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A New Genus of Neotropical Psocids with Horn-like Structures on the Head. (Psocoptera, Pachytroctidae)


Psocoptera (Corrodentia, Copeognatha) are commonly exemplified by a few domestic booklice or common bark-frequenting forms. However, the great structural and biological differences that occur within the order have led to the current recognition of approximately 25 families. The psocid described here has striking hornlike structures on the margin of the vertex (Fig. 4) and represents a new genus in the family Pachytroctidae, subfamily Pachytroctinae. It was collected in Trinidad and Brazil from foliage and ground litter.

The Brazilian specimen was collected by Aaron M. Nadler, of Brooklyn, N. Y., those from Trinidad by A. H. Strickland, of Harpenden, England, at that time located at the Imperial College of Tropical Agriculture, Trinidad. R. G. Donald, R. G. Fennah, and Edward McC. Callan, all associated then, or later, with the same institution, supplied additional information. John V. Pearman, Tring, England, has been consulted about the identification of this psocid, and I am indebted to Edward L. Mockford, Illinois Normal University, Normal, Ill., and C. N. Smithers, Australian Museum, Sydney, for reading the manuscript.

ANTILOPSOCUS, new genus

General body form (Fig. 1) much like Pachytroctes except for "horns" on vertex and T-shaped sclerite attached to inner
surface of female subgenital plate. Body arched in lateral view, not flattened; without scales or conspicuous pattern of setae; hypognathous, longitudinal axis of head oblique in lateral view.

Head with roughened sculpture; conspicuous dorsal “horns” on margin of vertex (Figs. 4, 5); epicranial suture present, no frontal sutures; no ocelli; eyes large, not extending posteriorly quite to margin of vertex; facets numerous, no rods or setae between facets; antenna with 2 basal segments and 13 flagellar antennomeres; labial palpus apparently 2-segmented; maxillary palpus 4-segmented; lacinia (“pick”) with 2 conspicuous teeth and a small inner one.

Pronotum very distinct; meso- and metanota closely joined but demarked by transverse line. No wings. Legs elongate; femora scarcely flattened or widened; tarsi 3-segmented; each claw with single preapical tooth only (Fig. 21). Female supra-anal plate simple, with few conspicuous setae; paraproct lacking sensory area, with several fairly long setae, one long terminal seta (Fig. 12); gonopophysis inconspicuous; subgenital plate broad, T-shaped sclerite present (Fig. 14).

Type species Antilopsocus nadleri, new species.

Antilopsocus runs to the Pachytroctidae in the family keys of Sommerman (1954), Roesler (1944), and Pearman (1958). Pearman’s organ (specialized area on mesal surface of hind coxa; see Badonnel 1943, p. 9) and secondary annulations of antennomeres near apex of flagellum appear to be absent in the material before me. A sensory peg apparently occurs near base of segment 2 of maxillary palpus. Each paraproct of Antilopsocus bears a conspicuous, medially directed (in dorsal view) terminal seta (Figs. 1, 12), about the same size as that in the genus Trogium of the family Trogiidae. I do not know of other pachytroctic genera with such conspicuous terminal setae.

Badonnel (1951, p. 1325) diagnosed the group Nanopsocetae, to which the Pachytroctidae belong, as lacking spines on the paraprocts; however, terminal spines or strong setae, called “appendices anales” by Enderlein (1905, text-fig. 6), are well known in the group Atropetidae and elsewhere. Apparently the definitions of the family Pachytroctidae and group Nanopso-
cetae require broadening to include at least moderately conspicuous terminal setae of the paraproct.

The discovery of the male and of winged individuals, if they occur, would be of great value in further defining the genus. Menon (1942, p. 30) warned against making assumptions based on one sex when dimorphism exists.

This genus was compared with other genera of the Pachytroctinae, as listed by Roesler (1944, pp. 135–136), from which Sphaeropsocus and Palaeotroctes were since removed. Menon (1942), Pearman (1958), and Badonnel (1963, p. 322) dealt with the position of Sphaeropsocus, of which Palaeotroctes is a synonym. From all previously known pachytroctine genera Antilopsocus differs in one or more characters additional to the cephalic "horns." It agrees best with Pachytroctes, which, however, lacks the T-sclerite according to Badonnel (1949, p. 25; 1955, pp. 100 et seq.). All current pachytroctine genera are exclusively Old World as now known except the Brazilian Neotroctes, which Roesler (1940, p. 228; 1944, p. 136) described as possessing 5 lacinial teeth, and Tapinella.1 Relationship to Nymphotroctes of France (Badonnel, 1931) is suggested by the tuberculate surface of the head in the two genera, but Nymphotroctes differs from Antilopsocus in having rods among the eye facets and minor teeth basad of the preapical tooth of the claws.

Comparatively few psocids with unusual head shapes are known. Various species have the compound eyes borne on a pedestal-like base; to a minor extent this development is shown by Psocus elegans Banks and P. lichenatus Walsh (family Psocidae) of the United States. An extreme example (Fig. 8) of the pedestal type of development is Labocoria diopsis (Enderlein) (Mesopsocidae) of Tanganyika, Africa.2 In the

1 Neotroctes was based on Pachytroctes brasilianus Roesler, 1940, collected beneath bark at Nova Teutonia, Santa Catarina, Brazil, Tapinella is represented in the New World by T. maclellata Mockford and Gurney 1956 of Texas, which has the T-sclerite and the lacinia shaped rather differently from Antilopsocus.

2 Described by Enderlein (1902) from Langenburg, at the northern end of Lake Nyassa, in former German East Africa.
Pachytroctidae a distinctive vertex shape, with blunt triangular lobes, is exhibited by *Peritroctes cochinensis* Menon of India (Fig. 7).

The name of the genus is adapted from the Greek word *Antholops*, meaning a horned animal, and *psocus*. The prefix *antilo* occurs in *Antilocapra*, the genus of the pronghorn antelope of western North America, the horns of which superficially resemble the dorsal head structures of this unusual psocid.

**Antilopsocus nadleri**, new species. Figs. 1–6, 9–21

The following description is based on the holotype except as noted.

**Holotype.**—Female. **Trinidad**: Imperial College of Tropical Agriculture, 1943–44, from soil litter (A. H. Strickland) (in alcohol, some parts on slides). [U. S. National Museum, Type No. 67408.]

General form as in Fig. 1; wings lacking. Head as in Fig. 4 in frontal view, Fig. 5 in lateral view (much foreshortened in Fig. 1); vertex with dorsal extension of head capsule on either side, shaped like a horn, each with a branch curved laterally and posteriorly, cuticle of horn sharply granular (Fig. 2); head capsule with roughened surface, especially on gena where variety of blunt tubercles (Figs. 2, *bt*; 3) occur, some bearing setae; mandibles as in Figs. 18 and 19, lacinia (Fig. 11) with inner tooth much reduced; maxillary palpus with apparent sensory peg near base of segment 2 (Fig. 9, *sp*), but interpretation uncertain; labial palpus (Fig. 10 from Brazilian specimen) apparently 2-segmented, but segmentation unclear. Antenna

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**Explanation of Figures**

Figs. 1–6. *Antilopsocus nadleri*, n. sp. 1, 4, 5, holotype; 2, 3, para-type; 6, specimen from Brazil. 1, General view, head foreshortened: 2, right "horn," front view, showing tubercles; 3, part of left gena, ventral view; 4, head, front view, details of integument shown only on left side; 5, side view of head, integumental details only in part; 6, outline of left "horn."

Fig. 7. *Peritroctes cochinensis* Menon, head, adapted from Menon (1938).

Fig. 8. *Labocoria diopsis* (End.), adapted from Enderlein (1902) (*bt*—blunt tubercles; *fa*—facets; *p*—pigment).
Figs. 1–8.
with 2 basal segments elongate barrel-shaped; flagellum (of Brazilian specimen) of 13 antennomeres, with length ratios as 10:9:11:9.5:10:9:8.5:9:6.5:7:7:8:6; flagellar setae relatively inconspicuous, coarsest at base (Fig. 15, flag. 1; Fig. 16, flag. 6), flagellum 9 (Fig. 17) with large preapical seta.

Thorax more heavily sclerotized than most of abdomen, more distinctly on lateral margins of nota and on pleura than on disks of nota; without trace of wings. Length ratios of femur, tibia, tarsomeres 1, 2, and 3 of front, middle, and hind legs, respectively (paratype from Trinidad), are: Front, 30:40:12:4:5; middle, 30:44:13:4:5; hind, 35:57:17:4:5. Trochanters closely joined to femora; hind tibia with roughened, semicrenulate surface, less so on hind femur and front and middle legs; femora with preapical spine near ventral margin, a few tiny marginal spines; front and middle tibiae with fairly conspicuous marginal setae, especially in apical half.

Abdomen with inconspicuous segmentation; no sculpture on integument noted; body setae sparse. Supra-anal plate (Fig. 13) with distinct setal pattern; paraproct with long, apically curved terminal seta (Fig. 12); subgenital plate and T-shaped sclerite as in Fig. 14.

Coloration: Head mainly butter yellow; eyes pale except for dark brown inner pigment; basal 2 antennal segments yellowish, flagellum blackish to apical half of flag. 8, again on flag. 13 and apical half of 12, intervening antennomeres colorless; general color of thorax varying from cream to champagne, darkened at shoulders and pleura; tibiae darkened to grayish yellow; tarsomeres 2 and 3 pale; abdomen whitish, tinged with yellowish white on genital segments (color terms from Kornerup and Wanscher’s Reinhold Color Atlas).

Explanation of Figures

Figs. 9-21. Antilopsocus nodleri, n. sp. 9, 11, 18, 20, 21, paratype; 12-14, holotype; 10, 15-17, 19, specimen from Brazil; 9, left maxillary palpus; 10, one side of labium; 11, apex of left lacinia; 12, apical portion of paraproct; 13, supra-anal plate; 14, subgenital plate, showing T-shaped sclerite; 15, 1st antennomere of flagellum; 16, 6th antennomere of flagellum; 17, 9th antennomere of flagellum; 18, ventral view of left mandible; 19, dorsal view, molar area of right mandible; 20, anterior surface of left hind leg; 21, one claw from left middle tarsus (sp—sensory peg). (Drawings by the author.)
Measurements (in millimeters) of holotype and specimen from Campo Grande, Brazil, respectively: Length of body, 1.5, 1.45; greatest head width across eyes, 0.43, 0.42; overall head length, apex of “horn” to apex of labrum, lateral view, 0.65, 0.56; space between eyes at vertex, 0.30, 0.27; narrowest distance between eyes across front, 0.23, 0.23; greatest longitudinal diameter of eye, lateral view, 0.13, 0.13; narrowest transverse diameter of eye, lateral view, 0.10, 0.10; length of front femur, 0.33, 0.28; front tibia, 0.43, 0.38; middle femur, 0.32, 0.26; middle tibia, 0.46, 0.38; hind femur, 0.37, 0.33; hind tibia, 0.60, 0.53; hind tarsus, 0.28, 0.26.

Variation: The paratype from Trinidad is mounted on a slide and the head is partly dissected. Its leg measurements are practically the same as those of the holotype, and the shape of the cephalic “horns” agrees essentially. However, the Brazilian specimen (Fig. 6) differs from the holotype in the “horns,” especially in the shape of the lateral appendage, as well as being a little smaller in most body measurements. The antennae of the holotype are not preserved except for the basal 2 segments. Those of the paratype are on a slide and, though the details of the flagellum are not well displayed, they appear to agree essentially with those of the Brazilian specimen.

Because the distance between Trinidad and Campo Grande, Mato Grosso, Brazil, about 2,200 miles, suggests a wide distribution for a species which seems to be of a somewhat localized type, I have consulted the collector of the Brazilian specimen about possibilities of an error in labeling. Mr. Nadler is confident (letter of March 6, 1964) that collection data with the specimen are correct. Although he collected in Trinidad later during the same month in which he visited Campo Grande, all vials from each place were handled entirely separately, and he sees no likelihood of error in labeling.

In view of the differences shown by the Brazilian specimen, perhaps additional specimens, particularly males, will show that a distinct species occurs in Mato Grosso.

Material examined: 3 wingless adult females (Holotype; 1 paratype collected with holotype [U. S. National Museum];
1 specimen from Campo Grande, Mato Grosso, Brazil, Jan. 9–10, 1959, collected while beating scrub vegetation and sugar cane beside wide paved road near town (A. M. Nadler) [Amer. Mus. Nat. Hist.]. The holotype is preserved partly in alcohol and partly on 2 slides; the paratype is divided and on 3 slides; and the Campo Grande specimen is partly in alcohol and partly on 6 slides.

The specimens collected by A. H. Strickland in Trinidad were taken during a survey, results of which he recorded in two papers (1945; 1947). In the 1945 paper he reported no psocids, but in the 1947 paper he showed that this species was the “one undetermined species” he submitted for identification to the U. S. National Museum, where it was examined by H. K. Townes in 1945.

In the 1947 paper a cacao plot located in the foothills of the Northern Range of Trinidad, near the St. Augustine Cotton Experiment Station, is given as the source of that species. Trees about 12 feet high provided a thick canopy over the cacao plantation where arthropods were obtained from ground litter and soil. Table 3 of the paper indicates that Psocoptera were taken from the cacao plot only in January and February, 1944. In response to an inquiry, Mr. Strickland stated (in a letter dated Dec. 5, 1949) that he remembered the “horned, stag-like psocids” collected in Trinidad, and that they were shown to the late A. D. Imms. It was Strickland’s impression that a division of the soil arthropod collection before samples were sent to Washington for identification may have resulted in some specimens of the “horned” psocid remaining in England. However, several inquiries failed to locate additional specimens.

I am glad to name this remarkable insect in honor of one of its discoverers, my friend Aaron M. Nadler, whose energetic collecting, especially in the Neotropics, has resulted in a choice reservoir of psocid and spider specimens at the American Museum of Natural History.

References


1947. The soil fauna of two contrasted plots of land in Trinidad, British West Indies. Ibid. 16: 1-10.

3 In the revised edition of Borror and DeLong, 1964, the key to families of Pscoptera is modified from Roessier.
Ten New Species of Phytoseius (Pennaseius) from Mexico, Trinidad, and British Guiana with a Key to Species (Acarina: Phytoseiidae)

DONALD DE LEON, Erwin, Tennessee

The species considered in this paper belong to the sub-genus Pennaseius Pritchard and Baker, 1962. Schuster and Pritchard (1963) raised the group to generic rank, but this ranking doesn't seem warranted to me. These mites are whitish, not very fast moving, and are commonly found on leaves of trees and shrubs. Although they are considered to be predacious, I have never observed them feeding, but have occasionally taken them from plants on which I saw no other mites. They may be facultative predators because Chant (1959) shows that some species in other genera of the family feed not only on other mites, but also on pollen, fungi, and plant juices.

In the descriptions, I have followed Garman (1948) in the designation of setae as his system seems less cumbersome for the phytoseiids than more recent proposals. In several of the new species, some or all of the shields of the ventral surfaces of the specimens at hand are so indistinct drawings could not be made. The descriptions and drawings are of holotype females except for the spermatodactyls which are of paratype males. All measurements are in microns. Leg measurements are from base of coxa to claw-end of pretarsus; tarsal measurements include the pretarsus.

**Key to Species of Sub-genus Pennaseius**

(Females except for floridanus Muma)

1. Dorsal shield with a pore close to base of M1.............2
   Dorsal shield without a pore close to base of M1........15
2. Genu IV without a greatly differentiated seta (Figs. 1-6)........3
   Genu IV with a greatly differentiated seta (Figs. 7-10)......9
3. L4 much shorter than L3 (about \( \frac{1}{2} \) as long or less)........4
   L4 about as long as or longer than L3..................8

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1 Cost of engravings paid for by a grant from the Pinellas Foundation, St. Petersburg, Florida.
4. D5 absent.................................................. 5
   D5 present................................................ 6
5. L4 much less than ½ as long as L3; macroseta of basitarsus IV with tip capitate....purseglovei, n. sp. (Trinidad)
   L4 about ½ as long as L3; macroseta of basitarsus IV with tip pointed..............orizaba, n. sp. (Mexico)
6. Cervix goblet-shaped (Fig. 3)....bennetti, n. sp. (Trinidad)
   Cervix funnel-shaped (Figs. 4 & 5).................................................. 7
7. Peritreme reaching forward to a point nearly in front of D1; macroseta of basitarsus IV blunt or else slightly capitata.nahuatlensis DeL., 1959 (Mexico)
   Peritreme reaching forward to a point about over middle of coxa I; macroseta of basitarsus IV tapering to a slender point...montanus n. sp. (Mexico)
8. Pore close to base of M1 conspicuous; M1 much shorter than D4...........florianus Muma, 1962 (Florida)
   Pore close to base of M1 inconspicuous; M1 not much shorter than D4...........rhabdifer, n. sp. (Trinidad)
9. L1 longer than L3; L5 about as long as or longer than L6............................................. 10
   L1 shorter than L3; L5 shorter than L6.................................................. 12
10. Macroseta of basitarsus IV longer than that of tibia IV..................amba Pritchard & Baker, 1962 (Belgian Congo)
    Macroseta of basitarsus IV shorter than that of tibia IV...... 11
11. M2 about as long as L7; macrosetae of leg IV with tips blunt...minutus Narayanan, Kaur, & Ghai, 1960 (India)
    M2 about ½ to ¾ longer than L7; macrosetae of leg IV with tips expanded...............hongkongensis Swirski & Shechter, 1961 (Hong Kong)
12. Pore close to base of M1 rather inconspicuous; D2 not minute (over 13 microns long) and longer than L2; 2 pairs of preanal setae.........paludis, n. sp. (Mexico)
    Pore close to base of M1 conspicuous; D2 minute (less than 9 microns long) and about as long as or shorter than L2; 3 pairs of preanal setae...............13
13. Cervix goblet-shaped; L1 not reaching to base of D2...........averrhoae, n. sp. (British Guiana)
    Cervix funnel-shaped; L1 reaching beyond base of D2...... 14
14. L3 reaching to well beyond base of L5; L6 reaching considerably more than half-way to base of L7..................mantecanus, n. sp. (Mexico)
    L3 not reaching to base of L5; L6 reaching only about half-way to base of L7........cismontanus, n. sp. (Mexico)
15. D5 reaching to base of M2 and longer than L7..................decoratus González & Schuster, 1962 (Chile)
D5 much shorter than \( \frac{1}{2} \) the distance to M2 and much shorter than L7. 

16. L4 about as long as or longer than L3. 

17. D5 less than 10 microns long; peritreme reaching forward to a point about in front of D1; cervix funnel-shaped, about 21 long. 

**Phytoseius** purseglovei, n. sp. (Figure 1) 

**Female**: Dorsal shield 251 long, 117 wide with setae arranged as shown in Figure 1. Lengths of setae as follows: L1 30, L2 9, L3 37, L4 11, L5 45, L6 59, L7 51; S1 31; D1 14, D2 7, (D5 absent); M2 45. Leg I 271, III 202, IV 302 long; tarsus IV 121 long, macroseta of basitarsus 21 long; at least 2 dorsal setae of genu IV and of tibia IV are very slightly capitulate. Cervix of spermatheca about 10 long. 

**Male**: Dorsal shield 191 long, 106 wide; spermatodactyl with foot about 7 long, shank about 11 long (for definition of these parts see De Leon (1961)). 

**Holotype**: Female, Curepe, Trinidad, West Indies, September 28, 1963 (D. De Leon), from Carica papaya. **Paratypes**: One male, collected with holotype; 1 female, St. Augustine, Trinidad, September 14, 1963, from Cordia curassavica; 2 males, 1 female, St. Augustine, Trinidad, October 18, 1963 (M. Bhorrai), from Cecropia peltata. The mite is named in honor of Professor J. W. Purseglove, Department of Botany, University of the West Indies, St. Augustine, Trinidad. 

**Phytoseius** orizaba, n. sp. (Figure 2) 

**Female**: Dorsal shield 259 long, 128 wide with setae arranged as shown in Figure 2. Lengths of setae as follows:

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\(^2\) I have followed Pritchard and Baker (1962) where they indicate that *Phytoseius finitimus* (Ribaga) should be the name for the mites called *P. plumifer* (C. and F.) by Chant (1959) and others.
L1 33, L2 11, L3 41, L4 21, L5 46, L6 56, L7 52; S1 29; D1 17, D2 10, (D5 absent); M2 43. Leg I 277, II 195, III 185, IV 320 long; tarsus IV 126 long, macroseta of basitarsus 25 long and ending in a slender point. Cervix of spermatheca about 9 long.

**Male:** Dorsal shield 206 long, 119 wide. Spermatodactyl with shank about 13 long, foot about 8 long.

**Holotype:** Female, Cordoba, Veracruz, Mexico, February 4, 1957 (D. De Leon), from Heliocarpus tomentosa. **Paratypes:** One female and 1 male taken with holotype.

**Phytoseius bennetti,** n. sp. (Figure 3)

**Female:** Dorsal shield 247 long, 121 wide with setae arranged as shown in Figure 3. Lengths of setae as follows: L1 28, L2 8, L3 38, L4 11, L5 42, L6 53, L7 49; S1 33; D1 16, D2 8; M2 42. Leg I 257, II 208, III 193, IV 299 long; tarsus IV 118 long, macroseta of basitarsus 21 long. Cervix of spermatheca about 7 long.

**Holotype:** Female, Manzanilla Bay, Trinidad, October 3, 1963 (F. D. Bennett), from Hibiscus tiliaceae. **Paratype:** One female taken with holotype. The mite is named in honor of Dr. F. D. Bennett, Commonwealth Institute of Biological Control, Curepe, Trinidad.

**Phytoseius nahuatlensis** De Leon, 1959 (Figure 4)

As leg IV and the cervix of the spermatheca of the type specimen were not illustrated in the original description, they are given here to aid comparison. Macroseta of basitarsus 25 long; cervix of spermatheca about 17 long; shank of spermatodactyl about 13 long, foot about 9 long. In the original description it was mentioned that several species may have been placed under one name. The complex has been restudied and now only the specimens from Tuxtla Gutierrez bear this name; the other species are distinguished by the characters given in the key. The species discussed under this name by Chant and Athias-Henriot (1960) appears to be unnamed.
Phytoseius montanus, n. sp. (Figure 5)

**Female:** Dorsal shield 271 long, 132 wide with setae arranged as shown in Figure 5. Lengths of setae as follows: L1 34, L2 13, L3 35, L4 17, L5 51, L6 63, L7 60; S1 32; D1 17, D2 15, D3 10; M2 39. Ventrianal shield 91 long, with narrow waist and 3 pairs of preanal setae. Leg I 282, II 228, III 207, IV 324 long; tarsus IV 126 long, macroseta of basitarsus 25 long. Cervix of spermatheca about 14 long.

**Holotype:** Female, 9 mi. south of Guadalajara, Jalisco, Mexico, March 22, 1957 (D. De Leon), from Hyptis albida. **Paratypes:** Two females, Jocotepec, Jalisco, March 22, 1957, from shrub; five females from 2 unrecognized trees, Santa Maria del Oro, Nayarit, Mexico, March 24, 1957.

Phytoseius rhabdifer, n. sp. (Figure 6)

**Female:** Dorsal shield somewhat rugose, 246 long, 139 wide with setae arranged as shown in Figure 6. Lengths of setae as follows: L1 21, L2 16, L3 28, L4 24, L5 31, L6 35, L7 38 (most of these setae rod-shaped); S1 25; D1 15, D2 15; M2 25. Leg I 271, II 215, III 190, IV 304 long; tarsus IV 110 long, macroseta of basitarsus 17 long. Cervix of spermatheca about 7 long.

**Holotype:** Female, St. Augustine, Trinidad, September 18, 1963 (D. De Leon), from Castillia elastica. **Paratypes:** One female, St. Augustine, September 21, from Pithecolobium saman, and 1 female, Tunapuna, Trinidad, September 25 from an unrecognized tree.

Phytoseius paludis, n. sp. (Figure 7)

**Female:** Dorsal shield 246 long, 115 wide with setae arranged as shown in Figure 7. Lengths of setae as follows: L1 34, L2 7, L3 38, L4 14, L5 45, L6 63, L7 51; S1 31; D1 17, D2 14, D3 11; M2 39. Leg I 272, II 211, III 196, IV 332 long; tarsus IV 126 long; macroseta of genu IV 21, of tibia IV 18, and of basitarsus IV 22 long. Cervix of spermatheca about 10 long.

Phytoseius averrhoae, n. sp. (Figure 8)

Female: Dorsal shield 249 long, 121 wide with setae arranged as shown in figure 8. Lengths of setae as follows: L1 25, L2 9, L3 35, L4 12, L5 40, L6 52, L7 49; S1 31; D1 18, D2 8; M2 47. Leg I 289, II 226, III 219, IV 320; tarsus IV 121 long; macroseta of genu IV 15, of tibia IV 13, and of basitarsus IV 18 long. Cervix of spermatheca about 10 long.

Male: Dorsal shield 203 long, 104 wide. Spermatodactyl with foot and shank each about 10 long.

Holotype: Female, Bartica, British Guiana, November 3, 1963 (D. De Leon), from Averrhoa bilimbi. Paratypes: One male and 1 female collected with holotype.

Phytoseius mantecanus, n. sp. (Figure 9)

Female: Dorsal shield 290 long, 135 wide with setae arranged as shown in Figure 9. Lengths of setae as follows: L1 47, L2 10, L3 59, L4 14, L5 76, L6 98, L7 78; S1 47; D1 24, D2 7; M2 66. Legs too bent to measure; tarsus IV 148 long; macroseta of genu IV 28, of tibia IV 26, and of basitarsus IV 25 long. Cervix of spermatheca about 14 long.

Explanation of Figures

Fig. 1. Phytoseius purscoleoi, n. sp. Dorsal and ventral shields, part of leg IV, cervix of spermatheca, and spermatodactyl.
Fig. 2. Phytoseius orizaba, n. sp. Dorsal and ventrianal shields, part of leg IV, cervix of spermatheca, and spermatodactyl.
Fig. 3. Phytoseius bennetti, n. sp. Dorsal and ventral shields, part of leg IV, and cervix of spermatheca.
Fig. 4. Phytoseius nahuatlensis De Leon. Part of leg IV, cervix of spermatheca, and spermatodactyl.
Fig. 5. Phytoseius montanus, n. sp. Dorsal shield, part of leg IV, and cervix of spermatheca.
Fig. 6. Phytoseius rhabdijer, n. sp. Dorsal and ventral shields, part of leg IV, and cervix of spermatheca.
Figs. 1–6.
Holotype: Female, Terrazas, S. L. P., Mexico, December 20, 1956 (D. De Leon), from *Hamelia patens*. Paratypes: One female taken with holotype; 4 females from *Guazuma tomentosa*, December 20, 1956, from 2 locations near Mante, Tamaulipas, Mexico.

Phytoseius cismontanus, n. sp. (Figure 10)

Female: Dorsal shield 274 long, 126 wide with setae arranged as shown in Figure 10. Lengths of setae as follows: L1 36, L2 8, L3 43, L4 7, L5 56, L6 72, L7 58; S1 36; D1 18, D2 7; M2 53. Ventrianal shield 80 long, with narrow waist and 3 pairs of preanal setae. Legs too crooked to measure; tarsus IV 141 long, macroseta of genu IV 22, of tibia IV 20, and of basitarsus IV 19 long. Cervix of spermatheca about 14 long.

Male: Dorsal shield 213 long, 127 wide. Spermatodactyl with foot about 10 long, shank about 14.

Holotype: Female, Ixtlan del Rio, Nayarit, March 24, 1957 (D. De Leon), from *Hyptis albida*. Paratypes: One male and 1 female, 6 mi. west of Tepec, Nay., March 25, 1957 from *Inga spuria* and 1 male, 3 females from *Lippia umbellata*. Other specimens were taken from *Orocopanax peltata* and *Persea hintoni* in the same area.

Phytoseius guianensis, n. sp. (Figure 11)

Female: Dorsal shield rugose, 289 long, 148 wide with setae arranged as shown in Figure 11. Lengths of setae as follows: L1 18, L2 17, L3 21, L4 19, L5 28, L6 32, L7 40; S1 25; D1

Explanations of Figures

Fig. 7. *Phytoseius paludis*, n. sp. Dorsal and ventrianal shields, part of leg IV, and cervix of spermatheca.

