture close relationships.

Key to the Species of Cuernolestes

1. 1st rostral surpassing border of postocular ventro-lateral spines; hemelytral venation around apical internal cell as in fig. 1; male posterior hypopygial border as in fig. 4 ..... **nanus**, n. sp.
   1st rostral not surpassing border of postocular ventro-lateral spines; hemelytral venation around apical internal cell otherwise 2
2. Head lacking seta on either side ventro-laterally before collum; hemelytral venation around apical internal cell as in fig. 3 ..... **philippinus** Miller
   Head with seta on either side ventro-laterally before collum; hemelytral venation around apical internal cell as in fig. 2 3
3. Tubercle on dorsum of each jugum indistinct, femora not annulate apically, posterior border of male hypopygium broad (fig. 5) ..... **normae**, n. sp.
   Tubercle on dorsum of each jugum small but prominent, femora annulate, posterior border of male hypopygium rather pointed (fig. 6) ..... **bakeri**, n. sp.

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BOOK NOTICE

THE WORLD OF BUTTERFLIES AND MOTHS, by Alexander B. Klots. Numerous text illustrations, including photographs; 24 full page color plates; 207 pp. McGraw-Hill Book Co., Inc., New York. $15.00.

This English version of Mr. Klots' contribution to the series of *La Nature Vivante* is a clearly written attempt to bring to others an interest in the study of these insects. The text, divided into chapters dealing with ancestry, structures, biology, food habits, relationships to other insects and to man, and distribution, is aimed at young and old alike. The principal attraction of this book is the excellent quality of the illustrations, which should serve to whet anyone's appetite for further study of the order Lepidoptera.— Ed.

TWO NEW AND TWO RARE TUBULIFEROUS THRIPS, RECORDED PRINCIPALLY FROM ILLINOIS

(THYSANOPTERA, PHLAEOTHRIPIDAE)

LEWIS J. STANNARD, JR., *Illinois Natural History Survey, Urbana*

The species described or listed herein belong to taxonomically difficult groups. These and many of their relatives are not only extremely close in diagnostic characteristics but also, what is worse, they are members of genera that have never been revised or analyzed. If the new characteristics and comparisons introduced in the following prove to be of aid, it is hoped that any synonyms that chance to result will be justly pardoned.

The types and other specimens studied are deposited in the collections of the Illinois Natural History Survey.

Eurythrips setiger, new species

Female (macropterous).—Length, distended, nearly 2 mm. General color dark brown, being darkest in apical segments of antennae, thorax, and posterior segments of abdomen. Pedicel of antennal segment III yellow to yellowish brown. Legs yellowish brown being darkest in the femora. Body with red subintegumental pigment.

Head, fig. 1, moderate in size, smooth dorsally and ventrally except at extreme sides and base. Eyes bulged. Ocelli present. Postocular setae long and dilated. Antennal segment III moderate in size, not shortened, with one inner and one outer sense cone; segment IV with one inner and two outer sense cones; segments VII and VIII each with a distinct pedicel. Maxillary stylets placed far apart within head.

Prothorax, fig. 1, with anteromarginal setae minute; other major setae well developed, dilated. Epimeral sutures complete. Ventrolateral metathoracic setae dilated. Fore tarsi each with a small tooth. Femora each with an unusually differentiated, dilated seta, fig. 2. Fore wings fully developed.

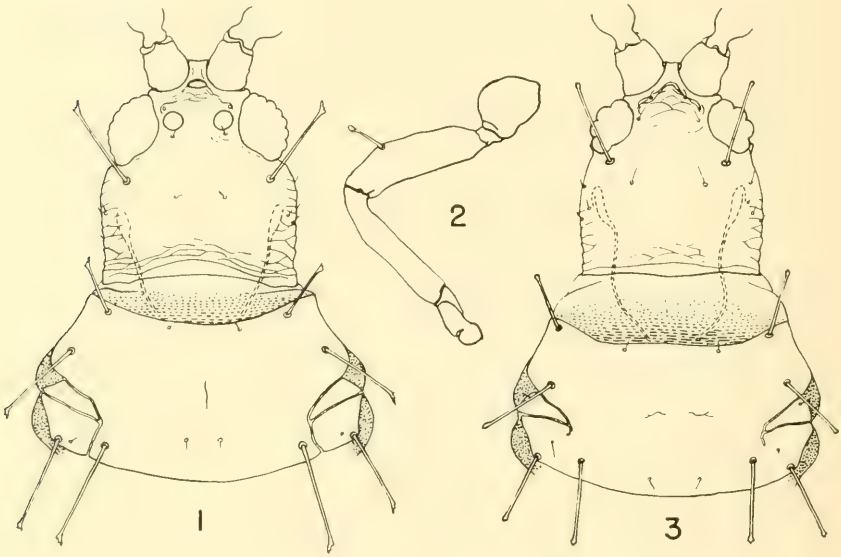
Pelta roughly triangular, hexagonally reticulate to nearly smooth. Abdominal tergites III to VIII each with two pairs of sigmoidal wing-holding setae. Abdominal tergite IX with major posterior setae about as long as tube and pointed. Tube about twice as long as length of abdominal tergite IX.

Female (brachypterous).—Length, distended, about 1.7 mm. Similar to macropterous female except head and legs slightly lighter in color. Ocelli present. Wings reduced to pads. Wing-holding setae present on abdominal tergites but slightly reduced in size.

Male.—Unknown.

Holotype.—Female (macropterous), Dixon Springs, Illinois, August 30, 1951, Ross and Richards, from vegetation. **Paratypes.**—1 ♀ m, Rantoul, Illinois, July 21, 1953, Evers and Stannard, from native prairie plants; 1 ♀ m, Rogers, Arkansas, July 8, 1949, Sanderson and Stannard, from grasses; 1 ♀ m, 3 ♀ b, Key West, Florida, December 27, 1951, Richards and Stannard, from grass clumps.

This species is separable from all others in the genus by the characteristic of the unusually differentiated, dilated seta present on each femur. It is also distinctive as being one of the few species of *Eurythrips* which has the prothoracic epimeral sutures complete.



Eurythrips setiger: fig. 1, dorsal aspect of head and prothorax; fig. 2, left hind leg showing differentiated seta on femur (all other setae omitted). *Eurythrips constrictus*: fig. 3, dorsal aspect of head and prothorax.

Eurythrips constrictus, new species

Female (brachypterous).—Length, distended, about 1.7 mm. General color brown; head, especially at base and apex, antennal segments I and II, legs, and thorax light to yellowish brown; posterior segments of abdomen grading into dark brown. Body with red subintegumental pigment.

Head, fig. 3, moderate in size, about as in *connatus* Hood, smooth dorsally and ventrally except at extreme sides and base, constricted under the posterior facet of each eye and at this point usually with a tooth-like projection. Eyes bulged. Ocelli absent. Postocular setae well developed, dilated. Antennal segment III with one inner and one outer sense cone; segment IV with one inner and two outer sense cones; segment VII with pedicel moderately thickened varying from the condition in *ampliventralis* Hinds to almost the broad condition as found in *connatus;* segment VIII with a broad pedicel. Maxillary stylets usually retracted into the head well beyond the midway point between the base of the eye and the base of the head.

Prothorax, fig. 3, with anteromarginal setae minute, remainder of major pairs of setae well developed, dilated. Epimeral sutures incomplete. Ventrolateral metathoracic setae small and pointed. Fore tarsi each with a minute tooth. Mid and hind femora without any unusual, differentiated setae. Wings reduced to small pads which bear one or two dilated setae.

Pelta broad, much as in *ampliventralis*. Wing-holding setae reduced. Abdominal tergite IX with major posterior setae not exceeding tube, pointed.

Male (brachypterous).—Length, distended, about 1.3 mm. Color and structure much as in brachypterous female. Abdominal sternite VIII with a narrow, median transverse glandular area. Abdominal tergite IX with the major lateral posterior setae reduced in size.

Holotype.—Female, Mammoth Cave National Park, Kentucky, April 8, 1950, L. J. Stannard, from *Andropogon* clumps. **Allotype.**—Male, same data as for holotype. **Paratypes.**—5 ♂, same data as for holotype; 21 ♀, 15 ♂, Red Hills State Park, Illinois, April 30, 1950, P. W. Smith and L. J. Stannard, from *Andropogon* clumps.