Fig. 8. *Phytoseius averrhoae*, n. sp. Dorsal and ventral shields, part of leg IV, cervix of spermatheca, and spermatodactyl.

Fig. 9. *Phytoseius mantecanus*, n. sp. Dorsal and ventrianal shields, part of leg IV, and cervix of spermatheca.

Fig. 10. *Phytoseius cismontanus*, n. sp. Dorsal shield, part of leg IV, cervix of spermatheca, and spermatodactyl.

Fig. 11. *Phytoseius guianensis*, n. sp. Dorsal and ventral shields, part of leg IV, cervix of spermatheca, and spermatodactyl.

Fig. 12. *Phytoseius mexicanus* De Leon. Dorsal shield, part of leg IV, cervix of spermatheca, and spermatodactyl.
Figs. 7-12.
19, D2 14, D3 15; M2 28. Leg I 293, II 243, III 229, IV 342 long; tarsus IV 126 long; macroseta of genu IV 11, of tibia IV 11, and of basitarsus IV 21 long. Cervix of spermatheca about 8 long.

**Male:** Dorsal shield 217 long, 152 wide. Spermatodactyl with shank about 20 long, foot not oriented for measuring.

**Holotype:** Female, Agricultural Exp. Sta., Mon Repos, British Guiana, November 5, 1963 (D. De Leon), from *Pueraria phaseoloides*. **Paratypes:** Two males, 4 females collected with holotype.

**Phytoseius mexicanus** De Leon, 1960 (Figure 12)

As no drawings accompanied the original description they are given here to aid comparison. The cervix of the spermatheca is about 21 long. The shank of the spermatodactyl is about 13 long, the foot about 8 long.

The types of the new species are in the author's collection.

**Acknowledgments**

I should like to thank Professor J. W. Purseglove, Head of the Department of Botany, University of the West Indies, St. Augustine, Trinidad, for making it possible to have the Trinidad plant specimens identified and to Mr. M. Bhorai for making the identifications; Dr. Fred D. Bennett, Entomologist-in-Charge, Commonwealth Institute of Biological Control, Curepe, Trinidad, for trips to several distant areas, and Dr. J. M. Cherrett, Bangor University Expedition to British Guiana, 1963, for the kind invitation to spend some time with the Expedition in British Guiana.

**Literature Cited**


Ronald W. Hodges

My preliminary work on the Nearctic Gelechiidae reveals that a series of Floridian moths, which I though was gelechiid, is oecophorid. The habitus is that of a gelechiid with the apex of the hindwing produced. However, closer examination shows that vein 1c is present near the forewing margin, an oecophorid character. The stalkings of veins 6, 7, and 8 in the forewing is unusual; but Anchonoma Meyrick, an Indian oecophorid, also has this character. The male genitalia are distinctly oecophorid (Clarke 1941, 1963; Pierce and Metcalf 1935); the female genitalia are not indicative of familial association.

YMELDIA, n. g. (Figs. 1–5)

Type-species: YMeldia janac, n. sp.

Head: smooth-scaled; tongue scaled basally; labial palpus slightly recurved, reaching vertex, smoothed-scaled, second segment slightly longer than third, apex acute; maxillary palpus folded over base of tongue; eye slightly emarginate below base of antenna; ocellus not visible on fully scaled head; antenna simple, two-thirds to three-fourths length of forewing, that of male thicker than that of female, pecten absent. Forewing: lanceolate; eleven veins present; 1b furcate basally; 1c weakly developed distally; 2 absent; 4 closer to 3 than to 5 basally;

6, 7, and 8 stalked, 6 to dorsum, 7 to costa. Hindwing: quadrate; apex produced; 8 veins present; 1b simple; a fold between 4 and 5. Male genitalia: tegumen narrow; saccus not developed; vinculum broad; uncus stout with blunt apex; gnathos a heavily sclerotized narrow band with short broad lobe from middle; tibia analis setate ventrally; valva broad, apex blunt; transtilla well developed; aedeagus with numerous scalariform cornuti. Female genitalia: signum a heavily sclerotized plate with filamentous projections extending from surface to wall of corpus bursae, a shallow transverse indentation at one-third length; ductus bursae and corpus bursae membranous; cestum sclerotized; ductus seminalis dorsal and anterior to cestum on ductus bursae; ostium bursae on 8th sternum; lamellae postvaginales developed; apophyses anteriores and posteriores short, apophyses anteriores furcate caudally.

_Ymeldia janae_, n. sp.

Head: labial palpus white, second segment with broad black band (scales white basally, black distally) on outer and ventral surface from one-fifth to one-half and a narrow preapical black band, third segment with a black band at one-fifth, three-fifths, and apex; maxillary palpus and base of tongue white; frons white with dark gray tipped scales from anterior margin of eye to base of tongue; vertex light salmon orange with gray brown tipped scales; antenna with scape off white and a few dark gray tipped scales on dorsal surface, shaft orange with black on basal half of many segments dorsally and three black bands of two segments each between two-thirds and apex, apex orange white. Thorax: salmon with brownish gray tipped scales; mesothoracic segment white posterolaterally, brownish gray apically. Forewing: white with scattered gray brown tipped scales, orange white apically, a black spot at three-fifths and apex of cell, a black streak between end of cell and apex of wing, a black spot on fold at one-half length of wing, scattered reddish orange streaks over dorsal surface, cilia pale brownish gray. Hindwing: grayish red. Abdomen: dark gray dorsally, white and pale yellowish white ventrally. Legs: white, metathoracic tibia
with an oblique black streak on outer surface at one-fifth, another streak on outer surface from one-half to near apex, 1st tarsal segment with a broad black band at middle, second and fourth with a basal black band, third segment black on dorsal and outer surfaces, fifth segment white. Male genitalia: as in Figs. 2 and 3 (RWH slide 1808), dorsal arm of transtilla with four stout setae, inner surface of valva with a slightly raised area beyond middle. Female genitalia: as in Fig. 5 (RWH slide 1809). Alar expanse: 6.5 mm.

Food plant: unknown.

Type: ♂, Lake Placid, FLORIDA, Archbold Biological Station, 3 April 1959, R. W. Hodges. U.S.N.M. Type No. 67451.

Paratypes: same locality as type, 12 ♂♂, 4 ♀♀, 27 March–4 April 1959 (RWH slides 1808, 1809, wing slide 48), USNM, CU, BM(NH).
Figs. 2-5. *Ymeldia janac*, n. sp.
2 and 3, male genitalia; 4, venation; 5, female genitalia.
The combination of characters of forewing with veins 6, 7, and 8 stalked and 1c present near the margin and hindwing with apex produced will separate *Ymeldia janae* from any known oecophorid.

Mr. Scott, Staff Photographer, Smithsonian Institution, made the photograph of the adult moth.

**References Cited**


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**Thrips Utilize Exudations of Lycaenidae**

**John C. Downey**

Mature larvae of the butterfly *Glaucopsyche lygdamus* Double-day were collected on flower stalks of *Lupinus argenteus* Pursh in the North Cave Hills, five miles west of Ludlow, Butte County, South Dakota. Three species of ants, *Formica oreas compotula* Wnlr., *Formica sp. ? rufa* group, and *Tapinoma sessile* (Say), were associated both with *lygdamus* and with larvae of *Plebejus (Icaricia) icarioides* Bdv., another lycaenid also feeding on the lupine. The ants were feeding on secretions obtained from a gland on the seventh abdominal segment of the butterfly larvae. The symbiotic relationship between ants and Lycaenidae has been discussed by several authors (see Hinton, 1951, Downey, 1962). Brower (1911) and Tilden (1947) noted the myrmecophily in *lygdamus* but did not identify the ant species.

Larvae were transported to Carbondale, Illinois, on the original flower stalks held in cotton-plugged vials. Associated ants
were removed and preserved on the day of collection. Seven days later the mature larvae, and a few individuals that had pupated, were examined with a binocular microscope, and larval thrips (Taeniothrips sp. ?) were observed to be imbibing the secretions of the exudate gland of several individuals.

It is presumed that the thrips were living on the flowers of the lupine, and as the foodplant dried out, the insects were attracted to the exudate gland of the butterfly larvae. Ordinarily the larvae will not emit droplets unless properly stimulated, usually by gentle touching and solicitations of ants in the region of the gland. For unknown reasons, perhaps the mere presence of the thrips in the region of the gland, the larvae voluntarily secreted the material which the thrips consumed.

Although the association noted above may be completely fortuitous, it should be noted that the thrips are extremely abundant on lupine flowers, and any butterfly larvae feeding on the flower stalks will no doubt be within the same micro-niche. The demonstrated ability of Taeniothrips larvae to respond to the secretions of the lycaenid in captivity indicates this relationship is possible in nature and closer ecological affinities between the two insect groups may be involved. Thrips species of the following genera have also been collected from lupine flowers in various western states: Aeolothrips, Frankliniella, Hercothrips, Limnothrips, Odontothrips, and Terebrantia.

Thrips were also noted on the seventh abdominal segment of one pupa, which was seen to ooze small quantities of liquid from the region of the gland. I had heretofore supposed the pupal gland to be non-functional in all Nearctic Lycaenidae; it is present only as a scar in the pupae of some species (P. icarioides) while individuals of other species (Everes comyntas Godt.) may or may not retain a pupal scar of the gland. The lygdamus pupa noted above, had transformed from the larval state two days prior to the observation and it succumbed before the adult emerged. Cause of death appeared to be a mold which grew first in and around the gland area, before eventually dis-coloring the entire abdomen. Of some pertinence is the fact that the only North American lycaenid whose pupal stage has
been reported in an ant nest is *G. lygdamus*. A functional pupal exudate gland as herein noted helps explain this situation. I have reared the species in Utah without ants, so the relationship with ants is not obligate. Three other *lygdamus* pupae from South Dakota could not be made to exude material from the gland, although the latter may still have been functional under normal conditions.

**Acknowledgments**

Grateful acknowledgment is hereby made to the National Science Foundation (Grant No. G23560) which is supporting a major project of which this is a part. My thanks also to Dr. Marion R. Smith for identification of the ants and Dr. Lewis J. Stannard for identification of the thrips herein reported.

**Literature Cited**


**Nomenclature Notice**

Full details on the following cases before the Commission will be found in the Bull. of Zool. Nomencl., Vol. 21, Part. 4.

Emendation to *Astraeus* of the generic name *Asthraeus* Laporte & Gory, 1837 (Insecta, Coleoptera). Z. N. (S.) 1628.

Validation of *Rhyncogonus* Sharp. 1885 (Insecta, Coleoptera). Z. N. (S.) 1629.

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New Species and Records of Coelotanypus from Mexico and Central America with a Key to the New World Species South of the United States (Diptera: Tendipedidae) *

Selwyn S. Roback, Curator, Department of Limnology, Academy of Natural Sciences of Philadelphia

The two new species herein described were found in a light trap collection made at Lake Catemaco, Veracruz, Mexico, by Dr. Paul Spangler of the Smithsonian Institution. The other specimens were, in most cases, in collections examined in the course of a study of the Pelopiinae of America North of Mexico.

I am indebted to the following individuals and institutions for the loan of specimens: Dr. Paul Spangler and Dr. Willis W. Wirth, Smithsonian Institution and U. S. Dept. Agriculture [USNM]: Dr. V. Pechuman, Cornell University [CU]: Dr. H. E. Evans, Museum of Comparative Zoology [MCZ]: Miss Martha L. Noller, University of Arizona [ARIZ]: Dr. P. Wygodzinsky, American Museum of Natural History [AMNH]. Material labelled [ANSP] is in the collection of the Academy of Natural Sciences of Philadelphia. The figures in the plates are by Mrs. Rita A. Nickle.

Since a great many species of Coelotanypus have been described by Edwards (1931, 1939), by me (1963–64), and by others, I felt it would be desirable, at this point, to pull these scattered descriptions together in a key as an aid to future work-

* The support of the National Science Foundation (Grant GB2719) is gratefully acknowledged.
ers in this genus. If the number of new species which have turned up in the collections I have examined to date is at all indicative, there are undoubtedly many more new forms to be discovered and described from South and Central America. In all, there are 16 species keyed out. Unfortunately not all are known from both sexes. This number of species is greater by far than has been recorded from any other region of the world and would seem to indicate that the Neotropical Region was the center of evolution and distribution of *Coclotanypus*.

In the keys and descriptions, Roman numerals (I, II, III) are used to designate the prothoracic-metathoracic legs and T₁–₅ to designate the tarsal segments.

**Key to Species**

1. **Male**. ................................................................. 2
   **Female**. ................................................................. 12
2. Wing with two bands (Argentina) .... C. delpontei Edw.
   Wing with only crossvein darkened or generally infuscated; never with two distinct bands. .... 3
3. Tibia II thick and flattened (Brazil) .... C. tibialis Edw.
   Tibia II normally slender. ............................................ 4
4. Abdomen with tergites 3–6 with alternating triangular brown marks and narrow basal bands, fig. 4 (Mexico) ......................... C. olmeclus n. sp.
   Abdomen with only narrow bands or with one-third to all of tergites 3–8 brown. ............... 5
5. Abdomen with only light transverse bands on tergites 3–6 or 3–8, figs. 5, 6. ..................... 6
   Abdomen with one-third to all of tergites 3–8 dark. ....... 8
   Yellow species; bands on tergites 3–6 or 3–8. .......... 7
7. Bands on abdominal tergites 3–6; tergites 7, 8 almost entirely brown, fig. 5 (Mexico) .... C. concinnus (Coq.)
   Bands on abdominal tergites, 3–8, fig. 6 (Brazil) .... C. dimorphus Rempel
8. T₅ of legs II, III entirely dark. .......... 10
   T₅ of legs II, III only apically dark. .......... 9
9. T₁ and T₂ of leg I with preapical spurs; tergite 3 with basal half dark; tergite 6 mostly dark (Jamaica, Cuba) ......................... C. cletis Roback
T₁ and T₂ of leg I without preapical spurs; tergite 3 mostly dark; tergite 6 with basal half dark (Panama, Canal Zone) .................. C. scapularis (Loew)

10. Vittae dull red; femora II, III mostly yellow; tibiae only darkened at apex (Argentina) .... C. ruficollis Edw.
Vittae orange-brown or bright orange-brown to rust-brown; femora II, III mostly dark; tibiae darkened at base and apex .................. 11

11. Vittae bright orange-brown to rust-brown; prescutellar area dark; genitalia light; cubital fork petiolate (Cuba, Panama, Canal Zone) .... C. humeralis (Loew)
Vittae orange-brown; prescutellar area light; genitalia dark; cubital fork sessile (Mexico) .......................... C. tricolor (Loew)

12. Tibia II thickened and flattened, fig. 27 .......................... 13
Tibia II normally slender, fig. 18 .......................... 14

13. Abdominal tergites 4–6 with indefinite dark bands, 8 all yellow; thorax red above (Brazil) .... C. tibialis Edw.
Abdomen entirely dark; thorax orange-brown above (Mexico) .......................... C. toltecus n. sp.

14. Wings with bands or generally cloudy areas .......................... 15
Wings with only r-m crossvein darkened .......................... 19

15. Wings with two distinct bands, fig. 29 (Colombia) ......... C. poss. delpontei Edw.
Wings generally infuscated or otherwise darkened .......................... 16

16. Wings with faint general light-brown infuscation; part of humeri distinctly white; head whitish (Cuba, Panama, Canal Zone) .... C. humeralis (Loew)
Wings with distinct brown infuscation; tip light; humeri sometimes lighter but not white; head with brown infuscation .......................... 17

17. Thorax orange; apex of radial sector and area below Cu darker, frons smooth; eye ratio 20 (Brazil) ..........................
C. amoenis Roback
Thorax red to dark red-brown; wing mostly infuscated; frons with tubercle or suggestion of one; eye ratio about 6.5 .......................... 18

18. All tibiae brown; T₁ of leg I brown; frons tuberculate (Surinam, British Guiana) ......... C. feris Roback
Tibiae II, III banded; T₁ of 1 with only apex brown; frons with only a suggestion of a tubercle (Surinam, Canal Zone, Mexico) ......... C. naelis Roback

19. Thoracic notum yellow to orange-brown; humeri broadly light; prescutellar area light .......................... 22
Thoracic notum mostly dark red-brown to black; humeri variable; prescutellar area dark. 20

20. T$_1$ and T$_2$ of leg I with preapical spurs, thorax black (Jamaica, Cuba). \textit{C. cletis} Roback
T$_1$ and T$_2$ of leg I without spurs. 21

21. Thorax dark red-brown; scutellum and leg markings orange-brown; pronotum mostly light (Cuba, Panama, Canal Zone). \textit{C. humeralis} (Loew)
Thorax black or brown-black; scutellum and leg markings black or brown-black, pronotum mostly dark (Panama, Canal Zone). \textit{C. scapularis} (Loew)

Abdomen yellow to yellow-brown bicolored. 23

23. Tibiae mostly yellow; abdomen, figs. 1–3, distinctly bicolored with extensive yellow areas; scutellum largely yellow mesally. 24

24. Tibiae largely brown; abdominal tergites 3–8 mostly brown, only apices light; scutellum mostly brown. 26

25. Abdomen as in figure 1 (Mexico). \textit{C. olmecus} n. sp.
Abdomen with T-shaped or subtriangular spots on 3–7, figs. 2, 3. 25

26. Abdominal tergites 3–7 with spots T-shaped, extending mesally to apex of tergite on 5–7, fig. 3; no later spots on 2–3 (Brazil). \textit{C. dimorphus} Rempel
Abdominal tergites with triangular spots, never extending to apex of tergite; lateral spots on 2–3, fig. 2 (Mexico). \textit{C. concinnus} (Coq.)

27. Fork of \textit{Cu} sessile; robust species 2.4–3.6 mm (Mexico). \textit{C. tricolor} (Loew)
Fork of \textit{Cu} petiolate; 1.9 mm long (Puerto Rico). \textit{C. insulans} (Joh.)

\textbf{Coelotanypus toltecus} n. sp.

The dark abdomen and the orange thorax will separate this species from its nearest relative \textit{C. tibialis} Edwards. Both have laterally compressed mesotibiae (Fig. 27).

Female 4.2–4.8 mm; head brownish; antennal flagellum 13 segmented, brown; last four segments in ratio 30–30–32–62; pedicel with 3 hairs; frons orange brown, vertex darker orange-brown; eye ratio 10±; postoculars multiseriate; palpi brown; segments in ratio 45–95–140–215.

Pronotum medium brown; with 12 latero-ventral hairs; meso-
notum orange; vittae not separated; humeri and supra-alar areas light; prescutellar area light orange; supra-alar 23 light + 9 dark; humerals 18 ±; dorsocentrals biserial between vittae; scutellum orange; postnotum dark red-brown; pleura and sternum dark red-brown; tubercle relatively large.

Femur I light basally, darker toward apex; femora II, III dark, lighter at apex; T₁ I apex dark brown; T₁ II, III all light; T₂ II, III with apex dark brown T₂₃ I all dark brown; T₂₃ II all dark brown; T₃ III apical half dark brown, T₁₃ III all dark; leg ratio 1.68; II .49; III .65; spur tibia I (Fig. 23) .120 mm with 4–5 lateral teeth; no light comb; spurs tibia II (Fig. 24) .120, .098 mm with 15, 14 lateral teeth respectively; spurs tibia III .132, .106 mm with 14 lateral teeth each; double preapical comb tibia III with 18 + 17 filaments; preapical spurs on T₁₃ of II, III; none on T₁₃ I; claw (Fig. 25); legs (Figs. 26–28).

Wing 3.9–4.2 mm, wholly infuscated; darker around r-m; m-cu sessile on jCu; haltares dark.

Abdomen wholly shining dark red-brown; spermathecae (3) ovoid with basal quarter dark; apex to duct clear; ducts relatively short; subgenital plate (Fig. 13).

Holotype.—Female, Lake Catemaco, Ver. VIII–9–6+ at light (Paul Spangler) [USNM] 67733. Paratype.—♀♀, same data [ANSP]; 17 ♀♀, same data [USNM].

Coelotanypus olmecus n. sp.

The abdominal maculation (Figs. 1, 4) will separate both sexes of this species from its nearest relatives C. concinnus (Coq.) and C. dimorphus Rempel.

Male, 3.8–4.2 mm; head (Fig. 12) light; antennal ratio 2.7; eye ratio 1.4; antennal pedicel brown with 5 hairs; palpus light, segments in ratio 35–70–85–120; postoculars multiseriate.

Pronotum white, lobes joined above; 8–10 hairs on lateroventral lobes; vittae orange brown continuous (Fig. 9), inner corners of humeri and area above supra-alar darker; humeri and supra-alar area light; 8 + humeral bristles; supra-alar...
10 + fine hairs and 9 darker larger bristles; dorsocentra irregularly uniserial to scutellum; mesonotal spur small, orange; pleura light with some brown; sternum orange-brown, darker laterally; scutellum light, darker around edges, disc light; postnotum brown.

Femora yellow with apex dark; tibiae I and III yellow with only apex dark; tibia II with base and apex narrowly dark; T\textsubscript{1-2} all legs with only apex dark; T\textsubscript{2-5} all legs, wholly dark; leg ratio I .78; II .68; III .71, apex of tibia I with spur .083 mm long and comb of 25 + clear filaments; tibia spurs II .076, .062 mm with 7 lateral teeth on each; spurs of tibia III .079, .055 mm with 7 lateral teeth each; preapical double comb of 15 + 16 filaments; T\textsubscript{1-3} II, III with preapical spurs; T\textsubscript{1-3} I without spurs; claw leg II (Fig. 22); legs (Figs. 14–16).

Wing 2.5–2.8 mm; clear except for cloud over r-m (Fig. 7); m-cu sessile on fCu; halteres light, globe whitish.

Abdomen marked as in Fig. 4; basistyle .260 mm; dististyle (Fig. 11) .132 mm; both lightly infuscated.

Female, 3.0–3.5 mm; antennal flagellum 13 segmented; last four segments in ratio 19–20–21–50; pedicel with 2–3 hairs; palpus four-segmented; segments in ratio 36–65–82–150; eye ratio 10.6; frons light; postoculars multiseriate.

Pronotum light with dorsal brown stripe on each lobe in line with mesonotal stripe; mesonotum with vittae as in male; dark areas on vittae differ from male (Fig. 10); supra-alars 16 fine + 8–9 dark; humerals 18; postalars 1; dorsocentra irregular; almost biserial; pleura and sternum orange.

Femora light, apices darker; femur II with some basal darkening; tibiae I, II with sub-basal apical dark bands; tibia III with only apex darker, T\textsubscript{1} I apex dark; T\textsubscript{2-5} I all dark; T\textsubscript{1-2} II, III with apices dark; T\textsubscript{3-5} II, III all dark; leg ratio I .64; II .54; III .67; tibia I with spur .076 mm long; no apical light comb; spurs of tibia II (Fig. 21) .083, .065 mm with 9 and 7 lateral teeth respectively; spurs of tibia III .089, .072 mm with 9 lateral teeth each; preapical double comb of 12 + 17 filaments; tarsal spurs as in male; claw leg II (Fig. 20); legs (Figs. 17–19).
Figs. 1-6. Abdominal Color Patterns

Wing 2.4-2.7 mm, as in male.
Abdomen marked as in Fig. 1; spermathecae (3) with apical third brown; remainder to duct clear; subgenital plate (Fig. 8) brown, apical half lighter.

_Holotype._—Male, Lake Catemaco, Ver. VIII-9-64 at light (Paul Spangler) [USNM] 67732. _Allotype._—Female, same data. _Paratypes._—3 ♂♂, 3 ♀♀, same data [ANSP]. 19 ♂♂, 40 ♀♀, same data [USNM].

_Coelotanypus_ poss. _delpontei_ Edw.
_Coelotanypus delpontei_ Edwards 1931 Dipt Pat & S. Chile II (5) : 318.

This single female except for the two wings bands (Fig. 29) is very close to _C. feris_ Roback in its coloration and frontal tubercle. The only known _Coelotanypus_ species with two wing bands is _C. delpontei_ Edw. from Argentina. In light of the usual sexual color dimorphism in _Coelotanypus_ this may be the female of _C. delpontei_ and pending the location of more material, I am tentatively assigning it to that species.

Female head red-brown; distinct tubercle between antennal pedicels; palpi and antennae red-brown; eye ratio 7.5.

Pronotum light red-brown with 13 + latero-ventral hairs; mesonotum including humeri, dark red-brown; 12 light and 10-12 dark supra-alaris; mesonotal tubercle small, orange-brown; pleura and sternum red-brown; scutellum and postnotum almost black-brown.

Leg I all dark, leg ratio .56; leg II all dark except for basal half of T₁; LR .50; leg III colored as II; LR .58.

Wing 2.7 mm; banded as in Fig. 29; halteres red-brown with only apex of globe light.

_Material examined._—Colombia: Bogota, ♀, October 28, 1935, Lower Caqueta Letter (Amo[ ]tegui) [USNM].

_Coelotanypus tricolor_ (Loew)
_Tanypus tricolor_ Loew, 1861, Berlin Ent. Zeitschr. 5 : 309.
_Material examined._—Mexico: B.P.Q., 2 ♀♀. 8-28-34
Fig. 7-12. *C. olmeccus* n. sp.

7. Detail of *m-cu* crossvein; 8. ♀, subgenital plate; 9. ♂, thoracic color pattern; 10. ♀, thoracic color pattern; 11. ♂, genitalia; 12. ♂, head.

Fig. 13. *C. tolteccus* n. sp.; ♀, apex of abdomen, lateral.
Coelotanypus concinnus (Coqillet)


Material Examined.—Mexico: Naxoaja, Sonora, 2 ♀♀, Aug. 13, 1959 (Nutting, Werner) [Ariz.].

Coelotanypus naelis Roback


This species was described from a single female from Surinam. Since its description more specimens have been found from Panama and one from Texas. I should like to offer some additional characters and variation in the species. Unfortunately all the additional specimens were females.

Female 2.4–2.9 mm; antennal flagellum 12 segmented; last four segments in ratio 17–17–19–45; palpus four segmented, segments in ratio 22–65–75–137; postocular bristles biserial to triserial behind eyes; eye ratio 6.0.

Mesonotum with 20 + humerals; supra-alars 7 large brown preceded by 9 small fine bristles; dorsocentrals biserial between vittae, uniserial to scutellum; scutellum with 8 long apical bristles and about 9 on disc.

Tibiae II, III with faint light band two-thirds from base; spur of tibia I .062 mm, some fine spines at base; spurs of tibia II .070, .053 mm; 9 lateral teeth on larger and 8 on smaller; spurs of tibia III .073, .045 mm; lateral teeth as in leg II; double comb of 14 + 13 bristles present; T₁ and T₃ of II, III with apices dark; T₃ of all legs dark; leg ratio I .61–.66, II .54–.59, III .62–.66.

Figs. 14–22. *C. olmeccus* n. sp.


Figs. 23–28. *C. tolteccus* n. sp.


Fig. 29. *C. pos. delpontei* Edw. Wing (imperfect).
Abdominal tergites and sternites shining brown; spermathecae with basal three quarters dark (.060 x .073 mm).

Material Examined.—Canal Zone: Barro Colorado Isl., 6 ♀♀. VII–41 (Zetek 4852) [USNM]; Mexico: Lake Catemaco, Veracruz, ♂, VIII–9–41 (Spangler) [USNM].

Coelotanypus scapularis (Loew)


I have been able to find no significant differences between specimens from the Canal Zone and Barro Colorado Island, and those taken in the United States and Canada. Though it fits Edwards (1931) description of the supposed male of _C. neotropicus_ Kieffer I am tentatively placing the specimen which I had previously assigned to that species, into synonymy here.

Material Examined.—Canal Zone: Barro Colorado, ♂, Dec. (Bates) [MCZ]; ♀, 16–I–35 (Bates) [MCZ]; ♀, 3–VIII (Scrimshaw) [MCZ]; ♂, March 1924 [CU]; Curundu, ♂, 28–XII–57 (C. E. Smith) [ANSP]; Panama, 3 ♀♂, VI–24 [CU].