The name of this species refers to the constricted, narrow, abdominal glandular band of the male which is a principal feature for its differentiation. In one characteristic, the moderately thickened pedicel of antennal segment VII, *constrictus* stands intermediate between *ampliventralis* and *connatus*. Usually females of *constrictus* can be distinguished from those of *ampliventralis* and *connatus* by the position of the maxillary stylets. In *constrictus* these stylets extend well beyond the half way mark between the base of the eyes and the base of the head whereas in the other two species these stylets are placed more basally in the head.

The species *genarum* Hood, recently described, is apparently very similar to *constrictus*, but *constrictus* bears only one outer sense cone on antennal segment III in contrast to *genarum* which is stated to bear two outer sense cones, and by this characteristic the two may be separated.

Hindsiothrips, new genus

Head longer than wide; surface smooth except at extreme base. Eyes relatively small as in *Haplothrips* subgenus *Karnyothrips*, never prolonged ventrally more than dorsally, not keglike or particularly bulged as in *Eurythrips*. Ocelli present in the macropterous form, absent in the apterous form. Postocular setae moderate in size to fairly long, pointed or dilated. Cheeks smooth without strong lateral setae. Antennae each eight-segmented; segment III subequal in length to segment IV, with at least one inner and one outer sense cone; segment IV with one inner and two outer sense cones; segment VIII decidedly lanceolate. Mouth cone short and broadly rounded. Maxillary stylets retracted far into the head, placed fairly close together within the center of the head. Maxillary bridge not discernible.

Thorax nearly smooth, without strong sculpture. Prothorax with anteromarginal setae small or long, anteroangular setae well developed, midlateral setae always small, posterior pairs of setae well developed; these setae pointed, blunt or dilated.

Epimeral sutures usually incomplete. Praepectus present. Mesopraesternum degenerate to nearly absent. Macropterous or apterous. Fore wings, when present, of nearly even width throughout and not indented in the middle, without accessory fringe cilia near the apex of the trailing edge. Fore legs armed with a small tooth.

Pelta nearly rectangular to trapezoidal, weakly sculptured. Abdominal tergites III to VII in the macropterous form each with one pair of wing-holding setae; in the apterous form these setae not differentiated. Abdominal tergite IX with major posterior setae longer than tube, always pointed, and in males the lateral pair is much reduced in size. Males apparently without a distinct glandular area on abdominal sternite VIII. Females with a small internal rod (fustis) in abdominal segment IX. Tube relatively short; terminal setae not greatly elongate.

Type species.—*Hindsiana pullata* Hood.

Besides the type species, this genus should also include *robustisetis* (Watson and Preer) which was originally described in *Eurythrips*.

Unfortunately the creation of *Hindsiothrips* brings into being another genus difficult to define. But the two species included cannot be placed in any presently recognized genus with any degree of satisfaction, and it seems best, therefore, to emphasize their intermediate taxonomic position by grouping them in a separate category that takes its place between *Phlaeothrips* (sensu Stannard 1957) especially the *flavicauda* complex, *Haplothrips* especially the subgenus *Karnyothrips*, and *Eurythrips*.

Hindsiothrips can be separated from *Haplothrips* and its subgenera and complexes by the combination of the lanceolate form of antennal segment VIII and by the incomplete epimeral sutures; from *Eurythrips* by the retracted position of the maxillary stylets which are placed closer together within the center of the head than is the case in *Eurythrips;* and from *Phlaeothrips*, particularly *flavicauda* and its relatives which bear praepectal plates, by the dark, non-yellow tube and by the incomplete epimeral sutures.

The aforegoing differences are stressed for the few species of each of these genera which are atypical. *Hindsiothrips* can be distinguished from the majority of the species in *Haplothrips* by the fore wings which are not indented in the middle, in *Eurythrips* by the shape of the eyes which are not especially bulged, and in *Phlaeothrips* by the presence of praepectal plates.

Key to the Adults of Hindsiothrips

Tarsi generally brown; postocular setae pointed ..... **pullatus**
Tarsi generally yellow; postocular setae dilated ..... **robustisetis**

Hindsiothrips pullatus (Hood), new combination

Hindsiana pullata Hood (1925:27). ♀. Type locality: Macedon, New York.

Female (apterous).—Length, distended, nearly 1.5 mm. Almost entirely dark brown. Inner apical angles of femora and pedicel of antennal segment III yellow to colorless. Body with red subintegumental pigment.

Eyes relatively small. Ocelli absent. Postocular setae moderately long and pointed.

Prothorax with anteromarginal and midlateral setae small, anteroangular setae moderate in size, and the posterior pairs of setae somewhat longer; the smallest of these setae pointed to blunt, the longest setae blunt or slightly dilated. Epimeral sutures incomplete.

Pelta subrectangular. Tube short.

Female (macropterous).—Length, distended, about 1.6 mm. Similar to apterous female except for the following: Eyes slightly larger in size. Ocelli present. Wings fully developed, nearly uniformly light gray. Pelta in the form of an isosceles trapezoid. Wing-holding setae sigmoidal.

Male (apterous).—Length, distended, about 1.5 mm. Color and structure similar to apterous female except for the sexual characteristics.

Previously this species was known solely from the type locality in New York State. The following records are new: ILLINOIS.—1 ♀ m, 2 ♀ a, Karbers Ridge (Hardin County), August 17, 1951, Ross and Stannard, from dead branches; 1 ♀ a, same data as preceding except, May 5, 1950, Sanderson and Stannard; 1 ♀ a, Belle Smith Springs (Pope County), May 5, 1950, Sanderson and Stannard, from dead oak branches; 1 ♀ a, Alto Pass (Union County), May 10, 1951, Sanderson and Stannard, from dead willow branches; 1 ♂ a, Decatur (Macon County), September 8, 1955, L. J. Stannard, from dead branches. ARKANSAS.—1 ♀ a, Rogers (Benton County), July 10, 1949, Sanderson and Stannard, from dead pine needles.

Hindsiothrips robustisetis (Watson and Preer), new combination

Eurythrips robustisetis Watson and Preer (1939:3). ♀, ♂. Type locality: not stated, but either Putnam or Alachua counties, Florida.

Female (apterous).—Length, distended, about 1.8 mm. General color yellowish brown. Antennal segment III to VIII, median and lateral portions of the terminal abdominal segments and tube, darker brown. Anterior of head, pedicel of antennal segment III, inner apical angle of femora, apex of tibiae, and all tarsi, yellow. Body with red subintegumental pigment.

Eyes relatively small. Ocelli absent. Postocular setae moderate in size, dilated.

Prothorax with major anterior and posterior setae well developed, dilated; midlateral setae minute. Epimeral sutures incomplete.

Pelta rectangular. Tube short, but slightly longer than that of *pullatus*.

Female (macropterous).—Unknown.

Male (apterous).—Unknown to me. Described as 'very similar to the female but smaller.'

Previously *robustisetis* was known only from Florida. The following new records indicate a wide distribution in the eastern part of the United States: ILLINOIS.—2 ♀ a, Palos Park (Cook County), December 14, 1932, Frison and Ross, from soil cover; 4 ♀ a, Elgin (Kane County), October 10, 1952, Ross and Stannard, from *Andropogon* clumps. MASSACHUSETTS.—2 ♀ a, Salem (Essex County), September 24, 1948, Bonet and Christiansen, presumably from soil debris.

BOOK REVIEW

THE PHYLOGENY AND CLASSIFICATION OF THE NORTH AMERICAN GENERA OF THE SUBORDER TUBULIFERA (THYSANOPTERA), by Lewis J. Stannard, Jr., Illinois Biological Monographs, no. 25, 1957. v + 200 pp. The University of Illinois Press, Urbana $2.50 paper, $3.50 cloth.

Although this work does a considerable service in meeting the need for more usable aids to identification in Tubulifera, its major contribution is the first original arrangement of the group as a whole that has been presented since Priesner's *Die Thysanopteren Europas.*

It is probably to show the importance Stannard attaches to phylogeny that this word comes first in the title, as the first and larger part of the paper is devoted to classification. Following a short introduction and notes on habits, there are several pages on morphology that are invaluable for the inclusion of the many new terms and characteristics not explained in previous works in English on thrips morphology. A glossary would have been helpful, but the illustrations at the end of the paper leave little to be desired in the way of explanation.