Addendum

After this manuscript had been completed I received, through the courtesy of Mr. Saul Frommer, Department of Entomology, University of California, Riverside, California, some specimens collected by Dr. E. C. Bay, which proved to belong to my new species _C. olmecus_. They differed from the type series in that they were generally darker in color.

The male vittae ranged from brown to dark brown with the markings almost black. The pleura and sternum were brown and the postnotum black-brown. The abdominal maculation was as in Fig. 4.

The female vittae were also darker, especially the laterals which are almost black-brown in some specimens. The stripe is black-brown. The scutellum is almost completely brown infuscated with only the apex of the disc lighter. The abdomen ranged from Fig. 1 to almost completely brown with the light areas only faintly indicated.
Material Examined.—Nicaragua: Volcano Conception, Mugogalpa, 1 ♂ 1 ♀, 29 April 1964 (E. C. Bay) [University of California]: 4 ♂♂, 4 ♀♀ same data [ANSP].

Literature


New Exotic Crane-Flies (Tipulidae: Diptera).
Part X

CHARLES P. ALEXANDER, Amherst, Massachusetts

The preceding part under this general title was published in Entomological News, Vol. 75 (3): 57-65. The present paper includes descriptions of various species of the Hexatomine genus Paradelphomyia Alexander from Pakistan and India, all taken by Dr. Fernand Schmid. The types are preserved in my personal collection.

Paradelphomyia (Oxyrhiza) dichromata, new species

Thorax uniformly polished black, abdomen abruptly yellow, the outer segments weakly infuscated; halteres yellow; legs yellow, the tips of the femora narrowly blackened; wings of male widened opposite termination of vein 2nd A, yellow, re-

1 Contribution from the Entomological Laboratory, University of Massachusetts.
strictedly patterned with brown, cells basad of cord without markings; macrotrichia of stigma and outer radial cells virtually lacking; male hypopygium with posterior border of tergite produced into an oval setuliferous lobe; apical blade of bastyyle slender, glabrous, tip obtuse; spines of ventral fork very long and slender, almost setoid.

♂. Length about 6-6.5 mm.; wing 6-6.8 mm.

Rostrum and palpì black. Antennae with scape black, pedicel and flagellum dark brown. Head dark gray.

Thorax polished black throughout; scutum and posterior part of praescutum with sparse long black setae, those of scutellum smaller. Halteres pale yellow, especially the enlarged club. Legs with fore coxae uniformly polished black, midcoxae yellow, the basal half dark brown, posterior coxae uniformly yellow; trochanters yellow; femora light yellow, tips narrowly but conspicuously brownish black; tibiae and tarsi yellow, the extreme tips very narrowly and vaguely infuscated. Wings yellow, the prearcular and costal fields more saturated; a restricted brown pattern, including narrow seams at origin of Rs, cord, R₂ and fork of R₂+R₃+R₄, fork of M₁+M₂ and outer end of cell Ist M₂; no darkenings basad of origin of Rs or behind vein Cu; veins light yellow, brown in the patterned areas. Wing of male widened opposite termination of vein 2nd A. Macrotrichia of cells sparse, including only two or three in stigmal area and few in outer ends of cells R₃, R₅ and M₁. Venation: Sc₁ ending opposite fork of Rs, the latter angulated at origin; R₂+R₃+R₄ about twice the basal section of R₅; cell M₁ subequal to its petiole; m-cu beyond midlength of M₃+M₄.

Abdomen yellow, contrasting abruptly with the darkened thorax, outer three segments weakly infuscated; in the paratype the proximal segments are somewhat more infuscated. Male hypopygium with the posterior border of tergite produced into an oval lobe that is provided with abundant delicate setae. Basistyle with apical blade slender, glabrous, apex obtuse. Outer dististyle blackened, slender, gently dilated outwardly, with two unequal terminal spines, with an additional acute spine on lower margin at near three-fourths the length. Spines of
ventral fork very long and slender, almost setoid, exceeding the aedeagus. Gonapophysis broadly dilated, the outer contour more thickened.


The most similar species is the Burmese _Paradelphomyia (Oxyrhiza) amabilis_ Alexander, which has the abdomen dark brown, concolorous with the thorax, differing further in the coloration of the halteres and legs and in the venation and trichiation of the wings, as the long vein _Sc_l.

**Paradelphomyia (Oxyrhiza) hKayamensis**, new species

Size medium (wing 6 mm); mesonotal praescutum brownish yellow, with a central dark brown stripe, pleura chiefly dark brown; antennae 16-segmented, flagellum black; halteres and legs yellow; wings subhyaline, unpatterned, with macrotrichia in cells _R_2 to _1st_ , inclusive; _Sc_1 long, subequal to _R_2+3+4; male hypopygium with apical point of basistyle very slender, setiferous; outer dististyle with four unequal spines, inner style with a basal lobe on outer margin; spines of ventral fork unusually long and slender.

♂. Length about 5.5 mm; wing 6 mm; antenna about 1 mm.

♀. Length about 6 mm; wing 6 mm.

Rostrum brown; palpi black. Antennae 16-segmented; scape light brown, the remainder black; all flagellar segments distinct, the more proximal ones short, outer segments elongate, nearly equal to their verticils. Head gray; anterior vertex broad, about four times the diameter of the scape.

Pronotum dark brown. Mesonotal praescutum brownish yellow, clearer laterally, with a single dark brown central stripe; scutal lobes dark brown, central area and posterior callosities testaceous yellow; scutellum brownish black, parascutella yellow; mediotergite brown, yellowed laterally, pleurotergite chiefly yellow, weakly darkened beneath. Pleura chiefly brown to dark brown, including the dorsopleural membrane. Halteres
yellow. Legs with fore coxae brown, remaining coxae and all trochanters yellow; remainder of legs yellow, outer tarsal segments weakly darkened. Wings subhyaline, prearcular and costal fields slightly more yellowed, no stigmal darkening; veins pale brown. Macrotrichia on longitudinal veins of about the outer two-thirds of wing; in cells sparse but well-distributed from $R_2$ to $1st A$, inclusive. Venation: $Sc_1$ ending immediately beyond fork of $Rs$, $Sc_2$ removed, $Sc_1$ alone subequal to $R_{2+3+4}$; $R_{2+3}$ and $R_2$ subequal; cell $M_1$ less than twice its petiole; $m-cu$ at near midlength of $M_{3+4}$.

Abdomen dark brown, subterminal segments in male slightly darker, hypopygium brownish yellow. Male hypopygium with apical point of basistyle very slender, with weak setae. Outer dististyle relatively slender, with four spines, two being large, the others very small; inner style triangularly dilated, with a relatively small basal lobe on outer margin. Spines of ventral fork unusually long and slender.


In comparison with other regional members of the genus with unpatterned wings, including *Paradelphomyia (Oxyrhiza) dissita* Alexander, *P. (O.) distivena* Alexander, *P. (O.) flavescens* (Brunetti) and *P. (O.) newar* Alexander, the present fly is most readily told by the hypopygial structure, especially the outer dististyle and the ventral fork. *P. (O.) flavescens* is the most isolated, each half of the ventral fork including numerous strong spines from a stout reticulated base; *P. (O.) distivena* has three outer spines on the outer dististyle, *P. (O.) newar* only two.

*Paradelphomyia (Oxyrhiza) myriacantha*, new species

Size relatively large (wing of male 6.5 mm); general coloration of thorax fulvous, praescutum and scutal lobes with vaguely differentiated more shiny areas; legs yellow, all tibiae with long hairy spines; wings brownish yellow, stigma and a vague seam over $r-m$ slightly darkened; $R_{2+3+4}$ long, nearly three times $R_2$;
male hypopygium with outer dististyyle blackened, trispinous, inner style dusky, with a low lobe on basal half; gonapophyses slender; ventral fork consisting of two groups of long reddish spines, the outermost long and needlelike.

♂. Length about 5.5 mm; wing 6.5 mm.
Rostrum dark brown; palpi black. Antennae brownish black. Head dark brown.

Thoracic dorsum almost uniformly fulvous, the praescutum with three scarcely differentiated more shiny stripes, scutal lobes similarly colored. Pleura more yellowed, dorsal sclerites slightly infuscated. Halteres pale yellow. Legs with coxae and trochanters yellow; remainder of legs yellow, the outer tarsal segments dark brown; all tibiae with long conspicuous hairy spines. Wings tinged with brownish yellow, stigma and a small cloud at r-m slightly darker brown; veins yellow. No macrotrichia in wing cells with the exception of two or three in outer end of R₄. Venation: R₂₊₃₊₄ long, nearly three times R₂; m-cu beyond midlength of M₃₊₄.

Abdominal tergites dark brown, sternites obscure yellow; hypopygium yellow. Male hypopygium with dististyles terminal, outer style black, widened outwardly, trispinous, there being a strong point on lower margin; inner style dusky, with a low lobe on basal half. Gonapophyses unusually slender. Ventral fork generally as in flavescens, consisting of two elongate groups of many reddish spines, the more basal ones shorter, the outermost long and slender, needlelike.

Habitat. India (Sikkim). Holotype: ♀, Chumzomoi Choka, in Rhododendron association, 11,800 feet, July 8, 1959 (Fernand Schmid).

The only other regional species with the ventral fork of the male hypopygium comprised of densely clustered reddish spines is Paradelphomyia (Oxyrhiza) flavescens (Brunetti), a smaller fly with slightly different hypopygial structure, including the bispinous outer dististyyle and broad pale inner style. The valid name of this latter species is flavescens (described as a Cladura, 1911), with jurcata (Brunetti) as a synonym (described as a Gnophomyia, 1912). The types of both of these supposed spe-
cies were taken at Darjiling, eastern Himalayas, in August 1909 by Paiva, a paratype of furcata being preserved in my collection. It may be noted that there is a later furcata (Kuntze), described from Denmark as the type of a supposedly new genus, Gonomyiella Kuntze, 1919, now known to be a synonym of fuscula (Loew), described as a Cladura in 1873. The generic name Gonomyiella Kuntze is preoccupied by the earlier Gonomyiella Meunier, 1899.

**Paradelphomyia (Oxyrhiza) ruficolor**, new species

Size large (wing of male to 7.5 mm); mesothorax shiny rufous; antennae 16-segmented, flagellar segments elongate, with very long verticils; femora yellow, tips narrowly brown; wings weakly suffused with brownish yellow, proximal third clearer yellow, including the veins; cell M₁ present; male hypopygium with dististyles terminal, inner style with a small basal axillary lobule; gonapophyses very broad; spines of ventral fork short and stout, at tips narrowed into hairlike points.

♂. Length about 6–6.5 mm; wing 6.8–7.5 mm; antenna about 1.5 mm.

Rostrum brownish yellow; palpi black. Antennae 16-segmented, dark brown; flagellar segments elongate, verticils very long and conspicuous, fully one-half longer than the segments. Head dark brownish gray; anterior vertex very broad.

Pronotum dark brown, paler laterally. Mesonotum almost uniform shiny rufous or fulvous, anterior half of praescutum darker medially; setae of praescutal interspaces and scutal lobes long and conspicuous, of scutellum shorter and paler. Pleura fulvous yellow. Halteres with stem yellowed, especially at base, knobs weakly darkened. Legs with coxae and trochanters light fulvous; femora yellow, clearer basally, tips narrowly brown; tibiae yellow, tips more narrowly darkened; tarsi brown. Wings weakly suffused with brownish yellow, prearcular field, costal area and vein Cu₂ clear yellow; veins light brown, light yellow in the basal third of wing. Abundant macrotrichia in cells R₂ to Cu, including about the outer half of cells R₁ and R₃. Venation: Vein R₁ arcuated before R₂, the lat-
ter very faint to nearly obsolete; cell $M_1$ variable in length, in the type subequal to its petiole, in the paratype only about one-third to one-fourth this length; $m-cu$ far distad, at near three-fifths to two-thirds $M_{3+4}$; vein 2nd $A$ long.

Abdomen brown, hypopygium yellowed. Male hypopygium with the dististyles terminal, the outer style slender, black, with two outer spines, the apical one smaller, with an additional stout arm along the inner margin; inner style large, triangular, pale, with a small axillary lobule. Gonapophyses very broad, pale. Spines of ventral fork relatively short and stout, the tips suddenly narrowed into hairlike points.

_Habitat._ **Pakistan.** _Holotype:_ ♂, Bourzil R. H., Northwest Frontier Province, 11,150 feet, September 10, 1953 (Fernand Schmid). _Paratype:_ ♂, Salf-ul-Maluk Sar, 11,000 feet, July 2, 1963 (Fernand Schmid).

*Paradelphomyia (Oxyrhiza) ruficolor* is quite distinct from other large-sized regional species, including especially _P. (O.) distivena_ Alexander and _P. (O.) newar_ Alexander. The venation and male hypopygium are distinct in all three species, including in the latter the basistyle, dististyles and ventral fork.

**Paradelphomyia (Oxyrhiza) tritumula,** new species

General coloration of mesonotal praescutum brownish fulvous, posterior sclerites and pleura yellow; head gray; antennae black; femora yellow, tips narrowly brownish black; wings brownish yellow, the base and costal border clearer yellow, stigma very pale brown; male hypopygium with the inner dististyyle very large, trilobed; ventral fork with each arm appearing as a slender black rod, at tip narrowed into an acute spine.

♂. Length about 5.5 mm; wing 6.3 mm; antenna about 1.2 mm.

Rostrum light brown; palpi brownish black. Antennae 16-segmented, black, scape more pruinose; basal flagellar segments enlarged, the succeeding ones more elongate, all segments with very low verticils. Head dark gray.

Pronotum brown, the scutellum more yellowed. Mesonotal praescutum brownish fulvous, subnitidous, posterior sclerites
more yellowed. Pleura clear yellow. Halteres with stem yellow, knob infuscated. Legs with coxae and trochanters yellow; femora yellow, tips narrowly brownish black; remainder of legs brownish yellow, the tips of the segments narrowly darkened, ends of the tarsi black; setae of legs relatively long and conspicuous. Wings relatively narrow, brownish yellow, base and costal region clearer yellow; stigma very pale brown; veins brown, those in the brightened basal fields yellow. Macrotrichia of cells long and conspicuous, in outer ends of cells $R_2$ through $M_5$. Venation: $Sc_1$ ending nearly opposite fork of $Rs$, $Sc_1$ alone more than three times $Sc_2$; vein $R_2$ faint, shortly beyond the fork; $R_{2+3+4}$ and $R_3$ in direct longitudinal alignment; cell $M_1$, about one-half its petiole; $mcu$ at near midlength of $M_{3+4}$; cell 2nd $A$ narrow.

Abdominal tergites dark brown, basal sternites more reddened; hypopygium slightly paler brown. Male hypopygium with basistyle stout, the outer setae very long, yellow, the longest about equal to the dististyle; dististyles terminal, broadly fused basally. Outer dististyle black, with three outer points, the intermediate one longer and slightly curved; inner style unusually large, trilobed, the more cephalic lobe slender, apex obtusely rounded, provided with sparse setae, the outer two lobes with abundant setulae and fewer scattered setae. Gonapophyses very large, yellow, outwardly divided into an inner or mesal beak, its apex obtuse, outer blade recurved. Spines of ventral fork appearing as slender black rods, their tips narrowed into an acute point.


Paradelphomyia (Oxyrhiza) triturula is most similar to species such as the larger $P$. (O.) ruficolor, new species, differing evidently in the details of structure of the male hypopygium, particularly the dististyles and gonapophyses.
The Collembola of New Mexico. XIV. Sminthurinae: Bourletiellini

Harold George Scott

None of the 10 species reported herein have been recorded previously from New Mexico. Specimens will be deposited with the Academy of Natural Sciences, Philadelphia, Pennsylvania.

(Tribe Bourletiellini Borner, 1913

(Genus BOURLETIELLA Banks, 1899 (sensu latu)

Key to Species of Nearctic Bourletiella

1. Dens with about 20 long setae on each edge

spinata (MacGillivray, 1893)

Dens with about 6–10 long setae on each edge ....... 2

2. Tenent hairs 2–3

Tenent hairs 6–7

3. Unguiculus present

4. Unguiculus absent

5. Unguiculi similar

6. Subanal appendage plate-like

7. Subanal appendage lamellate

agreni Stach, 1956

Subanal appendage bristle-like, J-shaped, or clubbed

7. Subanal appendage 2.5 × long as wide

subanal appendage length subequal to width

8. Body pale yellow, often with dark markings

9. Body maroon

caeruleacauda sp. nov.

undulata (Hammer, 1953)

10. Great abdomen depressed dorsally

great abdomen not depressed dorsally

14. subanal appendage length subequal to width

hortensis (Fitch, 1863)

15. subanal appendage length subequal to width

juniatae Maynard, 1951

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1 A portion of a dissertation submitted to the Graduate Faculty of the University of New Mexico in partial fulfillment of the requirements for the Degree of Doctor of Philosophy.


9. With irregular brown lateral stripes. \textit{rustica} Maynard, 1951
   Without lateral stripes. \textit{savona} Maynard, 1951
10. Unguiculus with apical needle. \textit{fallonae} Maynard, 1951
   Unguiculus without apical needle. \textit{russata} Maynard, 1951
11. Body all yellow. \textit{repanda} (Agren, 1903)
   Body with dark pigment. \textit{fallonae} Maynard, 1951
12. Unguiculus three-fourths length of unguis. \textit{repanda} (Agren, 1903)
   Unguiculus one-half length of unguis. \textit{repanda} (Agren, 1903)
13. Abdomen speckled. \textit{multimaculata} sp. nov.
   Abdomen not speckled. \textit{neopandus} (Wray, 1950)
14. Ant IV with 4–7 subsegments. \textit{arvalis} (Fitch, 1863)
   Ant IV with 15–16 subsegments. \textit{B. hoffi} sp. nov.

\textbf{Bourletiella aquatica} Maynard, 1951

\textit{NEW MEXICO RECORDS.} Twenty-two sweeping collections (grass and/or herbs, 13; juniper, 4; fir, 2; yellow pine, pinon, and rabbit brush, 1 each); 2 Berlese samples (aspen-spruce-fir, oak): 5,600 to 9,600 ft; Bernalillo, Colfax, Rio Arriba, Sandoval, San Miguel, Santa Fe, Socorro, Taos, Torrance, and Valencia Co.; Jun–Sep 1951–54.

\textit{DISTRIBUTION.} N. M., N. Y.

\textbf{Bourletiella arvalis} (Fitch, 1863)

\textit{NEW MEXICO RECORDS.} Two collections sweeping junipers; 6,500 and 7,000 ft; Sandoval and Socorro Co.; Jul 1951 and 1954.

\textit{DISTRIBUTION.} Mass., N. M., N. Y., Ohio; Australasia.

\textbf{Bourletiella batrachos} (Wray, 1948)

\textit{NEW MEXICO RECORDS.} Six sweeping collections (grass and/or herbs, 4; mesquite, 2); 4,000 to 9,000 ft; Chaves, Socorro, Taos, and Valencia Co.; Jun, Jul, and Sep 1953–54.

\textit{DISTRIBUTION.} N. M., N. C.

\textbf{Bourletiella caeruleacauda} sp. nov. Fig. 1

\textit{TYPE LOCALITY.} Holotype plus 1 paratype, Sandia Mts., Bernalillo Co., New Mexico, from under rocks, aspen grove
10,200 ft, Jul 1951. Type specimens will be deposited with the Academy of Natural Sciences, Philadelphia, Pennsylvania.

Description. Segments essentially fused; integument smooth; brown, with light blue abdominal venter and light-blue furcula; short to medium investing setae; bothriotricha present; head hypognathous; antenna to head as 16:9; antennal seg-

Fig. 1. Bourletiella caeruleocauda sp. nov.

ments as 3:4:10:20; Ant IV with 10 subsegments and 13 whorls of setae; Ant III without long strong setae; eyes 8 and 8 on darkly pigmented eyespots; mouthparts chewing; claw tunicate; unguiculus absent; tenent hairs 2-3; unguis with 1 tooth; anal papilla present; great abdomen depressed dorsally; furcula without ankylosis, reaching collophore; manubrium to dens to mucro as 3:5:2; mucro non-lamellate; dens with about 7 long setae on each edge; anal segment of male dorsally with
clasping organ; subanal appendage curved, length about 1.5 times basal width; length 1.1 mm.

Discussion. This species is distinguished from other species of *Bourletiella* by the lack of an unguiculus in combination with 7 dental setae.

Distribution. N. M.

*Bourletiella* *fallonae* Maynard, 1951

**New Mexico Record.** Sweeping grass, 9,900 ft, Taos Co., Jul 1953.

Distribution. N. M., N. Y.

*Bourletiella* *hoffi* sp. nov. Fig. 2

**Type Locality.** Holotype plus 9 paratypes, Glorieta Mesa, San Miguel Co., New Mexico, sweeping junipers, 7,600 ft, Aug 1953. Type specimens will be deposited with the Academy of Natural Sciences, Philadelphia, Pennsylvania.

Description. Segments essentially fused; great abdomen not depressed dorsally; integument smooth; yellow with dorsal and lateral irregular gray-blue spots; short to medium investing setae; head hypognathous; antenna to head as 32:23; antennal segments as 2:3:4:7; Ant IV with 15–16 subsegments; eyes 8 and 8 on dark eyepatches; mouthparts chewing; claws tunicate; unguiculus longer than unguis; tenent hairs 3; unguis and unguiculus without teeth; furcula not ankylosed, reaching collophore; manubrium to dens to mucro at 26:24:7; dens with about 6 long setae on each edge; mucro non-lamellate; anus terminal; subanal appendage plate-like; length 1.0 mm.

Discussion. This species is distinguished from all other *Bourletiella* by the following combination of characters; unguiculi similar; 3 tenent hairs; great abdomen not depressed; subanal appendage plate-like, 2.5 × long as wide; 6 long setae on each edge of dens.

Distribution. N. M.
Bourletiella hortensis (Fitch, 1863)

New Mexico Records. Three sweeping collections (grass and/or herbs 2, sage 1); one Berlese sample (grass roots); 5,700 to 9,900 ft; Bernalillo and Taos Co.; Jul and Sep, 1951 and 1953.

Discussion. The common name "garden springtail" is accepted for this species by the Entomological Society of America. It is an important economic pest.

Distribution. Conn., Ill., Iowa, Maine, Mass., N. J., N. M., N. Y., Ohio, Penna., Tenn., Va.; Nova Scotia and Ontario (Canada); Europe.

![Bourletiella hoffi sp. nov.](image)

Fig. 2. *Bourletiella hoffi* sp. nov.

Bourletiella multimaculata sp. nov. Fig. 3

Type Locality. Holotype plus 8 paratypes, La Joya Game Refuge, N of Socorro, Socorro Co., New Mexico, sweeping wolfberry, 4,700 ft, Jul 1954. Type specimens will be deposited with the Academy of Natural Sciences, Philadelphia, Pennsylvania.
Description. Segments essentially fused; integument smooth; yellow to brownish yellow with a large number of black spots (each a little larger than an ocellus) dorsally and laterally on head and body; antenna to head as 6:5; antennal segments as 3:6:7:15; Ant IV with 10:11 subsegments; Ant III without long strong setae; eyes 8 and 8 on dark eyepatches; mouthparts chewing; claws tunicate; unguiculus I longer than unguis I; unguiculus II subequal to unguis II; unguiculus III to unguis III as 3:4; tenent hairs 2; unguis with 1 tooth; unguiculus with 1 tooth; anal papilla present; furcula reaching collophore; manubrium to dens to mucro as 18:14:5; mucro non-lamellate; dens with about 7 long setae on each edge; anus terminal; subanal appendage J-shaped, length about 2.5 times basal width; anal segment of male with dorsal claspers; length 1.1 mm.

Fig. 3. Bourletiella multimacula sp. nov.
DISCUSSION. This species is distinct from all other Bourletiella in having (1) dens with 7 long setae on each edge; (2) tenten hairs 2; (3) unguculi similar with apical needles; and (4) great abdomen depressed dorsally and speckled.

**Distribution.** N. M.

**Bourletiella russata** Maynard, 1951

**New Mexico Records.** Three sweeping collections from grass and two Berlese samples (oak, soapberry); 4,100 to 9,600 ft; Bernalillo, Chaves, San Miguel, and Valencia Co.; Jun-Sep 1951 and 1953-54.

**Distribution.** N. M., N. Y.

**Bourletiella spinata** (Macgillivray, 1893)

**New Mexico Records.** Eight sweeping collections (grass and/or herbs, 4; sage, 1; rabbit brush, 1; greasewood, 1, snowberry, 1); and 1 Berlese sample (alligator-bark juniper); 5,500 to 9,900 ft; Bernalillo, Sandoval, Santa Fe, Taos, and Valencia Co.; Jun-Oct 1950-53.


**Summary**

Ten species of Bourletiella (including *B. caeruleacauda*, *B. hoffi*, and *B. multimaculata*, all new species) are recorded for the first time from New Mexico. A key to species of Nearctic *Bourletiella* is presented.
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JAMES ABRAM GARFIELD REHN
James Abram Garfield Rehn
1881–1965

With the death of James A. G. Rehn on January 25th, 1965, the American Entomological Society and the Academy of Natural Sciences of Philadelphia lost their oldest active research worker. His services to both these institutions have been very great. When on June 1, 1900, he joined the staff of the Academy as a Jessup student, he began a career which was to become outstanding in the field of systematic zoology. A. E. Jessup, early Academy member, had left a substantial fund for the aid of carefully selected students in natural history.

Mr. Rehn was born in Philadelphia in 1881, the son of William J. and Cornelia Loud Rehn. He was educated in the Philadelphia schools, the Public Industrial Art School and the Pennsylvania Academy of Fine Arts. At the time of his first association with the Academy of Natural Sciences—at the age of nineteen—he had been a member of a group of boys known as the Aristotle Society, the activities of which had been supervised by C. W. Johnson, who was then Curator of the Wagner Free Institute of Science. As a result, he was not without a well-developed and active interest in natural history. However, he had apparently not yet determined exactly where his main interest lay, as for several years the articles he published were both in the field of Mammalogy and Orthoptera.

He became an associate in the Entomological Section of the Academy soon after joining its staff, and a resident member of

*The accompanying portrait shows Mr. Rehn at his desk at the Academy. It was taken in the summer of 1964 by Prof. Carlos Carbonell of the Faculty of Humanities and Sciences, University of the Republic, Montevideo, Uruguay.

(57)
the American Entomological Society in 1910. It seems probable that the contacts he formed here, perhaps especially with E. T. Cresson, the hymenopterist, Henry Skinner, and C. W. Johnson caused him to concentrate his chief interest on insects. In any case, beginning about 1910 a steadily increasing stream of papers on Orthoptera began to appear under his name.

Though Mr. Rehn has devoted most of his life to the study of this group, he has not been in any sense a so-called "closet naturalist." He has gone out and explored the mountains and plains, the rain forests and the deserts to study the ways of his favorite forms of animal life. He has studied their habits, their ecology, their distribution and interrelationships in great detail. Few men have explored this country more thoroughly and with greater care in a search for all the species in their special field. He has not only carefully surveyed the United States with his many expeditions, but has made numerous trips to foreign countries for the same purpose. These include expeditions to Africa, Colombia, Costa Rica, Honduras and Brazil. Altogether, he has spent well over 30 seasons in the field since joining the Academy staff.

Chiefly through these collecting trips, both domestic and foreign, he has multiplied many times over the size and diversity of the Orthoptera collections at the Academy. With the able assistance and generously used financial resources of his co-worker Morgan Hebard, this collection has been built into the finest and most nearly complete aggregate of its kind in the world. It now numbers over half a million specimens, and is very rich in types.

There can be no doubt that at the time of his death Mr. Rehn stood in a very small and select group of the world's great Orthopterists. On the basis of his published work, he was perhaps the best. During the course of his progress toward this high position, he received important honors, and became a member of many scientific societies. He was a fellow of the American Association for the Advancement of Science; a fellow and former president of the Entomological Society of America; a former president of the American Entomological Society; fellow of the American Geographical Society; charter member of the
American Society of Mammalogists; a charter member of the Society for the Study of Evolution; charter member of the Society of Systematic Zoologists; member of the Society of Sigma Xi; member of the American Society of Zoologists; corresponding member of the Sociedad Venezolana de Ciencias Naturales; and fellow and former president of the Delaware Valley Ornithological Club.