In the section on classification, comprising a key to genera and a treatment of each within the two subfamilies recognized, Stannard's adherence to qualitative in preference to quantitative characteristics not only makes the key more workable, but also provides a sounder basis for the separation of genera. The key is far the best I have used in this group, with all due respect to the formidable accomplishment represented by Priesner's *Genera Thysanopterorum.* The chart of characteristics of difficult genera is an excellent device.

The treatment of each genus is a synonymy, characterization, discussion of relationships, species list, and occasionally a key to species. Although brief, the characterizations are more satisfactory than complete generic descriptions often are. Stannard does not indicate in the species lists which combinations are new and which may not represent his own opinion, but the lists will nonetheless be useful, and the keys even more so. The rejection of seven available names in favor of a name proposed to replace a senior homonym (*flavipes* (Jones) in Haplothrips, p. 51) is difficult to understand, as inadvertence could not account for so many, and the disregard for priority otherwise implied is contrary to his interpretations of nomenclature anywhere else.

It is more difficult to evaluate the section on phylogeny, but insofar as I am acquainted with the group, I find the scheme of relationships plausible. The jump to Tubulifera from Heliothripinae takes in a wide gap, but other groups of Terebrantia have even less in common with Tubulifera. Below the subfamily level, Stannard places genera in "lines" and "spurs," an arrangement with much logic, but extremely difficult to visualize without a chart or diagram. The "legalistic involvements in the International Rules of Nomenclature," he avoids by not assigning genera to definite intermediate categories, however, are minimal in comparison to those created by his drastic lumping of genera. Many of the new combinations are unlikely to be accepted by other thysanopterists, for if there is intergradation among the groups in question, there are also clear lines of relationship for which names are useful. There is also the need, as the author points out in not accepting *Leptogastrothrips,* to see critical specimens for one's self in order to judge whether the change is an improvement.

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

TWO NEW SPECIES OF TUBULIFEROUS THYSANOPTERA FROM INDIA
(THYSANOPTERA, PHLAEOTHRIPIDAE)

T. N. ANANTHAKRISHNAN, *Professor of Zoology, Loyola College, Madras, India*

Allothrips Hood

Allothrips Hood, 1908, Bull. Ill. State Lab. Nat. Hist., 8(2):361-79. Watson, 1923, Univ. Florida Agr. Exp. Sta., Tech. Bull. 168: 3-100. Priesner, 1949, Bull. Soc. Fouad Ier Entom., XXXIII: 88. Stannard, 1955, Ann. Ent. Soc. America, 48(3): 151-157.

The genus *Allothrips* has hitherto been unrecorded in the Indian region, though it has been known to be worldwide in its distribution. It is characterized by the thick, band-like maxillary stylets, broadly rounded mouth-cone, dilated postocular setae and a 7-jointed antenna, with joint 7 pedicellate, not closely united with 6. *Allothrips* Hood very closely resembles an allied genus, *Pseudocryptothrips* Priesner, which also is apterous, but the latter has an 8-jointed antenna.

Allothrips indica, sp. nov.

Female: Total body length 0.938 mm—1.120 mm. Body bicolorous; head yellowish, except for the dark patches of pigment as in the figure; vertex yellowish brown. Prothorax, abdomen, antennal joints 4-7 brown. Pterothorax, all legs and antennal joint 2, yellow; joints 1 and 3 yellowish brown. Tube golden yellow, brown tipped. Eyes blackish red; dark patches of pigment scattered all along sides of thorax and abdomen.

Head about 1.1 times as long as wide, being 182μ long in the holotype and 198μ wide across cheeks and 154μ wide across eyes. Cheeks straight, eyes small with a few facets. Ocelli absent. Postoculars 22μ long with dilated tip, placed 13μ from sides of head and very close to the caudal eye facet. Interocular setae 16μ long. Other head setae minute, distributed as in the figure. Antenna 1.8 times head length, sense cones well developed and conspicuous, setae pale.

Joints: length (width) in μ—35-38(32-35); 48-53(32-35); 48-53(32); 38-42 (28-32); 35-42(28); 32-38(28); 51-61(26).

Mouth cone broadly rounded at tip; length from posterior dorsal margin of head, 126μ.

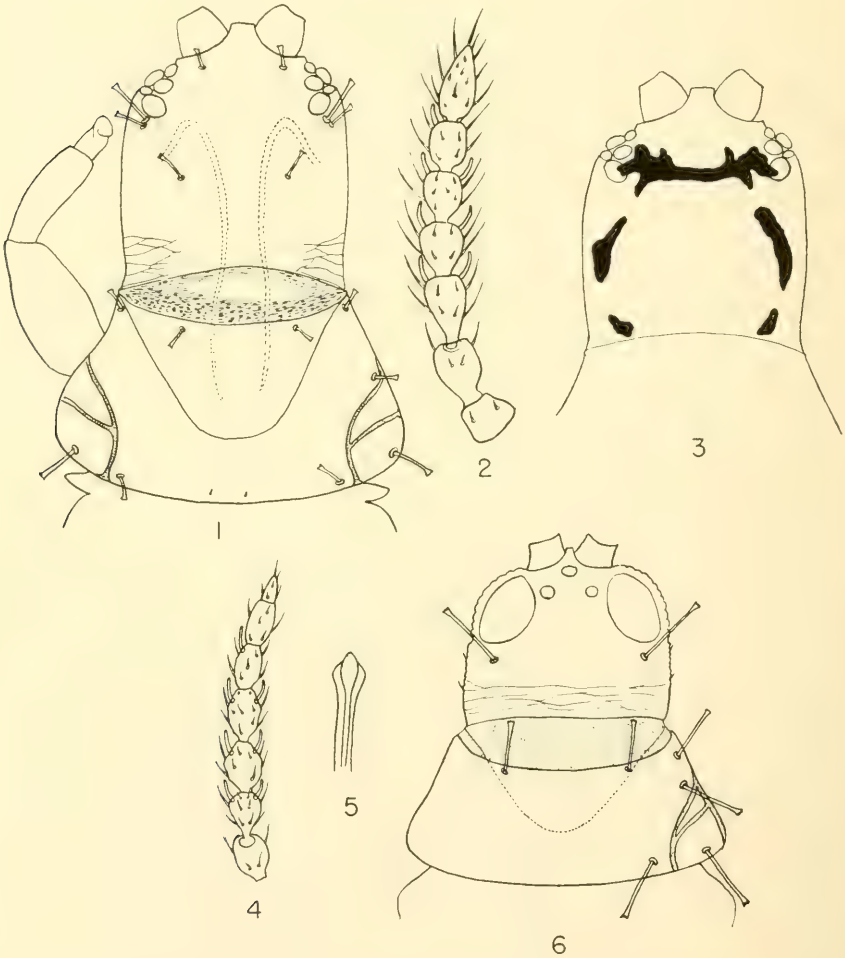
Prothorax 133-140μ long at middle, 140-168μ wide at anterior margin and 224-252μ wide at base inclusive of coxae. Prothoracic bristles well developed, dilated at tips; anteroangulars 29-32μ; anteromarginals 29μ; mid-laterals 29-32μ; postangulars 26-32μ; epimerals 29μ. Median pair of spines on posterior margin very poorly developed. Legs normal, well developed, dilated setae of femur on outer margin, 26μ long. Foretarsus without teeth. Pterothorax 224μ wide, slightly less wider than prothorax. Abdomen broad and heavy, widest at middle, about 350μ wide. Outer setae of IX 99μ long, pointed inner 64μ, with dilated tips. Tube 112μ long, 56-70μ wide at base and 28-35μ wide at tip; anal setae 98μ long.

Habitat: Two females taken from inside dead twigs of *Thevetia neriifolia* by K. S. Ananthasubramanian (7.4.1957), Madras, India (T.N.A. No. 274) (Holotype in the author's collection).

A. indica comes near *A. africanus* Hood, but differs in the general coloration, head 1.1 times as long as wide, short postoculars, antenna 1.8 times head length, and tube 1.6 times head length.

Xylaplothrips Priesner.