In his long years at the Academy, Mr. Rehn has served the institution in many important ways. He has successively held the positions of Assistant to the Board of Curators, Associate Curator of Insects, and since 1933, Curator of Insects. In an administrative capacity he has been Recording Secretary, Secretary of the Council, Secretary of the Board of Trustees and, since 1938, Corresponding Secretary. In the latter position he was in communication with many of the world's best-known natural scientists. In addition to these official positions, his services were invaluable to the institution as a member of many important permanent and temporary committees. This was especially true regarding his work on the Publication Committee, of which he was chairman for many years.

His services to the American Entomological Society have been no less noteworthy. For a long period he consistently played some vital part in the conduct of its affairs. He was its Vice-president, President, Treasurer, and Editor of its Transactions. He also performed the important service of directing its publications.

Few members of the Society perhaps appreciate the debt of gratitude they owe this man for his able direction of its financial affairs during the many years he was its Treasurer. It cannot be denied that in the permanent funds of the Society are now invested many additional thousands of dollars, owing to his close attention to its interests.

The results of Mr. Rehn's research in various fields have been extensively published. During the 65 years involved, there were 20 papers on mammals, including four as joint author; on the subject of Orthoptera about 337 have been printed, of which 83 were with other authors; in all, over 350 papers bear his
name. A complete and detailed bibliography of his work is expected to be published in the near future.

This compilation does not include the two comprehensive publications on which he was working at the time of his death. In 1949 Mr. Rehn started the first of these two monographic works. The Commonwealth Scientific and Industrial Research Organization of the Australian government had invited Mr. Rehn to prepare an exhaustive study of The Grasshoppers and Locusts (Acrididae) of Australia. Three volumes under this title have appeared to date.

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In 1954 he began the final preparation of what he doubtless considered the most comprehensive and important work of his life: A Monograph of the Orthoptera of North America (North of Mexico). It was to be, in fact, the culmination of all his work on that group in this country—a sort of definitive summing up. Dr. Harold J. Grant, Jr., present Chairman of the Department of Entomology has collaborated in this work, and the first volume has appeared under their joint authorship. It is expected that there will be five volumes when the work is completed—and it will be continued.

Mr. Rehn's field notes exemplified the meticulous care with which he did all his scientific work. They were filled with data about the conditions under which his specimens were collected, including place and date, time of day, weather, nature of the terrain and general notes about habitat and ecology. These later supplied the information needed when writing his papers. Between 1904 and 1955 he filled 20 volumes of these notes, which cover his expeditions in the United States. There are five additional index volumes. These notes contain records from 3538 numbered collecting stations.

Following the recent death of his wife on October 13, 1964, Mr. Rehn never returned to his desk at the Academy. For some time his health had been declining. The shock of this new tragedy doubtless helped to hasten the end of a long and useful life.

It is indeed unfortunate that he never took the time to write reminiscences of his life at the Academy. As the oldest member of the staff, his knowledge of past events, and of the
well-known personalities in the scientific world who had come and gone was unbelievably broad and voluminous. His advice and counsel on many matters were constantly sought by those of lesser knowledge and experience. It was nearly always easier to ask Mr. Rehn than to search through many records for an answer. For these, and many other more personal reasons he will be much missed at the Academy.

MAURICE E. PHILLIPS

A New Neotropical Lepidosis Curran (Diptera: Syrphidae)

F. CHRISTIAN THOMPSON, Department of Entomology, University of Massachusetts, Amherst

A second species of Lepidosis Curran is described from Argentina. The type is preserved in my collection.

Lepidosis smithae, new species

Face yellowish orange except for median black stripe; facial pile white; cheeks yellow except posterior third black. Dorsum of thorax with long cinnamon pile on anterior half and long black pile on posterior half, with four longitudinal stripes of short white pile. Scutellum without tufts of black pile. Abd-omen with two pairs of reddish spots.

MALE.—Head: Face yellowish orange except for median shining black stripe; face vertical, with tubercle small and below the middle; facial stripes with dense short flattened white pile, remainder with long dense white pile. Cheeks yellow except for black posterior third and thin black stripe on the border of the face, with white pile. Front black, with black pile in the middle and with white pile on the edges; frontal lunule yellow. Vertex black with black pile. Occiput white pollinose, with long white pile below becoming shorter above; cilia absent.

1 Contribution No. 1368 from the Entomological Laboratory, University of Massachusetts.
Eyes with brown pile and shorter white scale-like hairs intermixed. Antenna orange; third segment elongate, three and a half times as long as first and second segments together, and slightly concave below; arista yellow with black rays.

Thorax: shining black. Dorsum with long cinnamon pile on anterior half and long black pile on posterior half, with four longitudinal stripes of short thick white pile. Pleurae with long cinnamon pile. Scutellum dark brownish red, with basal half bearing long and short black pile intermixed and apical half with long cinnamon pile intermixed with short white pile. Legs: black except for brownish orange tarsi, orange on apex of femora and on basal three-fourths of tibiae. Pile long and black except for long white pile on basal fourth of fore and middle femora, on basal three-fourths of hind femora, and on hind coxae. Wings: hyaline, lacking microtrichia, with stigma brownish. Halteres: orange. Squamae and plumula: white.

Abdomen: shining black; second segment with a lateral pair of brownish red spots almost as long as segment and separated by twice their width; third segment with similar pair of spots, but separated by only their width. Pile of dorsum short and black, except for long white pile on the base of the first segment, on the spots of the second and third segments, and on the fourth segment. Venter black, with white pile. Genitalia black, with white pile. Length: 9 mm.

Holotype.—male, Mascasin, La Rioja, Argentina, November 1961 (F. Walz).

Discussion.—This species is quite distinct from *L. compactus* Curran, the only other described species in this genus. *L. smithae* differs from Curran’s generic description in that the scutellum lacks the dense tufts of pile and the legs are not robust. In spite of these differences, I feel that *smithae* definitely belongs to *Lepidosis*, because of the peculiar pilosity of the eyes, the primary character on which Curran based his genus. It should be noted that this species also lacks bristles on the thorax as does the genotype, an unusual condition in *Volucellinae*.

I take great pleasure in naming this species after Dr. Marion E. Smith, who has been of invaluable aid to me in my studies.
The Distribution of 1,000 Fleas of the Genus Xenopsylla Taken in Tanganyika During 1961–1963

C. AndreSEN HUBBARD, Tigard 23, Oregon, and Malaria Institute, Amani, Tanga, Tanganyika

From September 15, 1961 to May 15, 1963 the writer collected close to 1,000 fleas belonging in the genus Xenopsylla off various native rats and mice in Tanganyika, East Africa. The genus is known the world over because of the presence in it of cheopis, the chief vector of bubonic plague. In Africa there are more representatives of the genus than elsewhere for about 50 of the some 75 known from the world beset the collector. These fleas are small, generally numerous, and a nuisance to determine.

During the two-year study eleven representatives of the genus were found, four of which were new and described as such. A twelfth, described long before, was not recovered, and a thirteenth had been described far to the south in an area in which the writer had not collected.

The Xenopsylla cheopis, bantorum, versuta Complex

The members of this complex are so alike that the greatest amount of acumen and study are required to separate them one from the other. All were listed by the writer as X. cheopis in "Fleas From 1,001 Mice Taken in N.E. Tanganyika," E.A. Med. Jour. 40: 9. Subsequent study of these fleas by the specialists at the Tring Branch of the British Museum separated them into their proper categories.

Xenopsylla cheopis (Rothschild), 1903.

This flea was described from specimens taken off Acomys witherbyi (Spiny Mouse) near Shendi, the Sudan. It is probably the best known of the genus for it is world-wide in distribution. It has been known in Tanganyika since 1915, Vogeler having collected it off "Epimys" at Dar-es-Salaam on
January 14. Loveridge collected the flea at Morogoro off “Rattus” during December of 1916 and Verdcourt took it at Amani during July 1950, the host not mentioned.

In the writer’s study this flea was not found in any numbers until after the middle of July 1962. Before this date the flea was a rarity in his collections, after this date it seemed to explode in numbers everywhere.

At Amani, 3,000 feet up in the Eastern Usambara Mountains, this flea was found on *Rattus rattus kijabius* (Black Rat) sparingly. The rats were taken along creeks, on farms and plantations, and in the houses, and were a nuisance in the laboratories, gaining entrance into them through the pipe tunnels. These rats seemed clean as far as fleas were concerned. Many of them and a series of their nests, some with young were without fleas when examined. Some of the rats carried one or two. On April 13, 1963, however, four small young taken in the laboratory carried 3, 5, 7, and 10 each.

From Amani, working westward, that is, inland from the Indian Ocean at Mamba, 5,000 feet up in the South Pare Mountains, a female of this flea was taken off *Lophuromys flavopunctatus margarettae* (Chocolate Brown Mouse) on November 10, 1962. This was doubtless an accidental occurrence since hundreds of other specimens of this mouse examined did not carry it.

At Same, 2,200 feet, in flat land and 150 or so miles west of the Indian Ocean, in the compound of the Malaria Institute laboratory and resthouse there was a large number of *Arvicanthis abyssinicus virescens* (Grass Mouse) in the grass of the two-acre tract from July through December of 1962. The first rains in late December caused the mice to disperse and they vanished from the tract. The mice were examined each month of the period and were carrying this flea during the entire season. The records were: July 15 one mouse with 2 ♂♂, 4 ♀♀; August 1, one mouse with 1 ♂, 3 ♀♀; September 28, one mouse with 10 ♂♂, 18 ♀♀; October 15, 3 mice with 15 each; November 9, 2 mice with 12 each; December 22, one mouse with 1♂, 5 ♀♀. Numbers of other grass- and seed-eating mice were using the Grass Mouse trails but none were carrying this flea at the time of examination.
At Moshi, 2,400 feet in flat land and some 200 miles inland from the Indian Ocean on October 13, 1962, a specimen of this mouse carried 6 pairs of this flea.

At Arusha, 4,500 feet in flat land and some 250 miles inland from the Indian Ocean on February 7, 1963 this flea was carried by the following mice: Arvicanthis abyssinicus virescens, 3 ♂♂. Mastomys natalensis hildebrandti (Coucha Rat), 10 specimens carried 5♂; Rhabdomys pumilio diminutus (Four-stripe Grass Mouse), 2 ♀♀.

At Lake Manyara National Park, 3,000 feet in the Rift Valley and some 300 miles inland from the Indian Ocean, on January 15, 1963 two specimens of (Single-stripe Grass Mouse) Lemniscomys griselda rosalia carried 5♂ of these fleas and a single specimen of Arvicanthis abyssinicus pallidus (Pallid Grass Mouse) carried 42.

In so far as this flea was found in Entebbe, Uganda, on the north shore of Lake Victoria as early as 1911 it seems likely it will be found in the Tanganyika ports of the lake also.

**Xenopsylla bantorum** Jordan, 1938.

This flea was described off Aethomys (Bush Rat) taken at Tororo, Uganda. There are other records from Uganda and several from Kenya. This flea has not been reported out of East Africa. The writer's records are from north-central Tanganyika.

Working at Seronera, the Serengeti, at about 5,000 feet, the first week in October 1962 all mice taken carried this flea, many in large numbers. The hosts were: Arvicanthis abyssinicus muansae (Grass Mouse). These were so plentiful that they could be seen darting about everywhere. Ten specimens examined the morning of October 4 carried 40 ♂♂ and 60 ♀♀ of this flea, and 6 examined during the afternoon carried 25 pairs. Lemniscomys striatus (Striated Grass Mouse), 2 on October 4 carried 15 each. Steatomys athi (Fat Mouse), one specimen carried 2 ♂♂, 4 ♀♀ on October 6. Saccostomus campestris umbriventer (Pouched Mouse), 2 carried 12 pair on October 6. Thallomys damarenisis scotti (Masked Mouse), one
with 2 ♂, 4 ♀ on October 6. *Mus (Leggeda) triton* (Pigmy Mouse), one with 1 ♂, 2 ♀ on October 5. *Tatera robusta muansae* (Big Gerbil), one with one ♂ on October 4. *Mastomys natalensis victoriae* (Coucha Rat), 20 specimens examined during the week carried many of these fleas.

At Olalaa located midway between the Serengeti and Lake Natron at about 5,000 feet in hilly country, on October 3, this flea was removed from: *Steatomys athi* (Fat Mouse), one specimen carrying 1 ♂ and 2 ♀. *Tatera robusta pothae* (Big Gerbil), 6 specimens carrying 1 ♂ and 6 ♀. *Mastomys natalensis victoriae* (Coucha Rat), one specimen carrying 1 ♀.

**Xenopsylla versuta** Jordan, 1925.

This flea was described from Angola off *Funisciurus* (Squirrel) which was collected in 1906. It is also known from Uganda, Kenya, and Southwest Africa.

At Seronera, the Serengeti, the flea was taken on October 6, 1962 off *Thallomys damarensis scotti* (Masked Mouse), 2 ♀; and at Lake Manyara National Park, October 8, 1962 off *Thamnomys dolichurus surdaster* (African Tree Mouse), 2 ♂, 3 ♀; and on January 19, 1963 off *Mastomys natalensis hildebrandti*, a ♀. At Arusha on February 2, 1962 off *Graphiurus murinus isolatus* (African Dormouse), a ♂, and on October 1, 1962 off *Mastomys natalensis durumae*, a ♂. At Same, June 15, 1962 off *Xerus rutilus* (Ground Squirrel), 2 females; and at Gonja on November 8, 1962 off *Aethomys chrysophilus zoi* (Bush Rat), a ♂ and a ♀.

**Xenopsylla nubica** (Rothschild), 1903.

This flea belongs in this position. It is of the group of *cheopis*-like fleas but can readily be distinguished from the three above. It was described from specimens taken off the Grass Mouse *Arivcanthis* at Shendi, the Sudan. The flea is well known from Egypt, the Sudan and from a swath through central Africa. Here, however, are the first records from Tanganyika. *Tatera robusta swaythlingi* and *Tatera nigricauda nyama* (Big
Gerbil and Blacktailed Gerbil), off each a female on November 12, 1962 at Gonja.

The *Xenopsylla brasiliensis, morgandaviesi, robertsi* Complex

These fleas, in the female, may be distinguished from one another in the amount of bulb at the base of the tail of the spermatheca, *brasiliensis* having quite a bulb, *morgandaviesi* a small bulb, *robertsi* hardly any at all. The males can be separated by small differences in the genitalia. *X. robertsi* was described by Jordan in 1936 from central Kenya off black rats. There are as yet no Tanganyika or Uganda records.

*Xenopsylla brasiliensis* (Baker), 1904.

Although this flea was described from Brazil it seems today to be a native of Africa. Specimens of it were collected in Natal as early as 1904. Since then the flea has been collected all over Africa south of the Sahara and off a wide variety of hosts. It was first reported in Tanganyika in 1916.

To the south of Amani (Headquarters) the writer has collected a female at Dar-es-Salaam on March 12, 1962, a female at Morogoro, March 11, 1962, a pair at Iringa, March 19, 1963, a pair at Ifakara, April 2, 1963, and 4 ♀♀ at Njombe, March 23, 1963, all off *Mastomys natalensis* ssp. (Coucha Rat) and to the west off the same host a pair at Mamba on November 10, 1962, a ♂ and 3 ♀♀ at Korogwe, January 3, 1962, 2 pairs at Lushoto, December 23, 1961, and a ♂ and 2 ♀♀ at Gonja on November 12, 1962. *Rattus rattus kijabius* (Black Rat) carried this flea consistently at Amani. *Aethomys chrysophilus voi* (Bush Rat) carried fair numbers of it at Gonja. *Acomys albigens* (Spiny Mouse) carried a pair of this flea at Gonja on November 12, 1962.

*Xenopsylla morgandaviesi* Hubbard, 1963.

This representative of the *brasiliensis* group ranges west of *brasiliensis* and south of *robertsi* in the Lake Manyara National Park, the Serengeti and about the Ausha-Moshi area. The

At Arusha on October 1, 1962 and at Seronera on October 5, 1962 a pair from *Mastomys natalensis*.

The **Xenopsylla sarodes** Complex

*Xenopsylla sarodes* belongs to the *brasiliensis* group. The various members of the species seem to be true parasites of the Pouched Mouse *Saccostomus*. The original description of the flea was written by Jordan in 1937 from the male taken off *Saccostomus campestris isiolae* collected in northern Uaso Nyiro, Kenya. The female was described by Smit in 1959 from materials off the same mouse but taken in Kerio Valley, Kenya, April 12, 1958. Smit examining the writer’s material from Seronera determined it as new.

**Xenopsylla sarodes serengetiensis** Hubbard, 1963.

On October 6, 1962 three specimens of *Saccostomus campestris umbriventer* (Pouched Mouse) taken on the bank of the creek at Seronera Lodge, 10 miles south of Banagi, the Serengeti research center where the Michael Grzimek Memorial Museum is located, carried 10♂ and 14♀ of this flea. Other mice taken in the vicinity did not carry it.

**Xenopsylla sarodes manyarensis** Hubbard, 1963.

This flea is separated from the preceding by the 150 miles of grass plains which are the Serengeti. It is distinguished from the above by small differences in the genitalia. On January 15, 1963 a half-grown Pouched Mouse, *Saccostomus campestris umbriventer*, was taken on the top of the Rift wall above headquarters of Lake Manyara National Park. From this small
mouse were taken 45 ♂ and 35 ♀ of this flea. Several dozen other mice taken the same night in the same site did not carry it.

The *Xenopsylla debilis, humilis, difficilis* Complex of Gerbil fleas

These gerbil fleas were all originally collected by R. Kemp during his work in Kenya and Tanganyika in 1910. All belong in the *nilotica* group. So far they have only been listed from Kenya and Tanganyika.

*Xenopsylla debilis* Jordan, 1925.

This flea is said to differ from other *Xenopsylla* in the small size of the eye. At times as many as 100 or more of these fleas can be taken off a single gerbil. The writer has collected it from Gonja westward into Lake Manyara National Park and then north through the Serengeti. The hosts have been: *Tatera nigricalauda nyama*, at Same, Moshi, Himo through the year; *Tatera robusta pothae*, at Olalaa, October 4, 1962, 2 ♂ 5 ♀; and *Tatera robusta mwansae*, in the Serengeti at Seronera, October 6, 1962, 3 pair. It is not known how far to the west or south this flea ranges.

*Xenopsylla difficilis* Jordan, 1925.

The type host of this flea is the Blacktailed Gerbil. The flea seems to prefer this host. The writer has collected it off the same hosts as listed for *X. debilis* and from the same localities. How far into Tanganyika the flea ranges is not known. On July 24, 1962 a pair of these fleas was removed from *Gerbillus pusillus pusillus* (Pigmy Gerbil) examined at Moshi.

*Xenopsylla humilis* Jordan, 1925.

This gerbil flea is the most eastern recorded in the writer’s records. On December 21, 1961, at Korogwe off *Tatera robusta swaythlingi*, a ♂ and 2 ♀. Korogwe is about 100 miles inland from the Indian Ocean and at an elevation of about 1,000 feet.
To the west the flea has been taken as far as Lake Manyara National Park and usually off *Tatera robusta vicina*. On one occasion at Moshi the flea was off *Gerbillus pusillus pusillus* (Pigmy Gerbil), a pair, September 29, 1962.

**Xenopsylla raybouldi** Hubbard, 1963.

Three pairs of this flea were taken off a specimen of *Tatera leucogaster cosensi* (Gerbil) at Ifikara on April 2, 1963. These are the types. No other specimens are known. Ifikara is just south of the central point of the country. The flea is something new in a *Xenopsylla* pattern.

**Xenopsylla crinita** Jordan and Rothschild, 1922.

This flea is thought to be a true parasite of *Cricetomys gambianus* (Giant Rat). Although there are records from several sites in southeast Kenya, from Mt. Kilimanjaro in Tanganyika and from Zanzibar, the writer has never taken it. Fifty or so of the type host examined in north-east Tanganyika failed to carry it.

**Xenopsylla tanganyikensis** Marcus, DeMeillon and Davis, 1960.

This flea was described from a single male taken off *Tatera taborae* (Gerbil) in central Tanganyika at the designation of Iku, Mpanda, on November 22, 1956 by Chapman and Robertson.

The authors state that it is “a species of the *cheopsis* group and related to *cheopis* (Rothschild) 1903 and *bantorum* Jordan 1938. It differs strikingly from these two species in having \( P^1 \) of the clasper parallel-sided.”

The writer has not yet collected this flea.

This is the second paper on Tanganyika fleas to be published by the writer under National Science Foundation grant G-1954, sixteen others having been published on world fleas under NSF grant G14023.
Two New Braconid Parasites of the Spruce Budworm (Hymenoptera)

C. F. W. Muesebeck, United States National Museum

The purpose of this paper is to provide names for two undescribed and rather widely distributed Braconidae that are internal parasites of the destructive spruce budworm, *Choristoneura fumiferana* (Clemens).

**Apanteles absonus**, new species

This species somewhat resembles *A. fumiferanae* Viereck, another widespread parasite of the same host, but it differs in many particulars, especially in having the propodeum largely smooth and without a defined areola, in the sclerotized plates of the first and second tergites being very weakly sculptured and the plate of the first narrower at apex than at base, in the considerably longer ovipositor sheath, and in the long and slender apical segments of the female antennae.

*Female*: Length about 2.8 mm. Face very shallowly and closely punctate; antennae slender, even the last four segments nearly or quite twice as long as broad.

Mesoscutum covered with minute, shallow, closely placed punctures; disc of scutellum smooth and polished, with only a weak suggestion of punctuation; propodeum smooth and shining, without an areola but with a few weak and short raised longitudinal lines radiating from middle of apical margin; mesopleuron polished; hind coxa smooth and polished except for an elongate, somewhat flattened area on the outer upper edge toward base which has some scattered punctures; radius arising from slightly beyond middle of stigma and a little longer than intercubitus.

Sclerotized plate of first tergite narrowing slightly from base to apex, about twice as long as wide at apex and mostly smooth and shining, with only a little weak sculpture laterally on apical half each side of a shallow, poorly defined, longitudinal impression; plate of second tergite only about half as wide at base as
at apex and less than half as long as wide on posterior margin, smooth and shining except for a little weak sculpture along lateral and posterior margins; remainder of abdomen smooth and shining; ovipositor sheath much longer than hind tarsus and a little longer than abdomen.

Black; antennae, including scape, black; wings hyaline, the stigma brown and without a pale spot at base; tegulae piceous; legs yellow except all coxae, a small spot at apex of hind femur above, hind tibia broadly at apex, and the hind tarsus, which parts are black or blackish; venter of abdomen, and usually more or less of the lateral margins of the tergites, yellowish.

Male: Essentially like the female except that the abdomen is usually somewhat darker.

Type: U. S. National Museum No. 67736.
Type locality: Pagosa Springs, Colorado.

Described from the following specimens, all reared from larvae of Choristoneura fumiferana (Clemens): Three females, including holotype, from the type locality, June, 1964; 2 females, Allenspark, Colorado, June, 1964; 3 males, Cloudcroft, New Mexico, June, 1964; 1 female, Greenville, Maine, June 21, 1950; 1 male, Bingham, Maine, June 21, 1950; 1 male, Ashland, Maine, July 9, 1947; 1 male, Caratunk, Maine, July 6, 1948; 2 females, Rockwood, Maine, June 13, 1946 and July 9, 1948, and 1 female, Patten, Maine, July 1, 1946. Additional para-types: 2 females and 1 male labeled "Sea View, Wash., Mar. 25, 1931, Picea sitchensis"; 2 females from Douglas Co., Wisconsin, May, 1956, labeled "ex boxes containing Pinus banksiana and overwintering budworm, also Petrova," and 1 female from Bayfield Co., Wisconsin, July 1, 1957, with the same rearing data.

Clinocentrus fumiferanae, new species

This is very similar to C. tarsalis Ashmead, from which it may be distinguished at once, however, by its conspicuously larger eyes and ocelli, much shorter ocellocular line and strongly receding temples.
Female: Length about 3.5 mm. Head a little broader than thorax, smooth and shining; face smooth, slightly broader than high from antennal foramina to base of clypeus; temples strongly receding and hardly half as wide as eyes; ocellococular line not, or barely, longer than diameter of a lateral ocellus; antennae slender, 32- to 38-segmented in the specimens examined; occipital carina complete; malar space less than half as long as basal width of mandible.

Mesoscutum smooth and polished; notauli sharply impressed and finely foveolate on anterior half of scutum, vanishing in the large, quadrate, rugulose area that occupies the median part of the posterior half of the mesoscutum; scutellar fovea very long, more than half as long as the disc of scutellum and divided by a median longitudinal septum; propodeum irregularly rugose reticulate; mesopleuron smooth and polished except for a rugose reticulate area in the anterior angle and a short, weakly foveolate longitudinal furrow below; metapleuron entirely rugose reticulate. Radius arising from middle of stigma, the first abscissa much longer than greatest width of stigma and nearly or quite as long as first intercubitus; second abscissa of radius less than half as long as third; nervulus postfurcal by at least its own length; mediella only a little longer than lower abscissa of basella, which is usually twice as long as upper abscissa.

First tergite about as broad at apex as long, closely, rather irregularly, striate, the two convergent basal keels meeting at a point on a level with the spiracles and continuing as a weak carina for a short distance; the connate second and third tergites closely, irregularly striate; the suturiform articulation distinct though weak; the following segments very short; ovipositor sheath a little longer than hind tarsus.

Yellowish brown; propodeum and first tergite usually more or less piceous; wings hyaline, the stigma transparent yellowish, nearly hyaline, its apical margins darkened; apices of hind femora and of hind tibiae and the hind tarsi infuscated.

Male: Like the female in all essential respects.
Type: U. S. National Museum No. 67737.
Type locality: Saranac, New York.
Described from the following material: Nine females, including holotype, and 1 male, all reared from Choristoneura funiferana (Clemens) July, 1947, at Saranac, New York; 4 females and 1 male from the same host on Abies balsamea, Ely, Minnesota in June and July of various years from 1955 to 1961, and 4 females, also from C. funiferana on Abies balsamea, in the Superior National Forest, Minnesota, 1955 and 1956.

“Prosoma sp.,” Supposed Host of Torymus pilularidis (Huber) (Hymenoptera: Torymidae)


In 1927 L. L. Huber described Callimome pilularidis (Torymus pilularidis of present terminology), reared from “Prosoma species on Baccharis pilularis De Candolle” (Proc. U. S. Natl. Mus. 70: 45). This host citation implies that Prosoma is some sort of gall maker on Baccharis. “Prosoma sp.” as the host of pilularidis has been repeated in the literature several times since, although no one has been able to find that Prosoma is a described genus. Huber himself (p. 8), in his host list, entered Prosoma as “Miscellaneous.” In the 1951 Synoptic Catalog of Hymenoptera of America North of Mexico (Monog. 2, U. S. Dept. Agr., p. 525), Peck repeated the host citation as originally given. In his 1963 catalog (Canad. Ent. Sup. 30, p. 550), he listed Prosoma as a possible nomen nudum, and as “Misc. insect,” although he placed it in his host list (p. 995) under the plant family Compositae. Lienck (unpublished Ph.D. thesis, U. of Ill. 1951, p. 19) stated that Prosoma could not be found in the various indices of generic names, and he listed it as “Miscellaneous; in all likelihood a misspelling.”

I also have consulted all available lists of generic names in both Zoology and Botany without finding Prosoma as a described genus. However, when I consulted the old Bureau of
Entomology files, I found that *Prosoina* is simply a mistake. The 1883 original file entry clearly is written “2964, Isosoma? on Baccharis.” The records of all the specimens reared from lot 2964 were consolidated later and typed as Pergande notes, and at that time the typist made an error, copying the handwritten “Isosoma” as “Prosoma.” All subsequent reference to the records for this material have, seemingly, been made to the typed Pergande notes, rather than to the original handwritten card. Consequently, when Huber was describing *pilularidis* and requested the data to accompany specimens which bore only the accession number 2964°, he was sent the erroneous name *Prosoma*. The wrong name was sent to him despite the fact that it appeared only at the head of the Pergande note card; *Isosoma* appears in the body of the data.

The data from the Pergande notes that should accompany the types of *pilularidis* Huber are these: “Jan. 2, ’83, rec. today from H. W. Turner, Martinez, Calif. a lot of galls, which are the deformation of flower buds of above plant [Baccharis *pilularis*] produced as it seems by a species of Isosoma, as no Cecid. larvae were found in all which were examined; however, they may prove to be only parasites. Several of the single galls are mostly grown together into a compact mass which sometimes is quite globular, mostly, however, each gall is quite distinct. They are of a soft, white, spongy texture inside and contain several cylindrical, elongated cells. When fresh, the color of the galls externally is purplish and pale yellow-green. The larvae are white and dorsally and ventrally beset with stiff bristles which enables them to move back and forward in their cells quite easily. Coll. Dec. 12, ’82.”

“Jan. 5, ’83, Two chalcids . . . issued today; they are apparently only parasites.” This is followed by 7 entries for further emergence of chalcids, over the period Jan. 5–Feb. 16, 1883, for a total of 11 specimens. These chalcids are all noted as having been labeled 2964°, and they clearly include the specimens Huber used 30 years later when he described *pilularidis*. Huber had 3 specimens, two labeled 2964°, Jan. 20, ’83, and one labeled 2964°, Jan. 27, ’83; the Pergande notes record the
emergence of the same numbers of specimens of chalcids from lot 2964 on the same dates. There probably was a variety of parasites among the 11 specimens of chalcids reared from the galls, but so far I have been able to find only the *Torymus* specimens in the U. S. N. M. collection.

I have quoted the Pergande notes almost completely because the information in them makes it possible to identify the gall from which the type specimens of *pilularidis* came. The larvae described are certainly those of a *Torymus*, but the description of the gall applies readily to the cecidomyiid *Rhopalomyia californica* Felt. This identification of the host gall is confirmed by the fact that there are now specimens of *R. californica* in the U. S. N. M. collection that bear the Bureau accession number 2964, and Doutt (1961, Ann. Ent. Soc. Amer. 54: 51) has also confirmed this through rearing *pilularidis* from *R. californica*.

There still remains the question about why these parasites of *Rhopalomyia californica* were designated *Isosoma*? in the old records. The answer seems to be that, in the 80's, *Isosoma* was a genus to which all phytophagous chalcids were referred. Pergande was of the opinion, as indicated in the above quotation, that the galls of *Baccharis* he had received might have been produced by a chalcid, rather than by a cecidomyiid. This guess was not altered in the Pergande notes later when cecidomyiids were reared from the galls.

It is to be hoped that the mythical *Prosoma*, as the host of *Torymus pilularidis* (Huber), can now be eliminated from the literature.
Further Notes about Lost Butterfly Types of W. H. Edwards, and the Designation of a Neotype for Coenonympha kodiak Edwards *

F. Martin Brown, Fountain Valley School, Colorado Springs, Colorado

In the Entomological News for December 1962 I published a resumé of notes about Edward's lost types that I had found in the correspondence between W. H. Edwards and W. J. Holland at the time Edwards's collection was being transferred to Holland. The three major losses were a box sent to Dr. Behr, a box sent to Dr. Scudder and a box sent to Dr. Speyer. Of the last of the three I found details of the loss in Edwards's manuscript entomological journals and reported it in the Entomological News for January 1964. At this time I can give some details of the other two losses. These are from letters that W. H. Edwards wrote to Henry Edwards, and which are now in the Library of the American Museum of Natural History and are a treasure trove of information.

Material Lost in a Shipment to Dr. Behr

A series of letters written in late 1870 present all of the details known about this loss. These details are best told in Edwards's own words by quoting the letters themselves. The pertinent parts of the original letter to Henry Edwards referring to the shipment follows:

"Coalburgh, W. Va.,

Oct 12 1870

Henry Edwards Esq
San Francisco

Dear Sir

I have packed a box contains 6 small boxes of Insects & directed same to Dr. Behr, advising him there of & of contents. This will be forwarded by express overland this week.

*This paper is a by-product of my studies of W. H. Edward's types being made under X. S. F. Grant GB-194.
In said box are 2 for you, one containing 3 pairs of the best Dianas of the season & 1 pair of Marcellus raised by me from eggs laid by Ajax.

In the other box are several of your insects marked “to be returned etc”. With these are two species of Lycaena, viz. \( \delta \) \( \Omega \) L. Behrii Edwards and \( \delta \) \( \Omega \) L. Shasta Edw. These to be returned to me. I rcd these several years ago from Dr. Behr & named them. Since then I have not seen them in any lot sent me. I do not find them in Boisduval’s last paper. You must know them & it is possible that Behr has named them also. Please see about this & let me know.

I have returned Dr. Behr his Melitaeas Gabbii, Whitneyii & Montana. I have neither [sic] of these specimens in my collection & am very anxious of having them, if you or the Dr. have duplicates.

Same with Colias Edwardsii & C. Emilia, both which I return. By the way I doubt if these are not one species. Look carefully & give me your opinion.

I send a lot of moths to be divided between Dr. B [Behr] and Mr. Stretch, the latter to have the Bombycidae & the Sphinges. I hope to receive from Mr. Stretch drawing of larvae of the Papilios, which he wrote me he had.

Yours truly
/s/ W. H. Edwards"

In a letter dated November 29, 1870, Edwards wrote “I have had no advise from Behr or yourself of the receipt of the box which I sent 6 weeks ago to him by express.” A week later, December 6, 1870, he wrote “I was glad at last to hear of the arrival of the box sent Dr. Behr early in October of which your letter of 27th ult. I only sent one [error: he sent two] box of the 5 to you and exactly which of your uniques I put in it I do not recollect. There were several small Lycaenidae and such others as I had.”

The full details of the shipment constitute a letter that was written a few days later:
Henry Edwards Esq
San Francisco

Dear Sir

I received a letter yesterday from Mr. Stretch that enlightened me as to the matter of the box of insects and has led me to examine mine carefully. When I read your letter three or four days ago I did not understand that none of your Lycaenae came, but thought you might have expected a fuller return of them and other specimens. I referred to my memorandum of shipment and concluded I had sent you but one box. But on thinking on the matter I am confident I sent your Lycaenidae in a small sized cigar box, purposely separating them from any danger of breakage from the bodies of the larger insects. I enclose you the original memorandum made on packing the boxes and there is nothing in it indicating whether one or [two] boxes contained your insects. I however wrote you and Dr. Behr exactly what was coming, and he will show you my letter. You may suppose if you like that (in case one box was spirited away) there must be entomological expressmen on the route. Why the box was a month on the road I do not understand. I had no advise of it til I received your letter. I have looked again over my boxes here and the only Lyc. & Theclas now here with your numbers on are as follows 266, 97 (two), 116 (two). The 116 a Thecla, the others are Pheres in my opinion. One Thecla marked Downieville, no No., but Saepiolus I consider it—96 (four) Antiacis, 99 orcus. Every other one went back, and with them ♂ ♀ of L. Behrii & ♂ ♀ L. Shasta, both my own & to be returned to me.

I recollect particularly a pair of Dryope and Lyc Mintha ♂ ♀, but I do not remember the others. I see by referring to the mss of my last descriptions that in same lot were L. Embla, L. Eunomia, Chrys. Hyllus. I am very sorry indeed about this. Apart from the loss of your type specimens I shall be very sorry to lose my two, as I had no duplicates of them. The boxes containing Moths & Sphinges were packed in good con-
diction and if they were damaged on the way the box must have had very rough handling. But that no broken bodies only wings should have been in the boxes when opened is very odd indeed. I should have directed the large box to you if I had not thought it possible that you might be absent or more in-accessible than Dr. Behr, and I wanted Mr. S [Stretch] to get his especially. I shall await your farther letters with much curiosity and some anxiety. But Dr. Behr will show you my letter respecting the contents of large box.

Yours truly
/s/ W. H. Edwards"

The original memorandum of shipment that was enclosed with this letter follows:

"Sent Dr. Behr Oct 11 1870
2 boxes small moths for self & Stretch (marginal note at left: "retain Ariadne & Satyrus Gabbii")

1 " Catocalas & Sphinges & Noctuas
1 box contd his own species, viz,

3 Colias Edwardsii 2 C Emilia
1 Lyc. regia
1 pair Lyc Lorquinii
1 Lyc fuliginosa
1 pair L. paradalis
1 T. Sylvinus
2 (pair) An. Angelina
1 pair M. Montana: do Whitneyii : Gabbii :

These I would like duplicates of

Sent H. E. several of his small butterflies and 3 pairs
Diana & 1 pr Marcellus from Ajax eggs. Also my specs, of
Lyc. Behrii ♀♂ & L. Shasta ♀♂ to be retd."

From this memorandum the following losses of types is clear: *Lycaena behrii* Edwards, *Lycaena shasta* Edwards from Edward's own collection; *Lycaena mintha* Edwards and possibly *Syrichitus petreius* Edwards described at the same time as
mintha. The pair of *Thecla dryope* that was lost probably was the pair noted on pp. 193-4 in the *Transactions of the American Entomological Society* for 1871, and not the type. The type of *Chrysophanus hermes* Edwards may have been lost at this time since it was described in the same paper as was *dryope*. Along with these were the types of the three manuscript names that never were published.

Edwards’s recollection apparently was faulty when he included in his letter to Holland as lost in this shipment the types of *Lycaena amica* and *pembina* (see Ent. News 83: 266, 1962). I suspect that these were lost in the shipment to Scudder.

**Material Lost in a Shipment to Dr. Scudder**

I have searched the Edwards letters in the Library of the Museum of Comparative Zoology at Harvard University, Cambridge, Massachusetts, and cannot find Edward’s letter to Scudder about this shipment. There is one in the Henry Edwards collection of letters in the Library of the American Museum of Natural History.

"Coalburgh, W. Va., 17 Jan. 1875

H. Edwards Esq. San Fr.

Dear Sir.

It is nearly certain that a box of butterflies sent by me to Scudder 6th Jan. per express was burned in a collision north of Washington the night of 7th when all the mail & express matter were destroyed. This box contained many uniques & it will be impossible to replace part of them. Among others were the ♀♂ of Hylas figured on my unpublished Plate & which I would not have taken $50 for so long as they were uniques. My types of Oreas ♀♂, & of Silenus. (These last the ones figured.) Coenonympha Kodiak. This I had from you, I think & was my only specimen. It may be so you can help me to replace this last & some of the others, if not now, during the season & I write to ask you to have me in mind. I also lost the uniques ♀♂ Arg. Epione, not figured, a ♀ Arg Nausicaa (Arizona) my best Pap. Bairdii ♀ (if it is Bairdii),
Erebia Haydeni a unique Satyrus like Nephele from Hayden's collection & another from Arizona & all the new species of Wheelers Ex 1874. In some cases I have duplicates, but several were uniques. So I returned Scudder's Chion Calif* given him by Dr. Boisduval & his specimens of Asteroides (& 2 of my own taken in Mississippi). In short the loss leaves quite a gap in my collection and lamentations are useless. He had asked for several uniques, Arg. nitocris, Bischoffii, etc. etc. but I refused to send them but at last moment concluded to put in Bairdii & Epione & some others. As Nitocris is handsome as Nokomis it was lucky I held to that.

I wish much to know whether you have descd the Labache [Lahache] Colias for if you have not & do not intend to, I will. But if you do I shall be glad to have you. Cresson is dunning me for copy in order to make out a form of 8 pages of my present paper & since I have lost the Arizonians, I am hard up for material. I should put in Labache Colias to help. It is long since I have heard from you

Yours truly
/s/ W. H. Edwards"

From this letter I gather that the types certainly lost are these: Edwards's undescribed Argynnis, Grapta hylas Edwards, Grapta orcas Edwards, Grapta silenus Edwards, and Coenonympha kodiak Edwards. From Edwards's letter to Holland (Ent. News l.c.) it appears that the types of Hesperia yuma and possibly of Lycaena amica and pembina were lost at this time. Scudder was particularly interested at this time in Hesperids and butterflies from Canada. What other types of Wheeler material disappeared in the fire I do not yet know.

News of the loss of Edwards's sole specimen of Coenonympha kodiak came as a complete surprise to me. I had seen no hint of this loss in any of Edwards's papers, printed or manuscript, that I had read. I received the information after reading the galley proofs of my study of Edwards's types of Satyridae. A paragraph was written hastily to be inserted in that paper calling attention to the situation and to this article but the galleys
had been paged and sent to press. In the Satyridae paper I had designated and figured what had appeared to be the holotype of *kodiak*. This now must be considered a neotype.

**A Neotype for Coenonympha kodiak Edwards**

In light of the positive evidence that the type of *kodiak* was destroyed by fire on the 7th of January, 1875, I hereby declare as neotype for that name the specimen accepted as the holotype by Davenport (1941) and by Brown (1964a). Taxonomic support for the selection of this specimen will be found in Davenport’s paper. Both of us have compared the specimen in detail with the original description and there is no question in our minds that the specimen in question is accurately described by the original description of *kodiak* by Edwards (1869). The specimen is figured (Fig. 3) by Brown (*l.c.*). I believe that the specimen figured was sent to W. H. Edwards by Henry Edwards in response to the letter quoted above and was a member of the lot from which the holotype originally had been taken. The specimen cannot truly be considered a lectotype since there is no evidence that W. H. Edwards has based his original description upon any but the single specimen originally sent him by Henry Edwards.

**References**


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Curculionidae of the genus Curculio (formerly Balaninus) wanted for revisional study. State locality and "nut tree" found on if at all possible. Kenneth E. Weisman, 4 Balmoral Ave., Bartonville, Illinois.

Syrphidae. Exchange or purchase. Will collect any order or family in the New England area. F. C. Thompson, Dept. Entomology, University of Massachusetts, Amherst, Mass.

Membracidae wanted. Purchase or exchange. T. L. Stringfellow, Military Reservation, Box 11-A, Hudson, Massachusetts.

Buprestidae, Scarabaeidae, and butterflies wanted in exchanges for beetles and butterflies. Mr. W. van der Starre, 25 Crawley St., Warrnambool, Victoria, Australia.

Butterflies of the World wanted for exchange for those of my locality. Louis Clarke, 10435 Georgetown Drive, Rancho Cordova, California 95670.

Research Assistant in Butterflies wanted at Carnegie Museum for 1965-66; $2400 plus partial tuition in Graduate School, Univ. Pittsburgh where he must be accepted as a Ph.D. candidate. Send personal data to Dr. Richard M. Fox, Carnegie Museum, Pittsburgh, Pa. 15213, except between Dec. 1 and Mar. 1 when data should be sent to Dr. Fox at British Museum (N.H.), Cromwell Road, London S.W. 7, England.

Scoliidae of the Neotropical Region, Africa, or Madagascar wanted for study, determination, exchange, or purchase. J. Chester Bradley, Comstock Hall, Cornell University, Ithaca, N. Y., 14850.

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Larinocerus balius, a New Genus and New Species of Plant Bug from the United States (Hemiptera: Miridae)

RICHARD C. FROESCHNER *

Among the unidentified Miridae in the Smithsonian Institution were two series of a strongly marked and, surprisingly, apparently undescribed Californian mirid. Following Carvalho's (1955) keys, the lack of arolia, absence of a pronotal collar, and structure of the male external genitalia place it in the tribe Phylini; within the tribe the pale color of body and coria coupled with the modification of the third antennal segment (swollen and with large flattened hairs) run it to Hambletoniola Carvalho (1954) from Mexico.

The relationship between Hambletoniola and the present new genus is quite close, as shown by the following enumeration of characters shared by both: antennal segments II and III with large flattened hairs; vestiture of head and pronotum of long, pale, suberect hairs intermixed with recumbent, golden, scalelike hairs; femora and tibiae dull white with fuscous spots; and pseudarolia reaching well beyond midlength of tarsal claws.

For a time I considered the new species as a member of Hambletoniola, but on closer examination I found the following important differences which, in the tribe Phylini, clearly demark this as a distinct genus. Hambletoniola has 1) diameter of antennal segment II subequal to or less than diameter of segment III; 2) vertex twice as wide as one eye; 3) costal margin convex from base to midpoint, thence straight. In contrast, this

* Smithsonian Institution, Washington, D. C.
new genus has 1) diameter of antennal segment II distinctly greater than that of segment III; 2) vertex wider, its width about three and a half times that of an eye; and 3) costal margin convex from base to apex.

**LARINOCERUS, new genus**

**Diagnosis:** The greatly inflated and polished black second and third antennal segments with their broad, flat, scalelike pubescence separate this genus from all others in the subfamily Phylinae; and from all other genera of the family in North America (Fig. 1).

**Description:** Male. Overall length, 3.0-3.2 mm; ovoid; head, pronotum, and to a lesser extent the coria, with numerous easily abraded, suberect pubescence intermixed with golden, flattened, recumbent hairs. Head transverse, moderately inclined, clypeus distinctly surpassing juga; eyes moderately large, transverse diameter of one of them less than one-third of interocular width of vertex. Antennal fossa distinctly separated from eye. All antennal segments inflated and, except fourth, polished fuscous to black; all segments with numerous decurved dark hairs and segments II and III with numerous long, flattened, scalelike hairs; segment II thickest. Labium reaching between or only slightly surpassing middle coxae.

Pronotum transverse, about twice as wide as long, impunctate; angles rounded; calli obsolete; lateral margins blunt, not carinate; mesonotum broadly exposed.

Hemelytra opaque; costa convexly curved for full length, distinctly emarginate at cuneal fracture; clavus widening posteriorly; embolium set off by a groove only on basal half; prosternal margin straight; membrane with two areoles.

Legs relatively short, hind femora reaching about three-fourths of abdominal length; all femora compressed, posterior pair much taller than others; all femora with numerous, close-set fuscous spots of various sizes, hind femur also with a larger subapical pair (sometimes fused) dorsally and three very large

---

Fig. 1. *Larinocerus balius* new genus and new species.
ones on ventral surface; tibiae pale, with numerous prominent fuscous spots on dorsal surface, these encircling insertions of the dark tibial spines; tibial spines dark, their length greater than tibial diameter; tarsi long, more or less cylindrical; pseuderolia large, reaching well beyond middle of claws.

Type of genus: *Larinoecerus balius*, new species.

The generic name is derived from Greek: *Larinos*, meaning fat; and the masculine *keros*, meaning horn.

**Larinoecerus balius**, new species (Fig. 1)

As the only member of the genus, this species is easily recognized by the strongly modified second antennal segment which delimits the genus within the subfamily. (All measurements in following description given in millimeters.)

**Holotype:** Male. Length to tip of membrane 3.04; width across humeri, 1.12. Head: length, 0.30, width, 1.00, interocular width, 0.66. Antennal segments, I, length 0.20, diameter, 0.11; II, length, 0.60, diameter, 0.16; III, ovoid, length 0.26, diameter, 0.10; IV, length 0.26, diameter, 0.06. Pronotum: length, 0.53, width, 1.10.

Color: dull grayish white with numerous rounded brown to fuscous spots scattered over base of head, pronotum, mesoscutum, scutellum, corium (except basal angles), pleura and venter of abdomen (except broad median strip); membrane chalky white with a prominent, oblique, blackish spot just posterior to apex of cuneus, veins slightly yellowed; antennal segments I, II and III polished brownish black, IV reddish brown on basal two-fifths and pale yellow apically.

Female: very similar to male in form, color and measurements.

**Holotype male and allotype female:** south of Palmdale, California, June 8, 1935, P. Oman (U.S.N.M. type No. 67449). **Paratypes:** five males and ten females with same data as holotype; two males and two females, Los Angeles County, California, Coquillet collector. The species name is from the Greek *balios*, meaning spotted.
All specimens have most of the vestiture rubbed off, but enough patches remain on different places on several individuals to allow confident placement of this genus among those with the mixture of two types.

In comparing *L. balius* with the original description and type of *Hambletoniola antennata* Carvalho (1954) an error in the description of the latter was noted. The colors credited (p. 126) to antennal segments II and III actually refer to segments III and IV.

Unfortunately, no host information was available but the dull white color suggests that this insect frequents plants with pruinose white leaves, such as are found on many species of *Artemesia*.

References


A Second Specimen of Neochrysops globosus Walton. (Diptera, Tabanidae)

L. L. Pechuman, Cornell University, Ithaca, N. Y.

A miscellaneous lot of undetermined Tabanidae recently received from the Illinois Natural History Survey through the kindness of Dr. H. H. Ross and Mrs. Leonora K. Gloyd included a single specimen of *Neochrysops globosus* Walton. Both genus and species are based on a single specimen collected by Robert Fouts at Cabin John Bridge, Maryland, 20 July 1916 and described by Walton in 1918.

In 1947, Walton pointed out that after 28 years the specimen he described remained unique although competent collectors had attempted to secure more specimens at the type locality.
Walton separated *Neochrysops* from *Chrysops* by the more slender antennae, evenly infuscated wings, spur vein at the fork of the third longitudinal vein and globose abdomen. Also distinctive is the very large protuberant frontal callus, the rather marked convergence of the frons above and the slender palpi. The structure of the frons and antennae and the wing infuscation is reminescent of certain Ethiopian *Chrysops* and this resemblance is further heightened by the bright yellow stripes on the thoracic dorsum; some of the Ethiopian species also have a spur at the fork of the third longitudinal vein. The writer believes these similarities do not necessarily indicate a relationship with the Ethiopian *Chrysops* fauna and certainly the broad abdomen, which is wider than the thorax, is unique.


The Tennessee specimen does not differ in any essential way from the description given by Walton. The callosities are dark brown rather than pitchy black and the spur at the fork of the third longitudinal vein is barely indicated in the left wing and is absent in the right wing. The frontal callus is protuberant and very large, nearly touching the ocelli; the palpi are more slender than in any *Chrysops* known to me; the abdominal tergites have rather long black hairs on the extreme lateral margins. The length of the specimen is 9 mm.

**References**


Lepidoptera Records for Southeastern Pennsylvania

ARTHUR M. SHAPIRO, 7636 Thouron Ave., Philadelphia, Pa. 19150

Despite the long history of collecting in and around Philadelphia, the Lepidoptera of that region are still but imperfectly known. This is borne out by the relatively large number of species taken recently in the area that have not been cited in the literature as occurring in the southeastern counties. A number of new State records and records for the eastern half of the State have also been obtained. The more important of these records are presented in this paper.

County abbreviations: PH—Philadelphia; BU—Bucks; CH—Chester; DE—Delaware; MO—Montgomery.

*—indicates new State record; **—new record for Eastern Pennsylvania. ***—probable stray or immigrant.

Family LYCAENIDAE

***Panthiades m-album (Bdv. & Lec.) PH: Mt. Airy, IX.10.60.

***Calycope cecrops (Fabr.). PH: Mt. Airy, IX.10.60; Cresheim, VIII.29.61. DE: Glen Mills, VIII.IX.62 (3); Cheyney, VIII.5.58, VIII.7.62. (*)

Satyrium caryaevorus (McD.). PH: Mt. Airy; Wissahickon; Burholme; Cobb’s Creek. MO: Norristown. BU: New Hope. Late VI–early VII, not rare.

Satyrium acadica (Edw.). MO: Cheltenham; Schwenksville. Late VI–early VII, rare and local.


Family HESPERIIDAE

Thorybes confusis Bell. DE: Cheyney, early VII. (*)

Erynnis zaryucco (Lucas). DE: Marcus Hook; Chester; Cheyney; Dilworthtown, late VII and IX, generally rare.

Hesperia metea Scudder. PH: Cresheim; Wissahickon. MO: Cheltenham; Valley Forge; Fort Washington. Mid V, locally quite common. Reported also from CH: West Chester. (*)

Hesperia attalus (Edw.). DE: Glen Mills, VIII.8.62. (*)
Euphyes conspicua (Edw.). PH: Chestnut Hill, early VII, rare.


Atrytone arocus (B. & L.). BU: Feasterville, early VII, rare. (*)

Atrytonopsis hianna (Scud.). BU: Cresheim; Wissahickon. CH: West Chester. Late V–early VI, very local, with metea. (*)


***Oligoria maculata (Edw.). DE: Marcus Hook, IX.15.60. (*)

***Calpodes ethlius (Stoll). DE: Marcus Hook, VIII.19.62; Clifton Heights, IX.15.57. (*)

Family PIERIDAE


Family SPHINGIDAE


Lapara coniferarum (S. & A.). DE: Cheyney, VII.4.61. (**)

Smerinthus cerisyi (Kirby). CH: Devon, VII.28.61. (*)

Celerio intermedia Kirby. MO: Norristown, VI.29.62. (**)

Family CITHERONIIDAE

Citheronia sepulchralis Grt. DE: Cheyney, VII.5.59. (**)

Family ARCTIIDAE

Phragmatobia fuliginosa (L.). MO: Audubon; Plymouth Meeting; Norristown; Erdenheim; Flourtown. BU: New Hope. Mid VI to early IX, not rare locally.

Apantesis virgo (L.). MO: Montgomeryville, VIII.4.62, VII.30.58, VIII.8.64. CH: Devon, VIII.5.60 (2).

Family LITHOSIIDAE

Cisthene tenuifascia (Harv.). DE: Marcus Hook, VII.9.60. (*)

Cisthene packardi (Grt.). DE: Marcus Hook, VII.8.61. (*)
Family NOCTUIDAE

Porosagrotis vetusta (Wlk.). PH: Mt. Airy, X.4.64. MO: Flourtown, IX.8.62, IX.20.64. (**)
Metalepsis salicarum Wlk. MO: Audubon, IV.1.63.
Choephora fungorum G. & R. Common generally in the 5-county area. Mid IX to XII, mostly early-mid X. (**)
Polia purpurissata (Grt.) MO: Norristown, IX.2.63.
Polia imbrifera (Gn.). MO: Audubon, VIII.29.63.
Sideridis congermana (Morr.). MO: Norristown. BU: Doylestown; Chalfont. VII and IX, scarce.
Orthosia garmani (Grt.). MO: Norristown; Conshohocken. IV, scarce. (**)


***Leucania latiuscula H.-S. DE: Marcus Hook, IX.5.60.


Septis impalsa Gn. MO: Audubon, VII.21.64.
Papaipema necopina (Grt.). MO: Norristown. DE: Dilworthtown. IX–X, rare. (**)

Lemmeria digitalis (Grt.). MO: Conshohocken, IX.11.62. (**)

Nonagria oblonga Grt. MO: Norristown, VIII.24.60.

Conservula anodonta Grt. MO: Conshohocken, VI.6.63. (**)

***Magusa orbifera Wlk. MO: Norristown, X.15.60; Flourtown, IX.8.64.

Fagitana littera (Gn.). DE: Rosemont, VII.8.63.

Stiroides obtusa H.-S. MO: Flourtown, VII.19.64. (**)

Derrima stellata Wlk. DE: Rosemont, VII.16.63. (*)

Basilodes pepita Gn. MO: Norristown, VIII.22.61, VIII.17.60.

Cirrhophanus triangulifer Grt. MO: Flourtown, VII.17.63.

Eutelia pulcherrima Grt. MO: Montgomeryville, VI.6.63; Flourtown, V.23.64, VI.2.63; Norristown, V.24.64; Erdenheim, V.21.64, VI.10.64 (2). (**)

Paeectes oculatrix Gn. MO: Norristown, VI.27.62.


Abrostola ovalis (Gn.). DE: Media, VI.22.60. (*)

Autographa contexta (Grt.). MO: Audubon, IX.4.63. (**)

Chrysanympha formosa Grt. BU: New Hope, VI.24.60, VI.17.62. (**)

Eosphoropteryx thyatiroides (Gn.). MO: Audubon, VII–VIII, rare.

Plusia balluca Gey. MO: Flourtown, VIII.9.60.