Xylapothrips Priesner, 1928, Thys. Eur., 1:572; 1949, Bull. Soc. Fouad Ier Entom. XXXIII:80; 1950, Bull. Soc. Fouad er Entom. XXXIV:91. Stannard, 1956, Proc. Biol. Soc. Wash., 69:25.



Allothrips indica, sp. nov.: fig. 1, head and prothorax of female; fig. 2, antenna of female; fig. 3, head of female showing patches of dark pigment. *Xylaplothrips nayari*, sp. nov.: fig. 4, antenna of female; fig. 5, apex of pseudovirga of aedeagus; fig. 6, head and prothorax of female.

Xylaplothrips Pr. is generally considered as a subgenus of *Haplothrips*, though as Stannard observes, its status as "subgenus or genus or species complex" is a point of controversy. Though Priesner's separation is based on the placement of the foretarsal tooth at the extreme apex of the tarsus, the new species described below lacks the foretarsal tooth in both males and females. All the same, the delicate, slender body form is characteristic of *Xylaplothrips*.

Xylaplothrips nayari, sp. nov.

Macropterous female: Total body length 1.26—1.4 mm. General colour various shades of yellow and brown. Normal colour: Head, thorax and tube, antennal 4-8 and abdominal pleurites dark brown; antennal joints 1 and 2, IX segment and base of wings and scale lighter brown; joint 3 pale; abdominal segments 1-8 yellowish grey brown, being darker in segments 2-4. Leg coloration variable. All legs uniform dark yellow, except for a brownish tinge at base of forefemora; in some, both fore and midfemora are yellowish at extreme apex and brownish yellow at base. Wings light greyish infumate; fringes brown. Eyes black, ocelli with red pigment; plenty of scattered red pigment on thorax.

Head wider than long, being 112μ long from eyes and 140μ wide across cheeks. Eyes large, 56-63μ long, occupying half the head length or slightly more and 42μ wide. Ocelli well developed, arranged in triangle. Cheeks 56μ long, margin slightly serrate, one or two weak spines. Postocular setae, 48-51μ long, dilated at tip, placed 16μ from cheeks and 13μ below eyes. Antenna nearly 2.4 times as long as head.

Antennal joints—measurements in μ, length(width):—22-29(29-32); 38-42 (26-28); 35(22); 38-42(29); 28-42(19); 35(19); 32(16-19); 19-26(10). Prothorax as long as head, 112μ long, 172-196μ wide anteriorly and 238μ wide at base inclusive of coxae. Prothoracic bristles well developed, dilated at tip. Anteroangulars 38μ; anteromarginals 44μ; midlaterals 38μ; postangular 51-54μ; epimerals 48μ long. Pterothorax 224μ long, uniformly wide, 238μ. Forefemora slightly enlarged, 70μ wide at middle, inner femoral setae fine 48μ long. *Foretarsus without tooth.* Forewings 532-560μ long, with 5 accessory setae; basal wing bristles 45-48μ, 48μ and 70-74μ long respectively.

Abdomen broad at base, gradually narrowing towards extremity; IX abdominal segment 126μ wide and 70-84μ long. Wing retaining bristles well developed in segments 1-6. Tube as long as head, 112μ long, 48μ wide at base and 28μ wide at tip. Anal setae, fine, 70μ long.

Macropterous male:—1.12-1.19 mm. General colour almost as in the female, except for the dark red pigments at the sides of abdominal segments 2-4. Fore- and midfemora similarly coloured brownish yellow at base, rest dark yellowish. Head 112μ long, 126μ wide; eyes 56μ long, 42μ wide; postoculars 48μ long. Antennal joints: length(width) in μ: 22(26-29); 32-38(22); 32-38(22); 38(26); 35-38(19); 35(16-19); 32(16-19); 22(10).

Prothorax 98-112μ long, 140-154μ wide at anterior margin, 196μ wide at base. Prothoracic setae—anteroangulars 32μ, anteromarginals 38μ, mid-lateral 35μ, postangular 48-51μ, epimeral 38-42μ. Pterothorax length 196-210μ; width across mesothorax 196-210μ; width across metathorax 168-196μ. Forefemoral width 56μ. Wing length 490-504μ. Basal wing bristles 38-42; 38-45; 48-58μ long.

Abdomen 168μ wide at base, 126-140μ at middle, 84μ wide across IX. Segment IX 70μ long. Tube 98μ long, 42μ wide and 21μ at tip. Anal setae 84μ long.

Habitat: Numerous males and females on bamboo leaf sheaths, *Trivandrum*, collected by Dr. K. K. Nayar, Feb., 1957, Trivandrum, India (T.N.A. No. 290). This species has been named after Dr. Nayar as a token of regard for the constant help rendered to the author.

Dr. Priesner, while confirming *X. nayari* as a new species, points out that it is not far from *pictipes* Bgn. and *incognitus* Priesner, but *nayari* has head much shorter (broader than long), foretarsi unarmed (males and females), eyes larger (as long as cheeks), characteristic coloration, and shorter antennae.

Holotype female and allotype male with the author—Paratypes in the Indian Museum, Calcutta and Priesner's collection.

BOOK REVIEW

ZOOGEOGRAPHY—THE GEOGRAPHICAL DISTRIBUTION OF ANIMALS, by Philip J. Darlington, Jr. John Wiley & Sons, Inc., New York, xi and 675 pp., 80 figs. Sept. 1957. $15.00.

This book is a masterpiece of thoroughness and precision, as well as a landmark for zoogeography. It is the first comprehensive treatment of the subject in 80 years—since Wallace's foundation in "The geographical distribution of animals". An interesting aspect is that though it is by an entomologist, it concerns the vertebarte animals almost exclusively. The author did this because vertebrate animals are so much better known than insects. The book has many interesting aspects, including clarity, frankness and fairness of reasoning. Stress is given to geography and history, and four main factors—barriers, competition, dominance and evolution. Darlington emphasizes that animal distribution is a product of movement of animals, not of land, in stressing great age of continents, and in giving evidence against continental drift. The distribution of fresh-water fishes, amphibians, reptiles, birds and mammals is discussed in detailed chapters, followed by treatment of continental and island patterns, evolution of patterns, history of animal distribution, principles of zoogeography and geographical history of man. The maps are original and clear, on orthographic projection. The treatment of islands omits many island groups, although some have few or no terrestrial vertebrates. Almost no mention is made of the fact that insect distribution does not agree with vertebrate distribution in eastern Indonesia, New Guinea, the Solomons and other Pacific islands. Possibly the importance of ecology to zoogeography has been minimized by Darlington, even though he does stress competition and dominance. The strong emphasis on geography and history is of course well warranted. This book will be of the greatest use to entomologists even though island insect patterns, or some of the southern continent insect distribution patterns, may not fit the vertebrate picture.

—J. L. GRESSITT, *Bernice P. Bishop Museum, Honolulu.*

A NEW MILLIPED OF THE GENUS SIGMORIA FROM WESTERN NORTH CAROLINA

(POLYDESMIDA, XYSTODESMIDAE)

RICHARD L. HOFFMAN, *Department of Biology, Virginia Polytechnic Institute, Blacksburg.*

The following new species of *Sigmoria* is described in advance of a general revision of the genus as it is endemic to the region now being studied under the research program of the Highlands Biological Station and since publication of the generic synopsis cannot be expected for several years at the least.

Except for one specimen personally collected in 1949, all of the material at hand has been obtained either by investigators at the Highlands Station (largely through the influence of its Director, Thelma Howell) or my friend Leslie Hubricht, to all of whom I am indebted for their interest in collecting millipeds.

Sigmoria nantahalae, new species

(Figures 1 to 4)

Type specimens.—Male holotype and paratypes of both sexes, deposited in the U. S. Nat. Mus. (Myriapod Type No. 2460), from the Nantahala Gorge near Blowing Spring, 3 miles north of Nantahala, Swain County, North Carolina, collected on May 6, 1951, by Leslie Hubricht.

Diagnosis.—A small species of *Sigmoria* characterized by the black, gray, and red color pattern; by the slender gonopodial telopodite with two unequal subterminal processes; and by the strongly carinate transverse section of the cyphopod.