Catocala andromedae Grn. MO: Norristown, VII.27.61, VIII.8.61.
Catocala serena Edw. MO: Norristown, VII.20.60; Montgomeryville, VIII.8.64.
Catocala habilis Grt. DE: Glen Mills, VII.15.64.
Catocala nebulosa Edw. MO: Norristown, VII.28.60.
Catocala concumbens Wlk. PH: Chestnut Hill, VI.29.61.
***Erebus odora (L.). MO: Norristown, IX.15.61.
Calpe canadensis Beth. MO: Fort Washington, V.27.64.
Scoleccampa liburna (Gey.). MO: Horshav, VI.28.61.
***Ophiuche minualis (Gn.). DE: Cheyney: Marcus Hook; Rosemont. IX, rare. (*)
Celiptera frustulum Gn. MO: Flourtown, VIII.7.60.
***Ptichodis vinculum (Gn.). DE: Rosemont, VIII.5.58.
(**)
***Ptichodis lima (Gn.). PH: Wynneweld, IX.5.53. (**)

Family NOTODONTIDAE

Heterocampa astarte Dbl. DE: Media, VI.26.62. (*)

Family LASIOCAMPIDAE

Artace cribraria (Lj.). DE: Glen Mills, VII.28.64.

Family DREPANIDAE

Falcaria bilineata Pack. MO: Audubon, IX.1.63. (**)

Family GEOMETRIDAE

Enconista dislocaria Pack. DE: Cheyney, V.6.60. (*)
Mellilla xanthometata Wlk. MO: Conshohocken, IV.19.64. (*)
Phigalia olivaceaaria Morr. MO: Flourtown, III.30.64, V.9.64. (**)
Xanthotype rufaria Swett. DE: Chester, VII.2.59. (*)
***Sphacelodes vulneraria (Hbn.). MO: Flourtown, X.11.62. (*)
Cosymbia culicaria Gn. MO: Erdenheim, VII.64 (3). (**)
Eupithecia anticaria Wlk. MO: Erdenheim, VII.4.64.

Family THYRIDIDAE

Dysodia oculatana Clem. MO: Flourtown, VII.6.64. (**).
Notes and Descriptions of Bombyliidae (Diptera)

FRANK M. HULL, University, Mississippi

Several species of the genus *Eclimus* Loew have accumulated in the collection of the author and appear to be undescribed. There is a group of western and Mexican species which are unusually slender and have a varying pattern of spots upon the wings. Such is *Eclimus fascipennis* Williston, described from the state of Guerrero, Mexico, illustrated by Williston. All of the members of this group, which includes *Eclimus lecchi* Hall, appear to have an orange yellow or reddish brown genitalia in the females, which is enclosed by bright golden or reddish brown reddish hairs. The males and females may differ in the wing pattern in some of the species. All material collected by the author, and Mrs. Hull.

**Eclimus culiciformis**, new species

Length 7–11 mm.

This species must be related to *Eclimus lecchi* Hall which was described from 3 females, which had been reared. The palpus is one-third or less than the length of the proboscis. The antennae are black setiform pilose both above and below. The mesonotum has a well developed and conspicuous median stripe of cinnamon brown pollen down the middle, and the wings are patterned in the female, with quite dark brown spots in an arrangement more or less similar to *Eclimus lecchi* Hall. The male wing is quite different.

Head black with grayish white pollen on the front and a narrow, medial stripe of black pollen, which does not reach to the antenna. Sides of vertex with reddish or sepia brown pollen. Palpus from one-fourth to one-third the length of proboscis, the latter about three and one-half times as long as the head. Face polished and bare, with no protruding pile. Mesonotum black, widely bluish gray pollinose along the sides. Pleuron graying white pollinose with white pile. Legs slender, the femora nearly or quite black, the tibiae and tarsi varying from very dark brown to more of a medium reddish brown; pile of legs blackish, with appressed silvery pile beneath the femora. Wings of female with dark brown pattern in whole of first 3 cells and anterior half of first submarginal cell, excepting the base of the latter. This brown area along the first submarginal cell connects broadly with a spot lying on each
side of the base of the second submarginal cell, but not extending into the first posterior cell. Other equally dark spots present upon the discal cross vein, the middle of discal cell and cross vein at end of second basal cell. Male wing lightly brown in the first 3 cells, darker on the outer half, but clearing at the apex. There is a small extension of brown to the anterior cross vein, which is narrowly margined by brown. Abdomen similar to other members of the group in coloration and pile.

Holotype, male, Patagonia, Arizona, August 24, 1962. Allotype, a female; and 8 male and 5 female paratypes with the same data.

**Eclimus maculipennis**, new species

Length 9–13 mm.

Related to *Eclimus fascipennis* Williston, but it differs in the wing pattern which is much more extensive.

Male. Head is black, proboscis two and one-half times as long as the head; palpus one-fourth as long as head. Front black, with grayish white pollen and shining black triangle in the female. Antenna black with short black pile above and below. First segment twice as long as second segment. Mesonotum shining black with numerous, strong tubercles in the males; sides greyish white pollinose, and with several reddish bristles in front of the wing. Pleuron grayish white pollinose with white pile. Wings dark brown beyond the anterior cross vein, the base of both submarginal cells and the first 3 posterior cells hyaline in the middle; end of discal cell margined with brown. Costal, subcostal cells on basal half and anterior margin of first basal cell on basal part light reddish brown. Femora sepia brown with light brown, scaliform, appressed pile; tibiae and tarsi lighter reddish brown with black pile. Abdomen shining black with bluish reflections, white pile basally on the sides, scanty black pile apically.


**Eclimus halli**, new species

Length 12 mm.

Head black, the face shining with long, pale pile extending from the sides opposite the antenna. Proboscis long and slender.
the palpus only one-fifth as long. First segment of antenna two and one-half times as long as the second, both with long, shaggy, blackish pile. Whole of the short front dark sepia brown and similarly pollinose. Thorax black; pteropleuron and meta- pleuron dark reddish brown and bare; mesopleuron with long, whitish pile. Mesonotum black with scattered, appressed, silky hairs, the margins in front of wing with bright, golden, appressed pile. Scutellum reddish brown with scattered whitish hairs. Wings with anterior half lightly tinged with brownish yellow; on the outer part of the wing beyond anterior cross vein the color is more brown rather than yellow. Second submarginal cell only diffusely margined anteriorly. Legs light reddish brown, becoming more yellowish brown on tibiae and tarsi; the appressed pile is pale, especially on the dorsal aspect of hind femur; tibial bristles black. Abdomen dully brownish black, expanding somewhat distally; the first 3 segments are ringed apically with bright, golden pile; the next segment with silver pile, and beyond the pile is bushy and brownish black changing to a brownish yellow straw colored pile distally.

Holotype, male, Tepotzlan, MEXICO, September 7, 1951.

Entomological Departments

The News, as in the past, will continue to solicit articles such as the present one and giving information on the state of entomology in universities, museums, and other groups.

The Catholic University of America

The Department of Biology, headed by Dr. Ross H. Arnett, Jr., is expanding its curriculum in entomology. Dr. Sergey Polivanov, a student of Dr. Dobzhansky, has joined the faculty, as a population geneticist, and in the fall, Drs. George M. Happ, a student of Dr. T. Eisner at Cornell, and Lee D. Miller, a student of Dr. Fox at Pittsburgh will join the faculty. A full range of courses in systematic biology is offered (aided by a plant taxonomist and biometrician, and a plant morphologist). The University's location, in Washington, D. C., with its easily available collections and libraries, is especially desirable for graduate students in systematic entomology.

(Continued on page 104)
The Pterotinae (Coleoptera: Lampyridae)

FRANK A. MCDERMOTT, Wilmington, Delaware

In my Taxonomy of the Lampyridae (1964) the subfamily Pterotinae is composed of two genera, Pterotus LeConte and Harmatella Walker, which are widely separated geographically. Through the courtesy of Mr. J. W. Green, California Academy of Sciences, and Miss C. M. F. von Hayek, British Museum (Natural History), I have been able to make a comparative study of Pterotus obscuripennis LeC. and Harmatella bilinea Walk. While Pterotus is considerably larger than Harmatella the two species are similar in several characters. In both the pronotum is strongly convex with but little lateral margins; in both the head is only partially covered by the pronotum, most of the eyes being visible from above; both have a small nick or indentation of the edge of the pronotum just forward of the posterior angles, and the anterior angles are obliterated. The antennae have eleven articles, each article from 3 to 10 bearing a ramus; the large antennal sockets are forward of the eyes and not contiguous; there is at least an obsolete suture between the clypeus and the front. The trochanters are attached obliquely to the femora; the inner edges of the metepisterna are not sinuate; the abdominal spiracles are dorsal. The mandibles are rather stout and not suddenly slender in the distal half i.e., not modified in the sense of Green, 1959, p. 89. The general trend of this combination of characters is to place both species in the Lampyridae. Unfortunately they agree in another point—the females of neither have been described and apparently not collected or identified.

However, Pterotus and Harmatelia differ in a number of characters. In the former the intermediate coxae are not contiguous but are somewhat separated by a sharp ridge between them; in Harmatelia they are contiguous. The antennal rami are attached to the articles by a broad base in Pterotus but narrowly at the distal ends of the articles in Harmatelia; in the maxillary palpi of Pterotus the terminal article is scarcely
thicker than the preceding ones while in *Harmatelia* the terminal is conoidal as usual in lampyrids. The labial palpi of both species have a simple, rounded terminal article, not crescentic or securiform. The scutelli are quite different. Perhaps the most pronounced difference is in the aedeagi, that of *Pterotus* (Fig. 1) being of the general form usual in Lampyridae while that of *Harmatelia* (Fig. 2) is markedly different.*

The antennal rami of both species are long, narrowly remiform, diffuse, not fan-folding. No distinct joint structure at the bases of the rami, like that between the articles, is present in *Harmatelia* but the narrow base apparently serves as a flexible hinge, allowing at least limited voluntary independent movement; in spite of the rigid base, voluntary and independent bending and relaxation of the rami would not be excluded in *Pterotus*.

The abdominal spiracles are in the pleural fold in *Pterotus*, but *Harmatelia* does not appear to have such a fold and the spiracles are dorsal, near the lateral edges of the segments.

Thus it appears that while in *Pterotus* and *Harmatelia* we have two quite different insects, they bear a considerable degree of similarity in some characters. Neither fits quite strictly to the accepted lampyrid characteristics and both have some suggestion of phengodid affinities. Combining them in the subfamily Pterotinae is admittedly arbitrary but nevertheless serves to bring them together as transitional forms.

There remains the question of luminosity. So far as I have been able to ascertain luminosity has not been observed or at least reported in *Pterotus*, and Dr. J. Gordon Edwards tells me that the adult males he has taken are nonluminous. LeConte (1859) said "None of the ventral segments are phosphorescent" but this may mean only that large luminous organs as in, e.g., *Photinus*, are not present. E. E. Green (1912) has illustrated

*It may be noted here that the aedeagus of *Phengodes (? laticollis)* is of the lampyrid pattern; 2.0 mm long, with a fine tube 9.0 mm long projecting from the median lobe. The aedeagus of *Mastinocerus texanus* LeC. is similar, the lateral lobes more slender. Neither of these species shows obvious indications of abdominal luminous organs, but that on the prosternum of *Mastinocerus* is clearly visible.
the distribution of the minute luminous spots in *Harmatelia*; these are primarily dorsal and are closely associated with the spiracles, but the light is visible from below. Examination of the ventral segments of *Harmatelia* shows low intumescences at the points shown as luminous by Green, sometimes with a dark central spot which in some cases appears to be the open end of a tube 0.025 mm or less in diameter (probably an artifact). These spots are surrounded by a granular mass suggestive of the cell masses at the luminous points on *Phengodes ♀* (Buck 1938, p. 400). Because of the shrinkage in drying the abdomen of *Harmatelia* is nearly flat and the cell masses may be actually just under the dorsal surface. They do not appear to be the "pores" at the points of muscle attachment (LeConte 1881, p. 33; McDermott and Crane 1911, p. 308 and 310); the points of muscle attachment were not distinguished in either *Pterotus* or *Harmatelia*.

Structures similar to those in *Harmatelia* and in approximately the same location and with similar subchitinous granular masses were present in *Pterotus* but in the absence of reported luminosity their function is doubtful. It is possible that both *Pterotus♂* and *Harmatelia♀*, like *Lucidota atra* and *Phengodes♂* have the ability to produce light only briefly after eclosion and this would be missed except under unusual circumstances and in darkness. Neither species shows any trace of the residual larval luminous organs on the 8th ventral segment as usually found in even non-luminous lampyrids. Sectioning of freshly killed and preserved specimens would be necessary to establish the structure, and observations on freshly emerged *Pterotus♂* in the dark are highly desirable, as well as the identification of the female.

Descriptions of *Pterotus obscuripennis* have been given by LeConte (1859; 1881) and by Fender (1962). LeConte (1859) thought it might be a drilid but later (1881) placed it in the

*Verbal information from the late H. S. Barber, which has been confirmed by Dr. James E. Lloyd. I have not been able to find that Barber published his observation.*
tribe Pterotini of the Phengodini; Fender puts it in the subfamily Amydetinae. Crowson (1955, p. 68) says that it would trace more easily to the Lampyridae than to the Phengodidae by his key, and on p. 171 he lists it among the Lampyridae.

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Fig. 1. Aedeagus of *Pterotus obscuripennis* LeConte. The general color is yellow, except the curving tips of the lateral lobes which are white, and the two sharp curved projections which are brown.

Fig. 2. Aedeagus of *Harmatelia bilinea* Walker. Entirely yellow except for the white tip of the median lobe.

In both figures: *V* is the ventral view, *L* is the lateral view, *D* is the dorsal view.
No complete description of *Harmatelia bilinea* appears to have been published; Walker's original description (1858) is very brief. I am therefore appending a description based on three specimens from the British Museum. Bourgeois (1909) described his *Haplogecis distincta* and *H. ceylanica*, which E. E. Green (1911) synonymized with *Harmatelia*, calling attention to differences between Walker's species *bilinea* and *discalis* and between specimens found at different localities in Ceylon.

**Harmatelia bilinea** Walker

Description of *Harmatelia bilinea* Walker based on three specimens from the British Museum (Natural History). These were very similar, 6.0–6.2 mm long by 2.0 mm broad; the length of the antennae varied, being 6.1, 6.65, and 5.85 mm long in the three specimens. Other dimensions given below are for a dissected specimen.

**Type locality, Ceylon.**

Pronotum 1.15 mm long by 1.71 mm broad, widest at posterior angles. Very convex with no flat lateral or anterior borders; lateral and fore edges slightly reflexed; base straight, edge thickened. Anterior angles obliterated; posterior angles slightly less than 90°, a little salient laterally due to an indentation in the edge of the pronotum just forward of them. Color mostly dark brown, lighter medially forward; thickened basal edge and areas around angles yellow. Finely granulose; median narrow channel. Villosity pale, appressed, fairly long at sides.

Scutellum triangular, not trapezoidal; broad, medially carinate in basal half, apex truncate; dark yellow, hairy. Meso-notal plates broad, dull yellow.

Head: Frons and mouth parts project forward, giving the effect of a short beak. The pronotum is bent downward and forward with reference to the axis of the body, resulting in the head being directed obliquely downward; this is also true in *Pterotus*, but due to contraction in drying, the position may not be that of the living insects. Frons dark brown between an-
tennal sockets; vertex nearly black, slightly concave medially. Antennal sockets large, yellow, in front of eyes, and not contiguous. Clypeus short, yellow, with a few stiff setae; a rather pronounced sulcus between it and the frons. Mandibles small, semicircular, tapering uniformly to tips. Maxillary palpi short, with the terminal article of the usual thickened conoidal form. Labial palpi short, terminal article simple, rounded, not crescentic. Frons 1.28 mm across eyes, 0.9 mm between them; eyes small and distant but protuberant.

Antennae of 11 articles, the second very short; 3 to 10 each with a narrowly remiform ramus 3 × or more as long as the article, attached at the distal end of the inner edge; 11 like the ramus on 10. Rami diffuse, not "fan-folding," bending at various angles from a "hinge" at the basal end. Color generally dark reddish brown to practically black.

Elytra 5.1 mm long by 0.77 mm broad as seen from above; subparallel, widest at base, narrowing somewhat posteriorly; deflexed over sides of body. Ground color dark brown, with a pale yellow oblique vitta, wide at base and attaining suture at midlength, continuing to apices; a narrow yellow border on external edge near apex.* Rugose, with a fine granulation between the coarser sculpture. Villosity pale, oblique; darker on brown portions; no secondary villosity observed. Only basal traces of epipleura, the edges of the elytra being slightly inflexed; two obsolescent costae on each elytron. Wings iridescent.

Thoracic sterna and ventral abdominal segments yellow; tergites reddish brown with yellow lateral borders. Inner edge of metepisternum slightly curved, but not sinuate; almost straight in another specimen. Posterior edges of ventral segments straight; 7th narrower than 6th; 8th very small, embracing the broadly ogival 9th.

Abdominal spiracles on the dorsal side of the segments near lateral edges; no distinct pleural fold.

Supposed luminous spots visible on ventral surface of abdomi-

* If the yellow is considered the ground color, Walker's description is equally applicable: "... elytris nigro bivittatis."
nal segments at the locations illustrated by E. E. Green (1912), as low intumescences with a dense granular appearance below the transparent chitin, and sometimes with a small central black spot. A similar structure is visible forward of the intermediate coxae, as shown by Green. No evidence of the residual larval luminous organs on the 8th ventral segment.

Legs rather long; mostly yellow. Trochanters attached obliquely to the femora; intermediate coxae in contact or very closely approximate. 4th larval article very small, bearing a small bilobed velvety pad.

Aedeagus: see Fig. 2.

Literature

Fender, K. M. 1962. in Hatch, Beetles of the Pacific Northwest, 3: 36, pl. xx, fig. 5.
Green, E. Ernest. 1911. Spolia Zeylanica 7: 212.

(Continued from page 97)

Founded primarily as a graduate school, this University has been granting Ph.D. degrees for 75 years, and has chapters of both Sigma Xi and Phi Beta Kappa. M.S. and Ph.D. degrees are offered and fellowships and assistantships are available. Among the facilities are mobile units for field research, computers, cobalt irradiator, and equipment for study of sound production in insects. Current and planned researches include taxonomy of Coleoptera and Lepidoptera, genetics of Drosophila and Tribolium, biochemistry of defense mechanisms in arthropods, isolating mechanisms in beetle speciation, and sound production in insects.
Description of the Eggs of Common Plecoptera of Western United States

ALEN W. KNIGHT, ALAN V. NEBEKER, and ARDEN R. GAUFIN, University of Utah

The eggs of stoneflies have received limited attention from authors such as Needham and Claassen (1925), Miller (1939), Hynes (1941), Brinck (1949), and Frison (1935), who have dealt, for the most part, with eggs of species not occurring in western United States. The need for specific identification of the eggs developed during the course of an investigation of the feeding habits of western stoneflies. The lack of descriptive material and means for specific identification of the eggs prompted the writing of the present paper.

In addition to their value in studies of feeding habits of stoneflies or of other aquatic organisms that feed on stonefly eggs, egg descriptions are often of value in the identification of species. Because stonefly eggs are highly variable in shape, reticulation, presence or absence of a collar, color, and relative size, they may serve as useful means of classification. Their usefulness in this capacity is acknowledged by Frison, who holds that "although in many groups it will be impossible to distinguish species on the basis of the eggs alone, they must not be overlooked as sources of evidence for natural groups of related species." He further states "where the eggs have not become specialized, a similarity may exist among many genera without meaning much more than common ancestry of some sort, but markedly different eggs obviously can never support arguments for close relationships." DeGrange (1960) also has recognized the importance of eggs for identification purposes and has used them to distinguish certain mayflies which were difficult to separate on the basis of morphological characters alone. He

1 This study was aided by a grant from the National Science Foundation, G-20703; a training grant from the Division of Water Supply and Pollution Control, WP-54; and a predoctoral fellowship from the Division of Water Supply and Pollution Control, WP-12,746.
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Fig. 1. Peltoperla brevis

Fig. 2. Pteronarcys californica

Fig. 3. Pteronarcella badia

Fig. 4. Nemoura californica

Fig. 5. Leuctra occidentalis

Fig. 6. Capnia uintahi

Fig. 7. Capnia columbiana

Fig. 8. Eucapnopsis brevicauda

Fig. 9. Isocapnia grandis

Fig. 10. Brachyptera nigripennis

Fig. 11. Arcynoptryx signata

Fig. 12. Isogenus elongatus

Fig. 13. Isoperla fulva

### Table 1. Description of Stonefly Eggs (Contd.)

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<tr>
<td><em>Kathroperla perdita</em></td>
<td>Honey</td>
<td>Oval</td>
<td>500</td>
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<td>Banks (Fig. 23)</td>
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<tr>
<td>VI. Family Perlidae</td>
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<tr>
<td><em>Claassenia sabulosa</em></td>
<td>Dark brown</td>
<td>Pear shaped</td>
<td>630</td>
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<tr>
<td>Banks (Fig. 24)</td>
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<tr>
<td><em>Acroneuria pacifica</em></td>
<td>Dark brown</td>
<td>Pear shaped</td>
<td>650</td>
</tr>
<tr>
<td>Banks (Fig. 25)</td>
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</table>
Fig. 14. Isoperla patricia
Fig. 15. Alloperla signata
Fig. 16. Alloperla borealis
Fig. 17. Alloperla pallidula
Fig. 18. Alloperla serrata
Fig. 19. Alloperla fidelis
Fig. 20. Hastaperla brevis
Fig. 21. Utaperla sopladora
Fig. 22. Paraperla frontalis
Fig. 23. Kathroperla perdita
Fig. 24. Claassenia sabulosa
Fig. 25. Acroneuria pacifica

Figs. 14-25. Eggs of Plecoptera.
says that, in such cases, immediate separation on the basis of eggs is often possible.

Methods and Materials

The eggs illustrated were obtained by various methods, the most simple and expedient being that of merely capturing females with extruded egg masses still intact. In some cases, however, it was necessary to take the adult females to the laboratory and allow them to extrude the egg masses later.

Another method used involved removing mature nymphs from their natural habitats and placing them in well-aerated beta tanks in an air-conditioned laboratory. Emergence, with attendant copulation and egg laying, could then take place. The beta tanks were covered with glass, except for two net cages which were inverted so as to allow the newly emerged adults to crawl up into the nets where mating occurred. Close observation enabled the authors to obtain the egg masses directly from the female. In some cases, mature eggs could be retrieved from members of the suborder Setipalpia in the last nymphal instar.

Every attempt was made to obtain living, mature eggs which were fully developed; but when these could not be obtained, the authors dissected preserved adults in order to prepare illustrations.

The Eggs

As stated above, stonefly eggs vary in size, shape, presence or absence of a collar, reticulation, and color. Egg size generally varies proportionately with the body size of the female. Color of the eggs ranges from colorless to a very dark brown. Presence of a collar is confined to eggs of the suborder Setipalpia. The chorion of the eggs consists of two distinct layers, the endochorion and the exochorion, which are often thick in appearance. The surface of the exochorion usually presents a sculptured appearance due to the pattern of the follicular epithelium which secreted it; it may be smooth or ribbed, or it may
possess appendages. In the Setipalpia, according to Brinck, the exochorion "is divided into two layers; of these, the outer layer forms the collar." The cavity of the collar is filled with a transparent, viscous substance that connects with or itself forms the anchor plate.

Living mature eggs were not always obtainable and the illustrations in the present paper do not show the temporary gelatinous membrane as illustrated by Brinck and by Hynes. In some eggs, this membrane is expanded away from the chorion shortly after the eggs are deposited in the water, presumably because of absorption of water into the space between the membrane and the chorion (Hynes). The gelatinous membrane may remain for as little as one hour, or it may persist a great deal longer. According to Brinck (1949), in the suborder Filipalpia, this membrane attaches the eggs firmly to the bottom.

Description of the Eggs

In the following section, a brief outline (Table 1) and illustrations (Figs. 1–25) are presented showing the eggs obtained in the course of our investigation.

Literature Cited


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* Deceased.
A New Subgenus and Species of Symbiocladius from South America (Diptera: Tendipedidae).

SELWYN S. ROBACK, Curator, Department of Limnology, Academy of Natural Sciences of Philadelphia

Through the courtesy of Dr. Pedro Wygodzinsky, American Museum of Natural History, I was able to examine a series of immature tendipedids and one female adult associated with mayfly nymphs. These specimens, representing a new species of Symbiocladius, were collected from Tierra del Fuego and Santa Cruz, Argentina. The immature stages develop dorso-laterally on mayfly nymphs of the genus *Thraulodes*? (Leptophlebiidae) in a manner similar to that of previously described *Symbiocladius* larvae and pupae. Certain adult characters (6-segmented ♀ antenna, hairy eyes, long pectinate empodium, subequal spurs on tarsi III) and the lateral development of the immature stages justify, in my opinion, the erection of a new subgenus for this new species. Table I compares some characters of the subgenera. Some figures of larval characters of *S. equitans* are also offered for comparison (Figs. 3–5).

The genus *Symbiocladius* s. str. is known from Europe (Fontaine 1964, Codreanu 1939, Šulc and Zavrel 1924), North America (Claassen 1922, Roback 1953), and Japan (Ueno 1930). This appears to be the first record of this genus from South America and from mayflies of the family Leptophlebiidae. All other records are from heptageniid nymphs. This latter family does not occur in South America.

Codreanu (1939) and Fontaine (1964) have adequately summarized the history and synonymy of *Symbiocladius* and it need not be repeated here.
The location of specimens is indicated after the localities given, (AMNH), American Museum of Natural History and (ANSP), Academy of Natural Sciences of Philadelphia. The letters (L) or (R) indicate whether the larva or pupa was on the left or right side of the mayfly nymph. Figures 1 and 2 are by Mr. Robert P. Moore, the remainder by the author.

I should like to acknowledge the help of Dr. James E. Sublette who provided me with notes on some characters of the type of *S. equitans* not given in the original description.

**Subgenus Symbiocladius** Kieffer


Type species *Phaenocladius rhithrogenae* Zavrel 1924, by original designation.

Included species *Trissocladius equitans* Claassen 1922

Eyes bare; antennal flagellum of female 5-segmented (*rhithrogenae*); spurs of tibia III very unequal or smaller spur absent; empodium short, not pectinate; claws with or without basal spines; immature stages under wing pads of nymphs of heptageniid mayflies; Europe, North America, Japan.

**Table 1. Comparison of some characters of Symbiocladius s. str. and Aceliatus n. sgn.**

<table>
<thead>
<tr>
<th>Character</th>
<th><em>Acelius wygodzinskyi</em></th>
<th><em>Symbiocladius equitans</em></th>
<th><em>S. rhithrogenae</em></th>
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</thead>
<tbody>
<tr>
<td>eyes</td>
<td>hair</td>
<td>bare</td>
<td>bare</td>
</tr>
<tr>
<td>female antennal flagellum</td>
<td>6 segments</td>
<td>—</td>
<td>5 segments</td>
</tr>
<tr>
<td>palpal segments</td>
<td>3 = 2</td>
<td>3 = 2</td>
<td>3 &lt; 2</td>
</tr>
<tr>
<td>spurs tibia III</td>
<td>almost equal</td>
<td>only larger</td>
<td>very unequal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>present</td>
<td></td>
</tr>
<tr>
<td>empodium</td>
<td>long, pectinate</td>
<td>short</td>
<td>short</td>
</tr>
<tr>
<td>basal spines on claws</td>
<td>3 long spines</td>
<td>1–2 fine spines</td>
<td>none</td>
</tr>
<tr>
<td>position of immatures on mayfly</td>
<td>latero-dorsally</td>
<td>under wing pads</td>
<td>under wing pads</td>
</tr>
<tr>
<td>lateral labial teeth, larva</td>
<td>5 robust</td>
<td>4–5 fine</td>
<td>5 fine</td>
</tr>
<tr>
<td>mandibular teeth</td>
<td>1 robust &amp; accessory</td>
<td>1 heavy &amp; 2</td>
<td>3 fine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>fine</td>
<td></td>
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Subgenus **ACLETIUS**—new subgenus

Type species *Symbiocladius wygodzinskyi* new species by present designation.

Eyes haired, Fig. 12; female antennal flagellum 6-segmented; spurs of tibia III, Fig. 18, almost equal; empodium, Fig. 19, long, pectinate; claws with basal spines; immature stages along side and dorsum of body of nymphs of leptophlebiid mayflies; South America.

*Symbiocladius* (**Acletius**) *wygodzinskyi* n. sp.

The characters given in the subgeneric diagnosis and Table 1 will suffice to separate this species from its nearest relatives.

Female 5.1 mm; head, Fig. 12, black-brown; antennal flagellum 6-segmented; segments in ratio 14–8–10–10–14–33; pedicel black with one ventral hair; palpi 3 segmented; segments in ratio 9–18–18; eyes haired; hairs as long as diameter of facets; eyes widely separated; head width only 1.2 times dorsal interocular space; no bristles on vertex or postocular areas; labrum short, 4 bristles.

Pronotum reduced, Figs. 15, 16; with about 6–7 latero-ventral hairs on each lobe.

Mesonotum, Fig. 5, black-brown; vittae not too distinct, slightly more shining than surrounding area; no acrosticals, humerals or postalar bristles; supra-alars and dorso-centrals reduced, Fig. 13; scutellum black-brown; bristles as in Fig. 13; postnotum and mesosternum black-brown.

Legs light brown; base of tibia and apical tarsal segment darker; the ratios of the leg segments are as follows:

<table>
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<tr>
<th>Leg</th>
<th>Femur</th>
<th>Tibia</th>
<th>$T_1$</th>
<th>$T_2$</th>
<th>$T_3$</th>
<th>$T_4$</th>
<th>$T_5$</th>
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<td>.64</td>
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<tr>
<td>II</td>
<td>117</td>
<td>121</td>
<td>52</td>
<td>29</td>
<td>19</td>
<td>11</td>
<td>13</td>
<td>.43</td>
</tr>
<tr>
<td>III</td>
<td>120</td>
<td>130</td>
<td>70</td>
<td>37</td>
<td>19</td>
<td>11</td>
<td>14</td>
<td>.54</td>
</tr>
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</table>

spur I .054 mm, Fig. 17; spurs II broken; spurs III .078, .062 mm, Fig. 18; no comb on tibia III; claw, Fig. 19, sharp; empodium well developed; only very rudimentary pulvilli present.
Wing slightly teneral; with fine microtrichiae; no macrotrichiae; $fCu$ distinctly past $r$-$m$; $C$ slightly produced; $R_{2+3}$ present but very faint; halteres with globe light, shaft darker.

Abdomen brown, hairs set in light sockets; apex of abdomen as in Fig. 14; spermathecae (2) with base narrowly brown and a reticulate brown collar around exit of duct; .15 by .18 mm; genital clasper .22 mm long by .14 mm wide.

Male—dissected from mature male pupa; color as in female; eyes barely produced dorsally; antennal flagellum 13-segmented; approximate antennal ratio 1.4; palpus 3-segmented; thorax as in female; spurs of tibia II .041, .037 mm; claws spatulate, 7–8 apical teeth; abdomen black-brown, genitalia as in Fig. 20; basistyle .366 mm; dististyle .172 mm; apical spur of dististyle sharp with 3 ovate bristles around it.

Holotype—Female, Argentina, Ushuaia, Tierra del Fuego, January 20–28, 1960 (Wygodzinsky) (AMNH).

Allotype—Mature male pupa, Argentina, Rio Turbio, Santa Cruz, January 17, 1960 (Wygodzinsky) (AMNH).

Larva

Almost mature larva, Fig. 1, 3.7 mm; head brown, .22 mm long; mandible, Fig. 10, .06 mm long with broad lateral tooth and tapering accessory tooth; maxilla small, membranous; palpus consisting of a shallow sclerotized ring and apical projections, Fig. 9; labium as in Fig. 8; antennal ratio 23–5–1–1–(.5?); fifth segment appears to be present; antenna .03 mm long, Fig. 6; labrum with apical spine comb, Fig. 7; no eye spot visible in head.

Thorax cream-colored swollen, Fig. 1; migrated eye spot, as described by Codreanu (1939) for $S. rhithrogenae$, not discernible here; prolegs short.

Abdomen narrower, tan in color; caudal papillae and anal gills not visible; posterior prolegs present, with usual hooks, reduced in size.
Fig. 1. Larva on female Thraulodes nymph.
Fig. 2. Female pupa on female Thraulodes nymph.
Pupa

Male pupa 4.5 mm; female pupa, Fig. 2, 4.5–5.1 mm; no thoracic respiratory organs present; scar, as described by Codreanu (1939), ahead of mesothoracic spiracle, present; caudal edges and intersegmental membranes 2–3 and 3–4 with complete dorsal spine rows; these rows mesally broken on 4–5 and more widely broken and restricted to lateral and ventro-lateral areas on 5–6, 6–7, 7–8; apex of abdomen as in Fig. 11; anal fins in male twice length of genital sacs.

Host

The hosts of S. (A.) wygodzinskyi immature stages are leptophlebiid nymphs, Figs. 1, 2, which appear to belong to the genus Thraulodes. The Neotropical mayfly nymphs are poorly known and, with few exceptions, there is always an element of doubt in the assignment of a nymph to genus. Thraulodes is primarily Neotropical and according to Burks (1953) only two species are known from the Nearctic region. Needham and Murphy (1924) key out 11 species from the Neotropical region. The nymphs here studied differ from the presumed Thraulodes nymphs described by Needham and Murphy in having distinct lateral spines on abdominal segments 6–9 rather than 2–9. A few show indications of spines on 2–5 and mature specimens might have the full complement of spines. None of the specimens examined was fully mature.

Labrum three times as long as wide; no mesal depression with teeth; maxillary palpal segments in ratio 40–40–24; femoral spines short, parallel sided; claws with 10–11 teeth on inner margin; gills lanceolate-acuminate, decrease in size on caudal abdominal segments; main trachea with lateral branches; ninth sternite caudally tapering, slightly excavate apically.

Material Examined

Argentina—Ushuaia, Tierra del Fuego, January 20–28, 1960: larva on ♀ nymph (L) (AMNH), 2 ♀ pupae on ♀ nymphs (L) (AMNH), ♀ pupa on ♀ nymph, on slide (L) (ANSP),
Figs. 3-5. *Symbiocladius equitans* Claassen, larva. 3. Labrum. 4. Labial plate. 5. Apex of mandible.
♀ pupa on ♀ nymph (R) (AMNH), ♂ pupa on ♀ nymph (R) (AMNH); Rio Tristen, Ushuaia, Tierra del Fuego, January 20, 1960: ♀ pupa on ♀ nymph (L) (ANSP); Rio Turbio, Santa Cruz, January 17, 1960: ♀♂, 2 ♀♀ pupae (AMNH), 2 ♂♂, 2 ♀♀ nymph (AMNH), ♂ nymph with empty pupal sac (R) (AMNH), ♀ nymph with pupal depression (L) (AMNH), ♀ pupa on ♂ nymph (R) (AMNH), ♂ pupa ♀ nymph (R) (ANSP); 3 larval heads from skins attached to pupae, on slide (ANSP).

Relationship of S. (A.) wygodzinskyyi to Thraulodes nymphs

Unlike the larvae and pupae of S. equitans and S. rhithrogenae which are situated under the forewing pads of their hosts, the immature stages of S. wygodzinskyyi are found along the side and dorsally on the Thraulodes nymphs, Figs. 1, 2. On some nymphs the caudal end of the Symbiocladius pupa was partially under the mayfly wing pad but in no case was the pupa curled with most of the abdomen covered by the wing pad. As can be seen in Fig. 1 the abdomen of the larva is along the lateral edge of the thoracic notum while the head and thorax extend along the lateral edge of the first three abdominal tergites. The pupa in Fig. 2 was mature and ready to emerge; it had pulled slightly away from the body of the nymph. Normally the abdomen of the pupa is downcurved and more closely appressed to the mayfly nymph and in some cases the pupa is farther caudad and its anal fins are under the mesothoracic wing pad. In all cases the immature stages of Symbiocladius are completely encased by a membranous sheath which seals them from the outside. This is also the case in the other immature Symbiocladius that have been described. In the specimens examined pupae were found on both the left and right sides of the mayfly nymph. Though the sample examined was small it would indicate that the choice of side is random. Of 11 mayfly nymphs with larva or pupa attached, 6 bore the larva or pupa on the left side and 5 on the right. The data on association of pupal and nymphal sex is inconclusive. Of 8 at-
tached pupae on nymphs, 5 were ♀ on ♂; 2 were ♂ on ♀; 1 was ♀ on ♂. There were no ♂ pupae on ♀ mayfly nymphs.

Almost all of the parasitized *Thraulodes* nymphs were very immature with the wing pads poorly developed. However on the specimen illustrated in Fig. 2 the wing pads are better developed and the reduction in size of the left mesothoracic wing pad is evident. The metathoracic wing pad is exposed instead of being covered as on the right side. Codreanu (1939) has described both asymmetrical and symmetrical reduction of the mesothoracic wing pads in *Heptagenia* and *Rhithrogena* as a result of the presence of the immatures of *S. rhithrogenae*.

**Literature**


On the Chilopod Genera Schizotaenia and Schizonampa

RALPH V. CHAMBERLIN

Schizotaenia was validated as a genus by O. F. Cook in 1896 when he published diagnoses of prognatha and six other species in combination with it. The genus became restricted in 1909 by H. W. Brölemann through his erection of a genus Ribantia to which several of Cook's species are now thought to belong. In 1914 the genus Schizotaenia was further restricted by my proposal of a genus Schizonampa for a Brazilian species, S. manni, with which several African species also belong. S. prognatha, as described and illustrated by Cook, does not conform to either of these two genera and remains logically as the type of Schizotaenia and was so definitely designated by me in 1962 (p. 4).

The problem of defining Schizotaenia thus must rest for solution upon the correct identification of prognatha. In the absence of any specimen or specimens designated by Cook himself as his type or types, we must depend for this upon his original diagnosis as published in his 1896 paper (Brandtia VIII, p. 38) and 14 drawings showing important structural details but not published at that time. Relevant to this diagnosis and those of other species included in the same paper, Cook says in his introductory comments (p. 35):

“This group of Chilopoda is represented in Liberia by a few species which were named, described and figured over two years ago, but publication is still delayed, so that preliminary descriptions are offered here.”

Of the drawings of prognatha, which were placed in my hands by Dr. Cook some time before his death, twelve were reproduced in my 1962 paper (cf. Plate VII), and the remaining two are here published (cf. Figs. 1 and 2).

The problem of identifying prognatha has been complicated by R. E. Crabill in a recent paper (1964) in which he makes and proceeds upon the assumption that a series of specimens in the
U. S. National Museum are the types of the species. At the outset two things may well justify doubt that these specimens can rightly be regarded as Cook's types. First, while the time at which Cook "named, described and figured" *prognatha* and the other species proposed along with it, according to the introductory statement quoted above, must have been in the first part of 1894 or earlier, some specimens of the National Museum series are labelled as collected as late as March, 1895, and hence could not have been before Cook when he made his diagnosis and drawings. The second point to be noted in this connection is that had Cook had the sixteen specimens of this series thus in hand at that time, it seems highly improbable that he would have made the special comment that *prognatha* is "rare in Liberia."

The deposit of labelled specimens in a museum, whether by the author of the name or by another, does not constitute publication or establish such specimens as types without some definite indication or adequate supporting evidence. In the present case, Crabill has given no such supporting evidence. On the contrary, as will be shown, negative evidence provided by the existing data justifies the conclusion that Crabill's assumption is premature and erroneous.

A major, and apparently decisive, difficulty in accepting the U.S.N.M. specimens as types of *prognatha* is that these specimens, according to Crabill's detailed description of them, present important differences from Cook's account of his own species, differences such as to make it obvious that the two accounts pertain to forms specifically, and in my opinion, generically distinct.* Some of the contrasts between the two accounts may be summarized as follows:

* In his paper Crabill repeatedly speaks of a "new description" or a "redescription" of *prognatha* as having been given by me in my 1962 paper, in reference to a brief characterization of *Schizotacea* in a key to the genera of the Chilenophilinae. (Op. cit. p. 1.) The characteristics given in that key for setting off *Schizotacea* are taken from Cook's own diagnosis and drawings, without the introduction of a single new item.
Schizotaenia prognatha Cook (1896)

"Antennae with last joint exceeding the last two preceding taken together." (Cf. Cook’s drawings reproduced as Figs. 42–44 in Chamberlin, 1962, pl. VII).

"Pleurae of last segment ... with a few large and small pores concealed under the last sternum." (Cf. e.g., Fig. 2.)

Both ultimate and penult legs with distinctly developed pre-tarsi but lacking true claws (Cf. Fig. 1 here reproduced and Figs. 51 and 52 in Chamberlin 1962.) "Rare in Liberia."

Fig. 1. Schizotaenia prognatha Cook. Caudal end, dorsal view.
Fig. 2. Caudal end, ventral aspect. (Drawings by O. F. Cook.)
Fig. 3. Schizonampa prognatha (Crabill). Ultimate pedal segment, ventral aspect 9 after Crabill.
Schizotaenia prognatha Crabill (1964)


Antennae “with ultimate article equalling the preceding two in length.”

Ultimate coxopleurae each invariably “with two large concealed pore openings.” (Cf. Fig. 3.)

Known from sixteen specimens taken at various times between Dec., 1891, and March, 1895, in the vicinity of Mt. Coffee, Liberia.

In laboring to reconcile these differences in support of his assumption as to Cook’s types, Crabill finds himself compelled to make several other assumptions based upon his belief that the differences are due to errors or inaccuracies on the part of Dr. Cook. Thus, making the unqualified and so far unevidenced statement that “the Cook description was composite,” he disposes of the difference in the coxopleural pores by suggesting that “Cook erred somehow, inadvertently figuring parts of two different species.” He suspects that “the figure showing a coxopleuron with three pores was made not from a specimen of prognatha but “rather from a specimen of Ribautia vara” even though the latter is a much larger species (in length 28 mm as against only 9 mm), with body described as deep brown as against white, and with 47 pairs of legs as against 41–43 pairs. It seems incredible that an experienced student, even on a casual examination, could confuse these species. Similarly, in disposing of the characteristic feature of the penult legs in terminating in a definite pretarsus as in the anal legs Crabill says: “only two explanations come to mind: The character is erroneous and does not exist. Possibly there was some mistake in the labelling of figures. If that is not the case then it is the hallmark of some as yet unknown genus and species.” Anything rather than recognize it as the hallmark of S. prognatha as given by Cook!

The genus Schizotaenia as typified by the species prognatha differs from the genus Schizonampa in the presence of these two characteristics of the coxopleural pores and the tuberculate penult legs. Thus:
a. Only two large coxopleural pores on each side; penult legs ending in a normal claw and lacking a distinct pretarsus. \textit{Schizonampa} Chamb.

aa. Several pleurocoxal pores, typically of two sizes, on each side; penult legs with distinct pretarsus but no claw. \textit{Schizotaenia} Cook

The specimens described by Crabill as \textit{Schizotaenia prognatha} pertain to \textit{Schizonampa} being plainly congeneric with \textit{manni} the type of that genus. In that genus they represent the third species to be named and may be listed as follows:

\textbf{Schizonampa prognatha} (Crabill), new combination

Types.—With the transfer of this species from \textit{Schizotaenia} to \textit{Schizonampa}, the U.S.N.M. specimens designated by Crabill as the “lectotype” and “paralectotypes” of Cook’s \textit{prognatha} become, respectively, the holotype and paratypes of the present species.

Locality. Liberia, on or in vicinity of Mt. Coffee.

Since in the thirteen complete type specimens of this species the number of pairs of legs varies by only two pairs, being 41 or 43, and in the eleven type specimens of \textit{S. angolana}, the number of pairs varies similarly by only two pairs, being 37 in the males and 39 in the females, it seems justified to use this character as a dependable one in the diagnosis of the species of this genus. It is so used in the following key.

\textbf{Key to the Known Species of Schizonampa}

1. Anal pores present (Africa: Angola) \textit{S. angola} Chamberlin
   With no anal pores. \textit{S. angola} Chamberlin

2. Pairs of legs 41–43 (Africa: Liberia) \textit{S. prognatha} (Crabill)
   Pairs of legs 37 (Brazil: Para) \textit{S. manni} Chamberlin

Each of these species is at present known only from its type locality and the three type localities are widely separated. It is reasonable to expect that in future collecting with adequate attention to the smaller and more obscure chilopods not only will the
ranges of the three species mentioned be extended but many related novelties will be brought to light. It is impossible on the basis of the presently known data to predict what forms will or will not be found when adequate collecting is carried out in the vast areas of South America and Africa now unexplored so far as this group of chilopods is concerned.

References Cited


Notes and News in Entomology

Pilot Register of Zoology. A second issue has been announced, and consists of the following three cards:


No. 22. Colobostrum nancyae Brown species nov. (Hymenoptera: Formicidae) from southwestern Australia.

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Single cards, ordered by number, at 10 cents (U. S.) each.
The Collembola of New Mexico.

XV. Dicyrtominae

HAROLD GEORGE SCOTT

The species reported herein has not been recorded previously from New Mexico. Specimens will be deposited with the Academy of Natural Sciences, Philadelphia, Pennsylvania.

Subfamily Dicyrtominae Borner, 1906

Key to Nearctic Genera of Dicyrtominae

1. Claw tunicate. .................. Dicyrtoma Borner, 1903
   Claw not tunicate. ............................................. 2

2. Ant III and/or IV subsegmented. . Ptenothrix Borner, 1906
   Ant III and IV not subsegmented. . Dicyrtoma Bourlet, 1842

Discussion. The only genus of Dicyrtominae collected in New Mexico study was Ptenothrix.

Genus Ptenothrix Borner, 1906

Key to Species of Nearctic Ptenothrix

1. Filament of unguiculus strongly knobbed. .................. 2
   Filament of unguiculus not knobbed or only weakly so. . . 5

2. Setae in dorsal row on dens smooth. .............................. 3
   Setae in dorsal row on dens ciliate. ........ aurata Mills, 1934

3. Distal Ant III distinctly subsegmented. ...................... 4
   Distal Ant III annulate. .................. maculosa (Schott, 1891)

4. Ant IV subsegmented. .................. palmata (Folsom, 1902)
   Ant IV not subsegmented. .................. frontalis (Banks, 1903)

5. Great abdomen with large tubercle dorsally..................
   Great abdomen without tubercle. .............................. 6

6. Great abdomen violet to brownish purple dorsally; spotted laterally. .......... unicolor (Harvey, 1893)

1 A portion of a dissertation submitted to the Graduate Faculty of the University of New Mexico in partial fulfillment of the requirements for the Degree of Doctor of Philosophy.


3 Senior Scientist, Training Branch, Communicable Disease Center, Public Health Service, U. S. Department of Health, Education and Welfare, Atlanta, Georgia.
Great abdomen marbled brown and black dorsally.............texensis (Packard, 1873)
Great abdomen striped dorsally.................................7
Great abdomen spotted dorsally..................................8
7. Great abdomen with transverse stripes...pineolae Wray, 1946
   Great abdomen with two narrow submedian longitudinal
   lines.......................................................vittata (Folsom, 1896)
8. Dens 2 times mucro in length..................................oswegatchiensis Maynard, 1951
   Dens 3 times mucro in length....................................9
9. Outer dental setae 9.............marmorata (Packard, 1873)
   Outer dental setae 10............olympia (MacGillivray, 1894)

**DISCUSSION.** The only species of *Ptenothrix* known from New Mexico is *Ptenothrix unicolor*.

**Ptenothrix unicolor** (Harvey, 1892)

**NEW MEXICO RECORDS.** Two collections (sifting aspen litter and beneath bark of aspen log) ; 7,600 and 9,200 ft; Torrance and Valencia Co.; Jul–Aug 1952.


**KEY TO SPECIES OF NEARCTIC DICYRTOMINA**

1. Dental setae smooth.................................................2
   Dental setae serrate.............................................variabilis Maynard, 1951
2. Head with a few short bristles on front.........................opalina (Folsom, 1896)
   Head with sturdy peg-like spines on front......................labellei Maynard, 1951

**KEY TO SPECIES OF NEARCTIC DICYRTOMA**

1. Filament of uinguiculus knobbed.................................2
   Filament of uinguiculus not knobbed............................4
2. Outer lamella of uinguiculus smooth...............................3
   Outer lamella of uinguiculus serrate..flammea Maynard, 1951
3. Great abdomen orange-yellow..ochreoa Wray, 1949
   Great abdomen blackish-purple...hageni (Folsom, 1934)
   Great abdomen yellowish-white with purple stripes...........curvilineata Wray, 1949
4. Dens 3 times mucro in length.......................... 5
Dens 4 times mucro in length..*quadrangularis* Mills, 1934
5. Unguis with 2 inner and 1 pair of lateral teeth............... 
..............................*mithra* Wray, 1949
Unguis with 2 inner and no lateral teeth........................
..............................*purpurata* Maynard, 1951

Note. Part XV concludes the taxonomic portion of this report. Future parts will analyze briefly the great mass of comparative ecological data assembled during the New Mexico study.

Summary

*Ptenothrix unicolor* is recorded for the first time from New Mexico. Keys are presented to Nearctic genera of Dicyrtominae, and to species of Nearctic *Ptenothrix, Dicyrtoma,* and *Dicyrtomina.*

Revised Synonymy in the Genus Eucerceris with a Description of the true Female of E. elegans Cresson (Hymenoptera: Sphecidae) ¹

Herman A. Scullen, Oregon State University, Corvallis

In the writer's 1948 paper (pp. 171–2) on the genus *Eucerceris* attention was called to the uncertainty relating to the synonymy and correct identification of several closely related species of the genus. At that time it was indicated that field observations and more extended collecting would be necessary to clear up this confusion. In 1939 (pp. 33, 35) the writer called attention to the misidentification of a female from Halsey, Neb., by Dr. Mickel. Since the publication of the 1948 paper many extensive series of these closely related species have been obtained by several collectors including the writer. Furthermore, Dr. Krombein had an opportunity to observe and report

¹ Supported in part by grants from the General Research Fund, Oregon State University and by the National Science Foundation.
(1960) on the nesting of *E. triciliata* Scullen near Portal, Arizona. His observations clearly showed *E. triciliata* Scullen is the male of *E. bitruncata* Scullen.

A restudy of types concerned, with the aid of many additional specimens and Dr. Krombein’s observations, has made it possible to correct former synonymy records.

**Eucerceris apicata** Banks, changed status, not a synonym


Studies since 1948 have shown that *E. hespera* Scullen is the same as *E. apicata* Banks. The association of the female of *E. conata* Scullen with the male of *E. apicata* Banks in large series has convinced the writer that they are male and female of the same species. The species is abundant in the southwestern desert area and ranges as far north as western Nebraska.

Females and males from Halsey, Nebr., were wrongly determined as *E. elegans* Cresson by Mickel. The present author has examined the specimens from Halsey, Nebr., and found them to be *E. apicata* Banks.

The type of *E. apicata* Banks has oval spots on the propodeal enclosure. The type of *E. hespera* Scullen does not have these yellow spots but a series of *hespera* from the same locality (El Paso, Tex.) shows that some specimens do have the yellow spots while others show a gradation from one color form to the other. Some males of *apicata* may have yellow spots back of the eyes but most specimens have only the amber area.

**Eucerceris elegans** Cresson

*Eucerceris elegans* Cresson, 1879. Trans. Amer. Ent. Soc. 7: xxiii, \(\varnothing\), Nevada.

A good series of this male has come to hand from the University of Nevada and the University of California at Davis. By a study of these series the true female of E. elegans Cresson has been associated with the male. The female is here being described for the first time. The female described by the writer in 1939, p. 33, as elegans Cresson has now been found to be the female of E. pimaram Rohwer (see below under that species).

**Figs. 1-3.** Eucerceris elegans Cresson, female. 1. Face; 2, Wing venation; 3, Pygidium.

**Female:** Length 12 mm. Black with creamy white and ferruginous markings; punctation smaller and more widely spaced than average; pubescence very short and inconspicuous.

Head slightly wider than the thorax; ferruginous except an irregular patch on the vertex embodying the ocelli, small patches embodying the antennal scrobes, tips of the mandibles and mandibular denticles, and the apical third of the antennae, all of which are black to fuscous; clypeal border with two pairs of small denticles, each pair located at the junction of the lateral lobes and the medial lobe, on a lower level there is a broad extension somewhat emarginate, above this broad extension there is a distinct row of bristles on the medial lobe of the clypeus; a conspicuous mass of setae extends along the lower
part and border of the lateral clypeal lobes; mandibles with one large bicuspidate denticle and a prominent row of bristles ventrally; antennae normal in form.

Thorax black except for a broad band on the pronotum, two very small lateral spots on the scutellum, and the metanotum which are creamy white; two small patches on the scutellum, two large patches on the propodeum and irregular areas on the sternum and the tegulae, all of which are ferruginous; tegulae low and smooth; slight elevations appear on the dorso-lateral areas of the pronotum; enclosure ridged at approximately 45° to the meson; mesosternal tubercles small but distinct; legs ferruginous; wings subhyaline but with anterior areas slightly clouded; submarginal cell petiolate.

Abdomen black with broad creamy white bands on the first five terga; an irregular band of ferruginous separates the white band from the black on tergum 1, lateral wedge shaped patches separate the white band from the black on tergum 3; venter ferruginous; pygidium with sides slightly convex and converging to a rounded apex, broader at the base.

Evanescent spots or small patches of creamy white may appear in the ferruginous areas on such parts as the scutellum and the propodeum. The scutellum may be largely creamy white in some specimens. The extent of the ferruginous markings is quite variable. Short stripes of ferruginous may appear on the mesoscutum of the female. These stripes on the mesoscutum are usually creamy white in the male of *E. elegans* Cresson. Some male specimens show the ferruginous of the propodeum much reduced or completely lacking. Also some male specimens show a trace of creamy white in the ferruginous while others have only a creamy white spot on the propodeum. Two specimens of males do not have the white of the face fused above the antennae: normally it is fused.

**Distribution:** Western Nevada.

**Specimens:** *Nevada*: ♀, Dayton, Lyon Co., June 28, 1959 (T. Haig); 2♂♂, 7 mi. north Dyer, Esmeralda Co., July 2, 1958, at *Melilotus alba* (R. C. Bechtel); 2♂♂, 23 mi. east Fallon, Churchill Co., June 20, 1958, at *Dalca polyadenia* (J. W. MacSwain); ♂, *ibid.*, June 20, 1958 (E. G. Linsley); ♀, Fern-

**Eucerceris pimarum** Rohwer, changed status, not a synonym


---

**Fig. 4.** Locality records for *Eucerceris elegans* Cresson.
An examination of the specimens determined as *E. elegans* Cresson by Mickel (1916, 1918) has shown they are not that species but are the same as *E. apicata* Banks. (See note under *E. apicata* Banks above.) This latter species has been found to be distinct from *E. elegans* Cresson. Synonymy as given by the writer in 1939 (p. 32) is in error. Extreme variations in the clypeal structure of the female of *E. pimaranum* Rohwer led to the description of *E. bitruncata* Scullen as a distinct species in 1939 (p. 35). The examination of a large number of specimens in recent years has shown intermediate forms between the two extremes. Long series always show the female of *E. pimaranum* Rohwer associated with the male described as *E. triciliata* Scullen. This species is abundant in the southwestern desert areas.