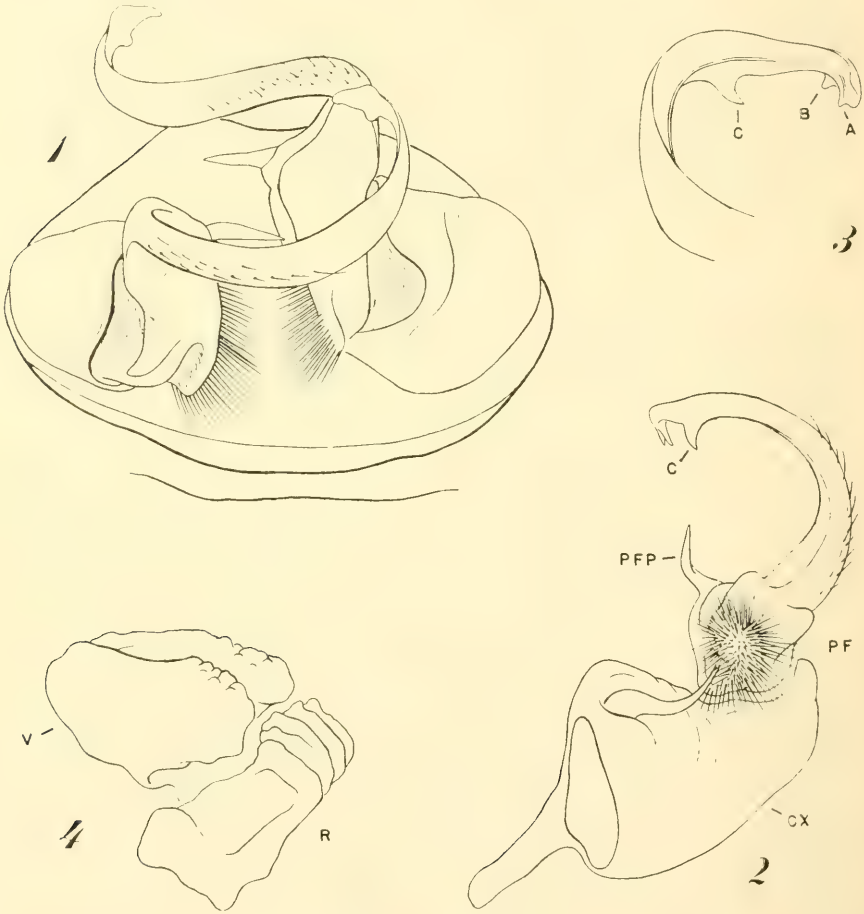
Male holotype.—39.0 mm. long and 9.3 mm. wide at the 12th segment; width/length radio approximately 24%.

Head smooth and polished, somewhat flattended in front, groove of vertex very distinct and with a row of tiny punctations. Genae broad, with shallow median depressions, the edges not margined; distal ends rounded, greatly exceeded by tip of 2nd antennal article. About 6 moderate sized macrosetae each side of the median labral sinus, which is margined with about 12 much smaller and closer set setae. Labral teeth small, rounded, the median tooth lightly recessed. Interantennal space broad, equal to length of 2nd article (1.3 mm.). Antennae long (8.0 mm.) and slender, reaching back beyond caudal margin of 3rd tergite, the articles cylindrical, somewhat clavate distally, and sparingly setose; 7th article with four sensory cones. Articles in decreasing order of length: 2, 3, 4, 5, 6, 1, 7.

Collum smooth and polished, 7.0 mm. wide, anterior lateral margins only weakly set off by a faint submarginal groove; in lateral aspect the ends are at the same level as the following paranota. Tergites of segments 2-5 completely smooth, their paranota only slightly bent forward; following segments are smooth but distinctly rugulose or coriaceous, the paranota broad and depressed, continuing slope of dorsum, the anterior and posterior corners rounded, and lateral edges set off by a distinct submarginal groove. Ozopores opening somewhat dorsolateral in their swellings, fully visible in lateral aspect. Tergites 17-19 almost completely smooth,

the paranota produced caudad into acutely triangular lobes except those of the 19th which are small, distally rounded processes, greatly exceeded by the elongate conical telson. Depth-width ratio of 12th segment: approximately 62%.

Anal valves nearly flat, slightly wrinkled, with strongly produced marginal ridges. Preanal scale large, with convex margins, the lateral tubercules located almost at the apex and nearly confluent with the terminal angle; lateral ends of preanal scale somewhat depressed.



Sigmoria nantahalae, new species, male and female genitalia drawn from paratypes: fig. 1, gonopods, in situ, with outline of sternal aperture; fig. 2, left gonopod, mesial aspect; fig. 3, distal half of telopodite blade of left gonopod, an oblique caudolateral aspect, somewhat more magnified than other figures; fig. 4, left cyphopod, in caudolateral aspect. Abbreviations: A, B, C, terminal processes of gonopod; CX, coxa; PF, prefemur, PFP, prefemoral process; R, receptacle; V, valve.

Pleural regions smooth and unmodified, the interzonal furrow a broad shallow depression down to level of stigmata, thence continuous across venter as a fine groove. Sternal areas flat to concave, sloping upward from the transverse groove to form a sharp-edged shelf between the second legpair of each segment. Sternites of segments 8-10 each with a few tiny setae, those of other segments completely glabrous.

Legs smooth and polished, coxae and prefemora with 1 to 12 ventral setae, femora and postfemora glabrous except for a distal ring of small setae, tibiae and tarsi distinctly more setiferous, the tarsal joints particularly so on the dorsal side. Sterna not produced at bases of legs, but both coxae and prefemora with sharp conical distal spines. Leg joints, in decreasing order of length, 3, 6, 2, 5, 1, 4. Tarsal claws long and bisinuate, each with a high thin carina on the dorsal side and a much smaller carina on each side of it.

Coxal process of 2nd legpair high, erect, and distally globose, smooth and shining with a few setae around the aperture. Sternum between 3rd legpair with two short, medially confluent digitiform processes; those between 4th legs lower, flattened and distinctly transverse; those between 5th legs low and hemispherical.

Gonopod aperture large and suboval, approximately 3.0 mm. wide and 2.3 mm. long; the gonopods fully exposed in ventral aspect (fig. 1), their prefemoral portions adjacent or in contact. Coxae connected by membrane and a large intercoxal muscle, no sclerotized sternal remnant present. Prefemora elongated and subcylindrical, densely setose on the mesial side; the prefemoral process a simple arcuate spine. Femur about half the length of telopodite blade, setose on its outer surface. Postfemur or tibiotarsus glabrous, sigmoidally curved, its inner margin with a conspicuous dentate process (C) and a smaller rounded subterminal lobe (B); the seminal groove being carried out to the extreme end on a tiny lobe (A).

Female paratype.—40.0 mm. long and 9.7 mm. wide at 12th segment, width/length ratio approximately 24%.

Body similar to that of male in structural details except for the more bulky form and wider sternal areas, the depth/width ratio of 12th segment beng 70%. The antennae are actually as well as relatively shorter than in males, 7.0 mm. in length and not extending back beyond caudal margin of 2nd segment.

Cyphopods small, of the form shown in figure 4. The caudal arm of the receptacle is larger than the cephalic (not shown in the drawing), the transverse section is strongly ridged with five or six distinct striations. Upper surface of valves, at their basal ends, conspicuously tuberculate.

Color in life.—Prozonites and anterior third of metazonites shining black; caudal two-thirds of metazonites, tip of telson, and caudal edge of collum light pearl gray; entire dirsal surface of paranota and front edge of collum bright vermillion. Underparts whitish, legs becoming pink distally. Antennae and labrum brown. Living specimens are rich and glossy in coloration, appearing as though enameled, and are the most attractive diplopods which I have encountered.

Distribution.—*Sigmoria nantahalae* has been collected so far at a number of localities in extreme western North Carolina and adjacent northern Georgia, chiefly in the mountain ranges surrounding the headwaters of the Nantahala and Hiwassee Rivers. These ranges include the Nantahala, Cowee, and Valley River Mountains, and the

Blue Ridge in north Georgia. Almost certainly the species occupies the Snowbird and Cheoah ranges as well, a matter which can be determined by future collecting. Specimens at hand bear the following locality and collection data:

NORTH CAROLINA. *Clay County*: White Oak Bottom, June 18, 1954, Julian T. Darlington; Buck Creek, June 5, 1952, C. E. Wood, Jr., and Leland Rodgers; U. S. Hy. 164, 4 miles west of Glade Gap, June 18, 1954, J. T. Darlington; Glade Gap, 3673 ft., July 20, 1952, Thelma Howell; Tuni Gap, eastern end of Tusquitee Mountains, July 20, 1954, Howell. *Macon County*: west side of Wesser Bald, 4 miles southwest of Nantahala, July 29, 1949, R. L. Hoffman; Cowee Mountains, 8.8 miles northeast of Franklin, U. S. Hy. 23, June 23, 1950, Leslie Hubricht; road to Wayah Gap, July 14, 1951, R. L. Humphries. *Swain County*: U. S. Hy. 19, 8 miles southwest of Bryson City, May 6, 1951; base of Cliff Ridge at Nantahala, May 6, 1951; near Blowing Spring, 3 miles north of Nantahala, May 6, 1951; Smokemont Camp Ground, 6 miles north of Cherokee, June 22, 1950, all by Hubricht.

GEORGIA. *Towns County*: Enota Glade Picnic Area, east side of Brasstown Bald near the top, June 7, 1953, Hubricht.

Collections made on the periphery of the presently known range will be of interest in establishing the distribution of this interesting species. Collectors who may have the occasion to obtain millipeds in the Cowee range, particularly its eastern extension which approaches the Highlands Plateau near Cashiers, North Carolina, are urged to be on the alert for the large and colorful *nantahalae*.

A Note on the Status of Sigmoria

The generic name *Sigmoria* was proposed by R. V. Chamberlin in 1939 for seven species from Tennessee and North Carolina, and defined by the following statement: "Includes large, robust species which are characterized by the sigmoidally curved blade of the telopodite."

Since that time a number of species have been added to the genus, many of which are not very closely related to the type species, and it appears that *Sigmoria* is now a sort of "catch-all" for species which do not readily fall into any of the other established genera. A thorough study is needed of the groups of species currently called *Apheloria*, *Sigmoria*, *Cleptoria*, and *Sigiria*, all being "genera" which are defined more by their traditionally allocated species than by tangible morphological characters. Although resolution of this problem remains to be accomplished, it is evident on the basis of preliminary studies that much shifting of species, as well as redefinition of the generic groups using newly discovered characters, is to be expected. *Sigmoria*, as represented by its type species, *S. munda* Chamberlin, will probably include only those forms in which the telopodite of the gonopod is provided on the inner margin with a distinct triangular process about a third of the length back from the distal end. Such a process is present in *nantahalae*, and is indicated by the symbol "C"

on the drawings. On the other hand, several forms described in this genus lack the process, and are probably referable either to *Cleptoria* or to some genus which has yet to be proposed. Since process C is usually concealed when the gonopods are examined *in situ*, it is necessary that a gonopod be removed for careful study or for illustration, and the mesial aspect is the one which normally shows the greatest amount of structural details. The practice of publishing drawings of the gonopods of related species from various different aspects cannot be too strongly disparaged.

The family name Xystodesmidae, not used in the recent checklist of North American diplopods by Dr. Chamberlin and me, is once more employed on the strength of recent studies which have disclosed important differences between the North and South American genera of the families involved.

ANNOTATED CATALOGUE OF AFRICAN GRASSHOPPERS. By H. B. Johnston. Anti-Locust Research Centre. Cambridge Univ. Press, American Branch: 32 East 57th St., New York 22. xxii + 833 pp. $18.50 (Cloth bound, 26 cm.)

The author of this invaluable catalogue has had much experience with African grasshoppers, and the sponsoring organization, the Anti-Locust Research Centre, has also been especially concerned with African problems for many years. The Director of the Centre, Dr. B. P. Uvarov, has been one of the very active students of African Acridoidea, and he is credited with the arrangement of genera in groups and tribes for the catalogue. Because of the happy combination of these factors, the preparation of the volume is assumed to be very thorough.

This catalogue is an index to what has been published; it does not contain new synonymy, new type designations, or other revisionary changes. As regards the literature on five outstanding locusts, only taxonomic and faunistic references are given, but full information on other grasshoppers is included. Condensed annotations following each species indicate references to the following topics: Descriptions; keys; figures; morphology; nymphs; ecology; bionomics; economic importance; distribution. The type species of each genus is shown as orthotype, haplotype, or logotype. Type localities of species and the museum containing each type are shown. References are given in abbreviated form, corresponding to the bibliography of 981 books and papers.

As now known, about 500 genera containing 2,000 species of grasshoppers inhabit Africa and the immediately adjacent islands. Much revisionary work remains to be done, which doubtless will place many currently valid names in synonymy, but new species have been recognized at a rapid rate in recent years, and the trend probably will continue. The hope is expressed in the preface that supplements to the catalogue will appear as a need arises. With the agricultural development of Africa, grasshoppers have become so important, and the fauna is so rich, that this catalogue is extremely practical and useful.—ASHLEY B. GURNEY, *Entomology Research Division, A.R.S., U.S.D.A., Washington, D. C.*

THE JUMPING SPIDER, PHIDIPPUS AUDAX HENTZ, AND THE SPIDER CONOPISTHA TRIGONA HENTZ AS PREDATORS OF THE BASILICA SPIDER, ALLEPEIRA LEMNISCATA WALCKENAER, IN MARYLAND.

(ARANEIDA; SALTICIDAE, THERIDIIDAE, ARGIOPIDAE)

It is recognized that spiders themselves are important enemies of spiders. Bristowe (1941, The Comity of Spiders) ranks spiders first in his list of spider enemies.

On August 14, 1957, while observing a series of basilica spiders, *Allepeira lemniscata*, that I was studying on the shrubbery of the Bethesda-Chevy Chase Senior High School, Bethesda, Montgomery County, Maryland, I found a specimen of *Phidippus audax* feeding on a large female basilica spider. Basilica spiders would attract the attention of and expose themselves to the attack of roving *Phidippus audax* in going out from the web dome to the leaves and branches, as they do occasionally, to check, reinforce or repair the web and strand that supports the cocoons. *Phidippus audax* was on top of this basilica spider which was attached by silk to a branch of an American Holly, *Ilex opaca*, at the level of a deserted snare of a basilica spider which had already made 4 cocoons and was present in its snare the day before.

Conopistha trigona is a frequent commensal of the basilica spider, usually being noted in either the dorsal or the ventral labyrinths of the host web. On one occasion, which I have reported, (1957, Proc. Ent. Soc. Wash., 59(2) :79), *Conopistha trigona* showed an aggressive tendency toward its host. On the 16th of July, 1958, I found a specimen of *Conopistha trigona* feeding on the abdomen of a dead basilica spider under the apex of the dome of the basilica spider's web on the top of a Privet Hedge, *Ligustrum vulgare*, at Greenbelt, Prince George's County, Maryland. The basilica spider was hanging in the normal inverted watching position, but its legs were buckled, giving it the typical appearance of a dead spider. *Conopistha trigona* was also in its normal inverted position, just below the basilica spider, feeding on the posterior dorsal abdomen of its host. Examination of the basilica spider revealed that its legs, tibia and tarsi were trussed up in silk. It was definitely the prey of this *Conopistha trigona* which appeared slightly smaller, having relatively thinner legs and a smaller cephalothorax.

—DONALD H. LAMORE, *Cottey College, Nevada, Mo.*

ANNOUNCEMENT

The XIth International Congress of Entomology will take place in Vienna from 17-25 August 1960 under the chairmanship of Professor Karl E. Schedl. Several symposia will serve as discussion media for panels of experts, and a number of social events will help to establish personal contact between Congress members. Application forms may be obtained from the Secretary General, Dr. Max Beier, c/o Naturhistorisches Museum, Vienna 1, Burgring 7, Austria.— ED.

REDESCRIPTION OF OPHIOPTES TROPICALIS EWING, 1933

(ACARINA, OPHIOPTIDAE)

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Through the courtesy of Dr. E. W. Baker of the United States National Museum, I have examined and compared a cotype of *Ophioptes tropicalis* Ewing, 1933 (slide U.S.N.M. 1081) with other species of *Ophioptes*. On the basis of these studies, the following redescription of *O. tropicalis* is presented. Its affinities to other known species are discussed in another manuscript describing a new species of pit mite from Cuba (Allred, 1958). The terminology of the palps is adapted from the interpretation of Southcott (1955:146).

Ophioptes tropicalis Ewing, 1933

Length of the female including the gnathosoma, approximately 360 microns; width at the widest part of the body exclusive of the legs, 330 microns.

Dorsum.—The propodosoma is provided with eight pairs of setae arranged in two lateral groups; the posterior seven pairs are approximately 36 microns in length; the anterior pair is 10 microns, with slightly swollen bases. There are four pairs of setae approximately 12 microns in length near the center of the metapodosoma.

Venter.—The propodosoma is provided with two pairs of peg-like setae 16 microns in length, each with several ridges or leaves. There is a pair of setae 17 microns in length immediately anterior to the first pair of pegs. There are four pairs of setae distantly surrounding the anus; the anterior two pairs are 9 microns, and the posterior two pairs are 14 microns. The posterior anal opening has four pairs of minute setae immediately adjacent to it.

Gnathosoma.—The venter of the gnathosoma is provided with a pair of hypostomal setae 14 microns in length. The postero-lateral seta of the femur is 8 microns in length. On the antero-lateral edge of each tibia is a thick, modified seta 10 microns in length. There is a similar seta 16 microns in length on the dorsal surface of the tibia. The tibial claw has two prongs. There are two setae 12 microns in length on each tarsus. The apical seta of the tarsus is modified but is not distinguishable as to the number of teeth it possesses. The chelicerae are simple, long needle-like stylets.

Leg I.—The coxa and trochanter each has one short seta. The femur has a long whip-like seta and a thick seta of medium length. The genu has a long whip-like seta and two short setae. The tibia has a serrated spur, a short seta and a seta of medium length. The tarsus has a short, conical, annulated peg 7 microns in length, one long whip-like seta, two thick setae of medium length, two short single-barbed setae and four other short setae. The tarsus terminates in a cup-shaped sucker and a double-forked seta with long, external serrations.

Leg II.—The setation of the coxa, trochanter, genu, tibia and tarsus is similar to leg I. The femur has one whip-like seta.

Leg III.—The coxa has one short seta. The trochanter has one short and one long setae. The femur has a whip-like seta. The genu is nude. The tibia has a spur and a whip-like seta of medium length. The tarsus lacks a peg, but has two

whip-like setae of medium length, two short single-barbed setae and four other short setae. The sucker and double-forked seta are present.

Leg IV.—The coxa lacks setae. The setation of the trochanter, tibia and tarsus is similar to leg III. The femur and genu are nude.

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THE TRANSFER OF ANAMPHIDORA FROM THE TENEBRIONIDAE TO THE ALLECULIDAE

(Coleoptera)

Anamphidora was described by Casey in 1924 (Memoir Coleop. 11: 330) for his new species *parvula* from Mexico; in the catalogues it has been placed in the Tenebrionidae beside *Amphidora*. *Anamphidora* is quite obviously an alleculid by virtue of its heteromeric tarsi, closed fore coxal cavities, and combed claws. The only important difference between this genus and the Mexican alleculid genus *Phedius* is in the tarsi: *Anamphidora* has simple tarsal segments and *Phedius* has lobed tarsal segments. The original description which Casey presented is not slanted toward alleculid characteristics and is in addition a mixture of generic and specific characteristics. However, the description given by Champion in 1888 (Biol. Centr.-Amer., Ins., Coleop. 4(1): 447) and later modified in 1893 (*ibid.*:568) for *Phedius* can be used for *Anamphidora* except for the tarsi. In Champion's key of 1888 (*ibid.*:386) to the Central American alleculid genera, *Anamphidora* will come out with *Lystronychus*, but these two may then be separated by the former's lateral pronotal borders being evenly arcuate, its sparse dorsal punctation, and its shiny surface. The following descriptions or redescriptions of some of the attributes of *Anamphidora parvula* Casey might be helpful:

Long, erect setae on all parts except the appendages; antennae filiform, segments 6-11 approximately twice as long as wide; pronotal punctures not coarse, not cribriform, the majority separated by much more than their diameters; elytra with striae 1 and 2 weakly impressed and visible, other striae not impressed and their punctures obscured by the confused punctures of the intervals, the strial punctures without setae; hind wings short, approximately one-third normal length; metasternum short, distance between mesocoxa and metacoxa subequal to length of mesocoxa.—

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COLOR AS AN INDEX TO THE RELATIVE HUMIDITY OF PLASTER OF PARIS CULTURE JARS

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INTRODUCTION

Postlarval trombiculid mites, collembolans, and oribatid mites require a high relative humidity at all times. Wharton and Fuller (1952) and Rohde (1956) discuss various methods of culturing mites in high relative humidities. A number of workers listed by the above authors use plaster of Paris and activated charcoal in a ratio of 9:1 as a substrate in their culture jars. This mixture has the advantages of not serving as a substrate for the growth of fungi and of being relatively easy to keep clean. Charcoal was originally added in order to offset a toxic effect that the plaster of Paris seemed to have. Another advantage of the use of charcoal has now become apparent. The higher the moisture content of the plaster-charcoal mixture, the darker a color it seemed to have.

It might, therefore, be possible to determine the relative humidity of the culture jars by inspection alone, without disturbing the contents by opening the jars. The first object of this study was to determine whether this was possible. Wharton and Fuller (1952) state that the plaster-charcoal mixture acts as a humidifier, giving off water vapor or reabsorbing it as conditions change. The second object of this study was to determine, assuming the above assumption to be correct, at what relative humidity the mixture would maintain the jars.

MATERIALS AND METHODS

Powdered animal charcoal from the Fisher Scientific Co., Catalog No. C-263, and plaster of Paris from Cardinal Products, Durham, N. C., were used in this study. One part charcoal to nine parts plaster of Paris were used, this having been recommended by Wharton and Fuller (1952) as a practical standard mixture. The ingredients were mixed in 100 g. batches with an accuracy of $\pm$ 1 g. and shaken up in a bottle to obtain a homogeneous mixture. A batch was then placed in a one-pint Ball Special Wide-Mouth canning jar and sufficient water was added to set the mixture. These jars have covers consisting of a lid with a rubber gasket and a screw cap.

Two holes were drilled in one of these lids, one to accommodate a thermometer and one for the sensing element of the Aminco Electric Hygrometer Indicator. Rubber tubing was used to make the seals around these instruments as air-tight as possible. When the relative humidity of a jar was to be tested, the lid with the sensing element and the thermometer was screwed onto the jar. At least one hour (usually more) was permitted to elapse before attempting to measure the relative humidity, in order to give the air in the jar a chance to attain a state of equilibrium with the substrate.

The color of the plaster-charcoal was determined by a method of visual comparison as described in an instruction booklet which accompanied the Munsell Book of Color produced in 1929 by the Munsell Color Co., Baltimore, Md. A square hole about 2 × 2 cm. was cut into a piece of gray cardboard. One such cardboard was placed over the squares of color in the Book of Color and another was placed over the plaster-charcoal in the jar. The first cardboard was moved about on the page until the hole was over a square of color matching that seen on the hole of the second cardboard. The plaster-charcoal mixture had a gray or black color, designated as N, or Neutral, in the Munsell color system, and was without chroma. Pure black was designated as N 0/ and pure white was N 10/. The steps in the color scale are integers, but it was possible to interpolate readings.

Protocol

One of the jars which had been prepared as described above was dried out in an incubator oven at 50° C. in order to dry out the plaster-charcoal as much as possible. Then the relative humidity and color were measured and were found to be 7.2% and N 5.7/. After that, the plaster-charcoal was saturated with water and another set of readings was taken: 93.5% and N 3.5/. At the next reading, five hours later, the relative humidity had risen to 97.5%, and thereafter continued to be between 97.5% and 98.0% until the jar was again dried out in the incubator oven. Readings continued to be taken almost daily until the plaster-charcoal returned to its original light color (N 5.5/), but the relative humidity was still high (97.5%). The jar was then dried out in the incubator oven, and the color was found to be unchanged, while the relative humidity had dropped to 9.5%. It should be noted that after each set of readings, the jar would be left open for 30-60 minutes to allow some of the moisture to escape. Although the color did gradually become lighter, the readings do not progress in an orderly manner. This may, in part, be due to the difficulty in reading gray color, especially on the curved surface of a bottle, and also the fact that some of the readings were made during daylight and others at night under artificial illumination.

In an earlier experiment, before readings of the color were being made, an oven-dried jar had water added to it, drop by drop, and the relative humidity was measured after the addition of each drop. An eye dropper was used for adding the water, the same one being used throughout this experiment. A reading was not taken until 5-6 hours had elapsed from the addition of the drop. The humidity of the jar rose from 6.0% (oven-dry) to 74.5% (15 drops).

Discussion and Conclusions

Utilizing these data, it is possible to conclude that, in one sense, it is not possible to use color as an index of the relative humidity, since the color will change, while the relative humidity will not (experiment utilizing a saturated jar). However, starting with a saturated jar, as long as the color is not the lightest obtainable, the user is

assured of a relative humidity of well over 95%. On the other hand, when water is added, drop by drop, to an oven-dried jar, the relative humidity rises from 6% to over 70% by the time 15 drops have been added, but this small amount of water is insufficient to cause any color change at all.

The answer to the second question posed in this study is affirmative, with qualifications. The data from the saturated jar experiment show that the plaster-charcoal does act as a humidifier which will keep the relative humidity of the jar constant until the substrate is almost entirely dry, but only if the experiment is begun with a moistened jar. At room temperatures, however, the only relative humidity which can be maintained by this type of humidifier is one of over 95%.

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ANNOUNCEMENT

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LEE L. BUCHANAN, 1893-1958

The Washington *Star* for February 19, 1958 carried the following story: "Lee L. Buchanan, 64, honorary research associate in zoology at the Smithsonian Institution and former senior entomologist at the Agriculture Department, was pronounced dead at Emergency Hospital Saturday night after collapsing on the street. Mr. Buchanan was an internationally recognized authority on weevils and their identification."

Lee L. Buchanan was born October 27, 1893 in Solon, Iowa. Solon is a small town on the Chicago, Rock Island and Pacific Railroad some 15 miles southeast of Cedar Rapids. There he spent his childhood, living the life of a midwestern small town boy, his world centered in his home, his school, and the church, and his interests extending to the immediate countryside of fields, woods, and streams. Quite early in life he showed an inclination toward books and games of skill. He was especially intrigued by competitive games, such as baseball, where the performance of individual players often is of more importance than strict teamwork. At an age when most boys are playing the game only for fun, he was studying it intently to be able to play it better.

He was not a boy naturalist, but he was from an early age at home in the outdoors. He fished, hunted, hiked, and camped. In all these endeavors, he carefully studied the equipment and performance so that he might excel. In school he was a much better than average, but not a brilliant, student. His grades were in the upper 80's and low 90's. In

all his school work he took an intense interest in those subjects which appealed to him.

When he had finished grade school in Solon, he had to go to Cedar Rapids for high school, because Solon had none. In high school he played on the baseball team, his early intensive study of the game giving him an advantage his physical powers alone would not have provided.

He entered the University of Iowa, Iowa City, in 1912 and took his A.B. there in 1916. During his days at the university he took up the game of billiards; he continued to play this game until the time of his death. In billiards, as in other games, he studied the play intently and exhaustively to outdo his opponents. Later in his life he took up the game of golf, studying with a professional player. He also gave this game intensive study to master it.

He took no courses in entomology in college until the second semester of his junior year, when he signed up for a course merely to fill out his schedule. His entry into entomology was, thus, essentially fortuitous. But he found at once that both the subject and his instructor, Professor Wickham, were exactly suited to his temperament. The course gripped his mind from the start, and he applied to it all his powers of intensive concentration. As a result, he was able in only the year and a half that remained to him before graduation to gain a broad comprehension of this admittedly detailed and essentially unorganized subject. His own inclinations, and the direction of Professor Wickham, himself a well known Coleopterist, led him to concentrate on the taxonomy of beetles. His first paper, a note on distribution of a leaf beetle, was published while he still was an undergraduate.

By the time he graduated, it was fairly well settled that entomology was to be his life's work, with a study of weevils (the largest family in the Insecta) to be his primary specialty. It was typical of him that he should choose the most difficult family of all.

After his graduation, Professor Wickham was largely instrumental in securing for him an appointment in the U. S. Biological Survey in Washington. Buchanan entered that organization on Oct. 21, 1917. His first assignment was keeping the card records of stomach analyses of birds. Because there wree at that time some 200,000 bird stomachs on hand, this would have been to many workers an impossibly trying assignment, but to him it represented a problem to be solved by patient and sustained concentration. Here again he studied the problem thoroughly and soon succeeded in putting the project on a rational and workable basis. Later he was able to spend more and more of his time identifying the fragments of weevils found in the bird stomachs; eventually he was permitted to devote all his time to the identification of these weevils. He afterwards remarked that these years spent in the Biological Survy were the best years of his life—his golden years.

From May 28, 1918 to Feb. 15, 1919 he served in the Field Artillery of the U. S. Army. (Like Miniver Cheevy in E. A. Robinson's poem, he viewed a khaki suit with loathing.) Returning to civilian life, he resumed his duties in the Survey.

On April 1, 1926 he went on half-time duty in the Survey, devoting the other half of his time to a project for rearranging and curating the Thomas L. Casey collection of Coleoptera. This collection had been willed to the Smithsonian Institution by Colonel Casey, but was arranged and labeled in such a cryptic fashion that it could not be used by other workers. The Casey Fund, administered by the Smithsonian, provided money for paying Buchanan's salary half time for a period of 5 years. During this period, he put this collection into superb condition, with the segregates, as defined by Colonel Casey, definitively arranged and labeled. This was far from an easy task, because it sometimes required days of intensive study to establish the exact limits and identity of a single series of specimens. This undertaking was ideally suited to Buchanan's capacity for intensive study and intelligent deliberation.

In 1929 the Biological Survey was abolished and he transferred to the Bureau of Entomology as a specialist in the taxonomy of Curculionidae. He continued to put in half his time on the Casey collection, but when that project was completed in 1931 he became a full time employee of the Bureau. For a short time in 1935 he held a Smithsonian appointment when he returned to the University of Iowa to arrange for the shipment to Washington of the Wickham collection. Aside from that, he remained a specialist on Curculionidae for the Bureau until his retirement in October 1949. In the late 30's his health had begun to fail noticeably. The exact cause was never determined—it may have been endocarditis, complicated by other factors, but apparently not cancer. By 1949 his health had become alarmingly bad, and he was forced to retire.

During his active career in Washington, he published a series of papers on the taxonomy of Curculionidae. His outstanding work was that on the classification of the white-fringed beetles. The segregates in this extremely difficult complex of weevils, which reproduce by thelyotokous parthenogenesis, can be distinguished statistically. He consequently made an exhaustive biometric study of thousands of specimens in order to establish the taxonomic units in the genus. This study of the white-fringed beetles is fundamental to the research which is now going on in parthenogenetic reproduction.

After his retirement, Buchanan's health continued to worsen, and he passed into a coma in the late summer of 1951. He was not expected to live, but his constitution evidently was more resistant than anyone supposed possible. He passed through the crisis and recovered. It seemed, however, that he might have suffered some brain damage during the time he was in the coma, as his personality, except for brief periods, was greatly changed afterwards. The acute awareness he had

always shown before was now almost gone. Physically he experienced a remarkable but transitory improvement. His general health gradually failed again, with brief periods of improvement.

In 1956 he presented his personal entomological library of over 3400 items to the Smithsonian, but he seemed well enough to try to undertake taxonomic studies again. Accordingly he was appointed Honorary Research Associate in the Smithsonian, specializing in Carabidae. He came irregularly to the museum and worked on Carabidae in the Casey collection up to the time of his death.

He was a member of the Entomological Society of America, the Entomological Society of Washington, the Biological Society of Washington, the Washington Academy of Sciences, and the Cosmos Club. He was a bachelor and was survived by his sister, Mrs. Fern Stolz of Washington, D. C., and his brother, B. E. Buchanan of Pueblo, Colorado. We wish to thank Mrs. Stolz for supplying us with a large part of the information used here.

ROSE ELLA WARNER
W. S. FISHER
B. D. BURKS

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