References Cited


**Dalla Torre, C. G.** 1897. Cat. Hymen. 8: 458.


Note on the European Pavement Ant, Tetramorium caespitum, in the Philadelphia area (Hymenoptera: Formicidae)

NEAL A. WEBER, Swarthmore College, Swarthmore, Pennsylvania

The Philadelphia, Pennsylvania, area may have been one of the original sites of introduction of the common European pavement ant, Tetramorium caespitum L., into the United States. Sailing ships from Europe, since the days of William Penn in the 17th Century, may have brought this species with cargo. The Swedes, Dutch, and British could have brought colonies repeatedly to the mild shores of the Delaware River at Marcus Hook, Upland (now Chester), and later to Philadelphia. This may be the species referred to by Kalm in 1748 in Philadelphia (Donisthorpe, 1927). A more specific and more recent manner of carrying the ants is suggested by the repeated introduction of English ivy (Hedera helix) to the campus of Swarthmore College in the southwestern suburban area of Philadelphia. An historical account of the acquisition of the ivy covering the walls of the principal college building, Parrish Hall, has been recently given by Isabelle Bronk (1964). This account, originally published in 1908, states that the custom of setting out class ivies was inaugurated in 1889. Members of the college were accustomed to bring living slips of ivy from Europe, before the days of the U. S. Department of Agriculture Plant Quarantine Service. It would have been a simple matter for a fecundated female of this ant to have survived the journey in soil about the ivy roots. For example, Dean Bond brought some in 1903 from the ruins of Ludlow Castle, England, others brought living ivy from a Quaker meeting house at Swarthmore, England, from Addison’s Walk at Magdalen College, Oxford, from Christ’s College, Cambridge, from a ruined church in Scotland, and from the Royal Gardens of the Luxembourg, Paris.
This ant is well established on the Swarthmore College campus at the present time and is abundant under the walls and walks about Parrish Hall. It lives also in and about the Benjamin West House on the campus, the house where the celebrated painter was born in 1738. The house itself was built about 1724. The ants are here nocturnal during the winter months and scavenge over the ground floor for food, being warmed by basement heating pipes. In April and May workers appear regularly in large numbers on the pavement stones outside. They appear at the same time outside Parrish Hall and other buildings, emerging from under pavement stones. A room of the two-year-old Animal Wing of the biology building became infested with this species in October 1964.

These swarms engage in the well-known combats described by H. C. McCook (1878, 1879). His accounts and specific determinations leave no doubt that the habits of this ant have not changed in the approximate 100 years since he returned from participation in the Civil War to become a minister in Philadelphia. Ironically, the chief notoriety of these ants “is due to their martial instincts. Hundreds, even thousands of them are often seen waging battle with great ferocity and persistence. One battle, which was noted close by the wall, within the enclosure of a church on Broad Street and Penn Square, was prolonged for a period of two weeks and several days. . . .” The combats that he described as taking place in May, 1879, occur regularly on the Swarthmore campus in the same month. They may take place as early as late April and may extend into June. Forel, quoted by Donisthorpe (loc. cit.), described an extended combat between thousands of ants that took place on the grounds of the University of Zurich, starting April 24, 1870, and lasting more than a month.

A modern study of this unusual and recurrent type of behavior would appear to be worthwhile, since no one has really explored the reasons for these conflicts. A possible hypothesis is that adjacent colonies increase in size until their territories meet or overlap. This expansion and increased seasonal activity results then in fighting.
Literature Cited


In tune with the new approach to academic subjects, this laboratory guide to introductory entomology combines the acquisition of factual knowledge with experimental observation. The authors have rather skillfully combined many entomological subjects. As might be expected, due to the diversity of interests of the authors, there is some unbalance in the treatment of these subjects. Parts are too elementary, and parts are highly technical, certainly too technical for beginning undergraduate students who might otherwise find the book useful.

The six sections of the book cover: morphology; systematics; genetics; physiology; behavior; ecology, and a final, very useful appendix. The later contains information on materials needed, sources, culture methods, media, and equipment.

In spite of some obvious errors, this book should prove a very good guide for beginning students of entomology. It immediately shows them the vastness of the field and provides them with exciting exercises for a first hand knowledge of the greatest of all groups of animals. I am looking forward to the chance to try it on a class.

Ross H. Arnett, Jr.
The Catholic University of America
Washington, D. C.
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An Annotated List of the Trichoptera of Minnesota, with Description of a New Species

DAVID A. ETNIER, Department of Zoology, University of Minnesota, Minneapolis

Although new species of Trichoptera will be discovered in North America for many years to come, the distribution, life history, and ecology of many already described species is so poorly known that work on the evolution of the order and its role in local and regional aquatic communities is difficult. It is hoped that the following list will be of use to those interested in these aspects of trichopteran biology.

Of the 208 species listed, 90 represent new state records. Fifty of these are the result of the work of Dr. Donald G. Denning while a graduate student at the University of Minnesota, and 39 of the remaining 40 are a part of the many records gathered by the author.

Many descriptions of larvae are to be found in Ross, 1944. Additional information pertinent to the identification of larvae is available for the families Rhyacophilidae (Flint, 1962), Phryganeidae (Wiggins, 1960), and Limnephilidae (Flint, 1960). Ross (1946, 1956) presents detailed treatment of the adults of the families Lepidostomatidae and Rhyacophilidae, respectively.

Work on this paper was initiated at the University of Minnesota Biology station at Itasca State Park, with support from the National Science Foundation during 1963 and 1964. The author extends special appreciation to the many people who have provided collections. The University of Minnesota Department of Entomology has been most helpful in making available their
collection. Thanks also to Dr. Glenn B. Wiggins of the Royal Ontario Museum, Toronto, and Dr. Herbert H. Ross and his staff at the Illinois Natural History Survey for identification and confirmation of identifications. The assistance and encouragement of Dr. Edwin F. Cook, University of Minnesota Department of Entomology, was most helpful.

**Oxyethira bernerii** n. sp.

This species differs from other members of the genus in the anchor-like appearance of the claspers in ventral view.

**Male.**—Length 2.5 mm. Color and general structure typical for genus. Seventh sternite with a median spine on the apical margin. Eighth segment lacking projections, broadly cleft ventrally, and setose. Ninth segment retracted within seventh and eighth segments, with a dense cluster of about 20 setae appearing near the posterior ventral margin, and extending to about the middle of the median arm of the claspers. Claspers fused, appearing anchor-shaped in ventral view (Fig. 1, CL). In lateral view the mesal arm of the claspers is curved dorsally. Immediately dorsal to the claspers is a moderately sclerotized, tri-lobed structure, each of the lobes bearing a terminal seta. Paired sclerotized processes that appear to be the tergites of the tenth segment (Fig. 1, 10) extend from the dorsum of the ninth segment. These structures are furcate in lateral view, and terminally expanded in ventral view. Ventral to these is a pair of membranous lobes, each of the lobes bearing a terminal seta.

The aedeagus is straight, with a delicate membranous expansion at the tip. The spiral process makes two complete revolutions around the aedeagus, is pointed terminally, and extends slightly past the tip of the aedeagus.

**Female.**—Unknown.

Holotype, male.—Finland, Lake County, Minnesota, about July 27, 1964. Henry Hesse.

Paratypes.—Minnesota.—Same data as for holotype, 12 males.

The holotype and two paratypes are deposited in the collection at the University of Minnesota. Paratypes have been sent
OXYETHIRA BERNERI N. SP.

Fig. 1. Oxyethira bernerii n. sp., ventral and side views of male genitalia. CL, claspers; 10, tenth tergite. Limnephilus quaeris (Milne), side view of male genitalia.
to the Illinois Natural History Survey, R. L. Blickle, Durham, New Hampshire, and Glenn B. Wiggins, Royal Ontario Museum, Toronto. Four paratypes have been retained by the author.

In the following list an asterisk (*) indicates a new state record. Species not illustrated in Ross (1944) are followed by a reference to a recent illustration. The author has chosen to follow the family and generic interpretation given by Ross (1944) unless otherwise indicated. Genera and species within families are arranged alphabetically. For species occurring in general throughout the state, no records are cited; those restricted to certain portions of the state are so listed, while exact locations are given for infrequently collected species. All records, unless otherwise indicated, are based on identification of adult males by the author. No data on abundance or date of collection are given, but these are available from the author on request.

Rhyacophilidae

**Rhyacophila fuscula** (Walker). Northeast.

Glossosomatidae

(Subfamily in Rhyacophilidae, Ross, 1944)

**Agapetus rossi** Denning. St. Louis and Lake counties. Denning, 1941a.

**Glossosoma intermedium** (Klapálek).

**G. nigrior** Banks. Temperance River and Saganaga Falls, Cook county. Denning, 1942 (as *Eomystra unica*).

*Protoptila erotica* Ross. Anoka county.

*P. maculata* (Hagen). Anoka county.

**P. talola** Denning. Pine county. Denning, 1947c. This species is very similar to and may be conspecific with the preceding species.

*P. tenebrosa* (Walker). Anoka and Hubbard counties.

Philopotamidae

**Chimarra aterrima** Hagen. Northeast.

C. obscura (Walker). East.
*C. socia* Hagen. East and Pennington county.
**Sortosa distincta** (Walker). Northeast. (*Trentonius distinctus* in Ross, 1944.)

Psychomyiidae

*Cyrnellus marginalis* (Banks). Wabasha county.
*Neureclipsis bimaculatus* (Linnaeus).
*N. crepuscularis* (Walker). Eastern half.
*N. validus* (Walker). Lake of the Woods and Cook counties.
*Nyctiophylax vestitus* (Hagen).
*Phylocentropus placidus* (Banks).
*P. aureolus* (Banks).
*P. centralis* Banks. Finland. Lake county.
*P. cinereus* Hagen.
*P. confusus* Hagen. Northeast.
*P. flavus* (Banks).
*P. interruptus* (Banks).
*P. pentus* Ross. Cook and Lake counties.
*P. remotus* Banks.
*Psychomyia flavida* Hagen.

Hydropsychidae

*Cheumatopsyche analis* (Banks).
C. *aphanta* Ross. South
C. *campyla* Ross.
C. *gracilis* (Banks). Northeast and Traverse county. Ross, 1938b,
C. *lasia* Ross. West.
C. *minuscula* (Banks). Northeast.
C. *oxa* Ross.
C. *pasella* Ross. Denning (1943) reported this species from Minnesota on the basis of a male from Houston county. The specimen has been reidentified as *C. campyla* by the author.
C. *sordida* (Hagen). Northern half.
C. *speciosa* (Banks).
C. wabasha Denning. The only state record is from the type locality, Wabasha, Wabasha county. Denning, 1947c.

Hydropsyche betteni Ross.
H. bidens Ross. Southern half.
H. bifida Banks.
H. bronta Ross.

H. hageni Banks. Denning (1943) reported this species on the basis of a female from Anoka county. Males have not been collected.
H. morosa Hagen. North and east.
H. orris Ross. Southeast.
H. phalerata Hagen. East.
H. placoda Ross.
H. recurvata Banks.
H. scalaris Hagen. East.
H. simulans Ross. East.
H. slossonae Banks.
H. sparna Ross. North and east.
H. valanis Ross. Ross (1944) reported this species from southern Minnesota. Specimens were not seen by the author.
H. vexa Ross. Morrison and Hennepin counties.

*H. walkeri Betten & Mosely. Cotton, St. Louis county.

Macronemum zebratum (Hagen). North and east.

*Parapsyche* sp. A larva of this genus was discovered in a March 27 collection from East St. Paul, Ramsey county. Two species, *apicalis* and *cardis*, are known from eastern United States.

Potamymia flavia (Hagen).

Hydroptilidae

Agraylea multipunctata Curtis.

Hydroptila ajax Ross. Denning (1947a) reported this species from Washington county. Specimens were not seen by the author.

H. amoena Ross. Ramsey and Cook counties.

*H. berneri Ross. Finland, Lake county. Ross, 1941b.
H. consimilis Morton. Lake, Polk, and Ramsey counties.

H. grandiosa Ross. Anoka county. Specimens were not seen by the author.


H. perditia Morton. Ramsey and Carlton counties.

*H. salmo Ross. Lake Saganaga, Cook country. Ross, 1941b.


H. valhalla Denning. Our only Minnesota record is from the type locality, Taylors Falls, Chisago county. Denning, 1947a.

*H. virgata Ross. This entry is based on females from Trout Creek, Winona county, that were identified at the Illinois Natural History Survey.

H. waubesiana Betten.

Ithytrichia clavata Morton. North.

Leucotrichia pictipes (Banks). East.

Mayatrichia ayama Mosely. East.


*N. okopa Ross. Finland, Lake county.


*Ochrotrichia tarsalis (Hagen). Finland, Lake county.

Orthotrichia americana Banks. Ramsey and Clearwater counties.


*O. bernerii Etnier. Finland, Lake county. See illustration in this paper.


*O. pallida* (Banks). Moore Lake, Anoka county.  
*O. serrata* Ross.  

**Phyrganeidae**  
*A. straminea* Hagen.  
*A. vestita* (Walker).  
*B. crotchii* Banks. *B. selina* in Ross, 1944.  
*Fabria inornata* (Banks).  
*Phryganea cinera* Walker.  
*Ptilostomis ocellifera* (Walker).  
*P. semifasciata* (Say).  

**Limnephilidae**  
*Drusinus uniformis* Betten. Houston county.  
*Frenesia missa* (Milne). Hennepin and Wabasha counties.  
*Grammotaullius interrogationis* (Zetterstedt). Cook county. Denning, 1941b.  
*Hesperophylax designatus* (Walker). East.  
*Leptophylax gracilis* Banks.  
*Limnephilus acrocurvus* Denning. Our only Minnesota record is from the type locality, Gull Lake, Crow Wing county. Denning, 1942.  
*L. bimaculatus* Walker.  
*L. consocius* Walker.  
*L. externus* Hagen. Pupal exuviae of this species from Mille Lacs Lake were deposited in the University of Minnesota collection by Dr. Donald G. Denning. The vial contained a reference to the pinned adults in the same collection, but these specimens could not be found. Ross, 1938b.

*L. hyalinus* Hagen.

*L. indivisus* Walker. Wabasha, Clearwater, and St. Louis counties.


*L. moestus* Banks. North and Ramsey county.


*L. ornatus* Banks. Northwest and Ramsey county.


*L. partitus* Walker. St. Louis and Lake counties. Betten and Mosely, 1940.


*L. quaeiris* (Milne). Crookston, Polk county. The illustration (Fig. 1) of the lateral view of the male genitalia was made from a Minnesota specimen collected by Dr. Denning and identified by Dr. Lorus J. Milne in 1938.

*L. rhombicus* (Linnaeus).

*L. rossi* Leonard & Leonard. This species has been reared by George Swanson, U. S. Fish & Wildlife Service, from Valley Creek, Washington county. Identification was made by Dr. Glenn B. Wiggins. Leonard and Leonard, 1949.

*L. secludens* Banks. Ross, 1938b.

*L. sericeus* (Say). North.

*L. sordidus* (Hagen). Northwest.

*L. submonilifer* Walker. East.


*N. fuscus* Banks. Scott county.


*Platycentropus indistinctus* (Walker). Denning (1937) illustrated the larva of this species from the Partridge River near Aldrich, Wadena county. Betten and Mosely, 1940. No specimens were seen by the author.
*P. radiatus* (Say). North.  
*Pycnopsyche guttifer* (Walker). North and Olmsted county.  
*P. lepida* (Hagen). North.  
P. subfasciata (Say).  

Molannidae

**Molanna flavicornis** Banks.  
**M. uniophila** Vorhies.

Leptoceridae

*Athripsodes alagmus* Ross.  
*A. ancylus* (Vorhies).  
*A. angustus* (Banks). North.  
*A. arielles* Denning. Our only Minnesota record is from the type locality, Coon Creek, Anoka county. Denning, 1942.  
*A. cancellatus* (Betten).  
*A. dilutus* (Hagen). North.  
*A. flavus* (Banks). Ross (1944) reported larvae considered to be this species from Minnesota. No adults have been taken.  
*A. mentieus* (Walker). Cotton, St. Louis county.  
*A. miscus* Ross. Known in Minnesota only from the type locality, Lake Itasca, Clearwater county. Ross, 1941b.  
*A. nephus* Ross. One male from Lake Itasca, Clearwater county, was tentatively identified as this species by T. Yamamoto of the Illinois Natural History Survey. The specimen was destroyed in mailing.  
*A. resurgens* (Walker).  
*A. tarsi-punctatus* (Vorhies).  
*A. transversus* (Hagen).  
*Leptocella albida* (Walker).  
*L. candida* (Hagen). Lake Itasca, Clearwater county.  
*L. diarina* Ross. Larvae that are apparently of this species have been collected in small streams in Becker and Goodhue counties. An adult male was taken in a light trap at Cotton, St. Louis county.  
*L. exquisita* (Walker).  
*L. pavida* (Hagen). Northeast.  
**Leptocerus americanus** (Banks).  
**Mystacides longicornis** (Linnaeus).  
**M. sepulchralis** (Walker).
Oecetis avara (Banks).
O. cinerascens (Hagen).
*O. immobilis (Hagen).
O. inconspicua (Walker).
O. ochracea (Curtis).
O. osteni Milne.
*O. persimilis (Banks). Lake and Cook counties.
*Setodes guttatus (Banks). Two females from Cass Lake, Cass county, have been tentatively identified as this species. Banks, 1907.
*S. incerta (Walker). Cotton, St. Louis county.
*Triäenodes aba Milne.
*T. dipsia Ross. Lake Saganaga, Cook county.
*T. flavescens Banks. Northwest.
*T. grisea Banks. Western half.
*T. injusta (Hagen).
T. tarda Milne.

Goeridae

*Goera calcarata Banks. A larva from Coon Creek, Anoka county, was tentatively identified as this species. Ross, 1947.

Lepidostomatidae

L. unicolor (Banks). Ross, 1946. Specimens were not seen by the author.

Brachycentridae

*B. numerosus (Say). St. Francis River, Sherburne county.
Micrasema rusticum (Hagen). North and central.
Helicopsychidae

Helicopsyche borealis (Hagen).

Literature Cited

Lucidota viridescens, sp. nov. (Coleoptera; Lampyridae)

Frank A. McDermott, Wilmington, Delaware

The genus *Lucidota* was established by Laporte (1833, p. 136) for lampyrids having antennae about as long as the body, articles 3 to 10 each bearing a rather long ramus, and the last two ventral segments of the abdomen usually luminous. The type species was fixed by Motschulsky (1853, p. 41) as *Lucidota banoni* Laporte. Motschulsky adopted Laporte's criteria for the genus, but also established several genera for species resembling *Lucidota* but not having the characteristic antennae and luminosity. Most of these generic names have not been generally used by subsequent authors, and I will not attempt here to give the history of the changes in the criteria for *Lucidota*. Olivier (1911, p. 63) gave a key for the genera he considered as belonging to the Lucidotinae, and on pp. 70-72 he established a series of genera, some being reinstatements of Motschulsky's genera, which he regarded as segregates from the *Lucidota* complex but without a definite key. One of these new genera is *Leucothrix*, of which he said “The numerous species comprising this new genus are easily recognized by the last articles of the antennae which are white or yellow while the preceding ones are black. Their form is oblong, oval, or long-parallel; their coloration is rather bright; the luminous organs are but little developed, on the last segment.” The only distinctive character is the pale antennal termini, and as this character is by no means confined to the Lucidotinae or even to the Lampyridae, it is inadequate as a basis for a genus.¹ Therefore

¹ Motschulsky, 1855, p. 21) notes: “The locality of the Isthmus of Panamá is remarkable for—among other things—the number of insects which have the extremities of the antennae white, not found elsewhere. Among the Coleoptera so colored I took specimens of carabids, brachelytra, anthiciids, and cucuids (*Telephanus albicornis* m.).” However, this character is found in numerous lampyrids and some other beetles from northwestern South America.
in my Taxonomy of the Lampyridae (1964) the species of *Leucothrix* are included in *Lucidota*.

The examination of a collection of Lampyridae recently received from Peru revealed several distinct species of "*Leucothrix*," some of which could not be identified by published descriptions and did not agree with previously determined specimens. One was quite distinct by the presence of definitely green pigmentation, particularly on the pronotum and elytral suture. At first this species was thought to be *L. albocincta* Pic which it resembles, but further examination shows that it is not this species. It is therefore described below as *Lucidota viridescens* sp. nov.

**Lucidota viridescens** sp. nov.

Holotype male, collected at Quincemil, PERU (type locality), October 16, 1962, by Luis E. Peña. (Fig. 1.)

Dimensions, 9.0 mm long by 4.2 mm broad; broadly elliptical.

Pronotum, 2.0 × 2.8 mm, semi-elliptic; disk convex with median subrectangular brown vitta extended along base to edges of the convexity, and with white marks on each side. Base almost straight; angles nearly 90°. Borders translucent whitish tinged with green, except somewhat brownish forward of vitta. Finely and densely punctulate; practically no villosity.

Scutellum and mesonotal plates black.

Elytra, 7.0 × 2.1 mm. Ground color translucent dark brown but appearing black over body. Wide explanate margins are translucent pale yellowish with a narrow black lateral edge and a narrow green line at the inner edge, visible on the short epipleura. Suture opaque green from scutellum to apical third. Finely rugose; fairly long pale villosity.

Frons yellow, vertex black; 1.3 mm across eyes, 0.6 mm between them; eyes small. Terminal article of the maxillary palpi

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2 In connection with green lampyrids, Gorham (1880, p. 30; 1881-84, p. 254) uses the words "subviridis" and "greenish yellow" in his description of *Photinus amabilis* from Panamá and Costa Rica, so this may be a third lampyrid with greenish coloration.
black, the preceding articles yellow. Labial palpi short, terminal article crescentic. Mandibles small.

Antennae black, compressed, barely serrate on inner edges; 5.1 mm long; hairy; last article small and pale.

Prosternum tinged greenish; mesosternum brown; metasternum dark brown.

Fig. 1. Lucidota viridescens sp. nov. Dorsal view.

Fig. 2. Aedeagus of Lucidota viridescens. Left, Ventral view. Right, Lateral view.

Ventral segments 2 to 7 reddish brown, sides white and hairy; 8th segment nearly transparent, feebly trilobed; residual larval luminous organs barely distinguishable. 9th (genital) segment semi-elliptic, translucent pale brown.

Tergites dark brown; pygidium feebly trilobed, the lateral lobes being acute and the median lobe broadly rounded.

Femora nearly white, tibiae infuscate, tarsi nearly black; claws simple.

The aedeagus was extracted from one paratype. The rather broad median lobe is curved so that the bimucronate tip projects between the lateral lobes; the latter are long and relatively slender with narrow curved tips, and each bears about midlength
a short apically directed projection with a brown elliptical structure beneath it (Fig. 2).

Allotype female, collected at Quincemil, Peru, August 14, 1962, by Luis E. Peña.

Dimensions 8.95 mm long by 4.1 mm broad.

Generally similar to the male. 8th ventral segment truncate-triangular, laterally sinuate and deeply notched apically; larval luminous organs small but more distinct than in male. Antennae 5.0 mm long. Pronotum slightly tinged green; only faint traces of green elsewhere.

The male holotype and female allotype have been deposited in the U. S. National Museum, with two male paratypes; 10 other male paratypes are in my collection.

Variations: The distribution of the green coloration varies from that of the most strongly colored, the holotype, to merely pale green patches on the sides of the pronotum with little green elsewhere. The last antennal article may be white, grading to only slightly paler than the preceding article. The pygidium may be more strongly trilobed and from brown to nearly entirely transparent. Specimens vary from 8 to 10 mm long.

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A Collection of Butterflies from Western Chihuahua, Mexico

HARRY K. CLENCH, Carnegie Museum, Pittsburgh, Pennsylvania 15213

In 1899 Mr. Charles H. T. Townsend collected a fairly sizable lot of butterflies for W. J. Holland in a montane locality in western Chihuahua, a region whose butterflies are still almost unknown. Holland, apparently, was disappointed in the specimens and dismissed them as "quite devoid of novelties, consisting almost wholly of common species of wide distribution." The paper in which he makes this statement (Ent. News 11: 332-333, 1900) describes the only form he deemed worthy of mention, Argyunnis nitocris coerulescens, now known as Speyeria (Speyeria) nokonis coerulescens Holland.

Although Holland was substantially correct in his evaluation, the material is not without interest, and there are a few "novelties" which he did not appreciate. Chermock has subsequently described the Cercyonis meadii population as a new subspecies; a new subspecies of Lycaenides melissa is described herein, striking in appearance and representing a surprising range extension of the species; and in another paper I am describing a remarkable and wholly unexpected (but hardly striking-looking) new species of Everes. In addition, the series of the little-known Paratrytone rhevenor Godman & Salvin may be the largest in existence—and when Holland penned those crotchety lines, it too, was undescribed.

The collection is interesting almost as much for what it does not contain as for what it does. Now more is known about southwestern butterflies than in Holland's time and it is possible to list a number of species, common and widespread in the southwest, which Townsend did not obtain but which are likely to be present there. Among these are: Papilio multicaudatus Kirby, Neophasia species (terlootii Behr ?), Eucrema mexicana Boisduval, Euptychia rubricata Edwards, Microtia dymas Ed-

Perhaps not all of these species are present in the area, but it is most improbable that none of them is. In brief, these lacunae imply that no use whatever can be made of the “negative information content” of the list which follows.

Holland (*loc. cit.*) located the place where these specimens were taken as “at the head of the Rio Piedras Verdes, in Chihuahua, at an elevation of from 7,100 to 7,300 feet above sea level in the Sierra Madre region.” This is approximately at 30° 15' N lat, 108° 15' W long, almost on the Sonora border, and may be found on the map of the American Geographical Society, 1:1,000,000 series, Sonora Sheet NH 12 (prov. ed. 1937, rev. 1938). The specimens themselves bore only the label “Chihuahua/Townsend” and (usually) a date. I have added a fuller label to them all.

To judge from the species taken, the locality is predominantly Upper Sonoran zone. Such species as *Papilio philenor*, *Cercyonis meadii*, *Limenitis astyanax arizonensis* and *Zicula cyna* are regionally good indicators of the zone. The elevation, however, would place this area close to the Transition zone, and certain of the species suggest that some collecting was done in that zone as well: *Lycaeides melissa*, *Callophrys apama*, *Oarisma garita*. A not surprising resemblance of this fauna to that of the mountains of southeastern Arizona (or the reverse) is shown by the presence of such species as *Paramecera ricaque*, *Gyrocheilus patrobas*, *Ochlodes snowi*.

**Papilionidae**

*Battus philenor* Linnaeus. August, September. 8♂, 9♀.


*Papilio cresphontes cresphontes* Cramer. No date. 3.
**Pieridae**


Phoebis sennae Linnaeus. May (1♀), August (4♂, 1♀), September (3♀).


Colias (Colias) eurytheme Boisduval. July–September. 80♂, 26♀. Includes seven albinic females and one that is cream-colored.

**Danainae**

Danaus (Tasitia) gilippus strigosus Bates. August, September. 7♂, 2♀.

Danaus (Danaus) plexippus plexippus Linnaeus. July–September. 8♂, 2♀.

Agraulis vanillae incarnata Riley. August. 1♂.

**Satyridae**

Euptychia (Cyllopis) dorothea Nabokov. 1 June (1♂ fresh), 27 June (2♀ fresh), 1 July (4♂ worn, 3♀ more or less fresh), 21 July (1♂ very worn), no date (1♀). Total. 6♂, 6♀.

Paramecera xicaque Reakirt. August, September. 3♂, 1♀.

Cercyonis meadii mexicana Chermock. August, September. 3♂, 2♀ (the type series).

Gyrocheilus patrobas Hewitson. August, September. 75♂, 2♀.

**Nymphalidae**

Euptoieta claudia Cramer. August, September. 66.

Speyeria (Speyeria) nokomis coerulescens Holland. September. 22♂, 100♀ (the type series; additional specimens exist, but have been exchanged or given away and no record kept).

Phyciodes mylitta Edwards. July, August. 3.
Vanessa atalanta Linnaeus. August, September. 8.
Vanessa cardui Linnaeus. May (1 only), August, September. 25.
Vanessa carye Hübner. August, September. 11.
Limenitis (Limenitis) astyanax arizonensis Edwards. July, September. 3.
Anaea (Anaea) aidea Guerin. September. 1♀.

Libytheidae

Libytheana carinenta mexicana Michener. August. 1.

Riodinidae

None.

Lycaenidae

Ministrymon leda Edwards. August. 2♀.
Callophrys apama Edwards, subspecies. no date. 1♂.
Strymon melinus Hubner, subspecies. July. 1♀.

Lycaeides melissa mexicana, new subspecies.

The male differs markedly from any known melissa subspecies (including the population in the mountains of southeastern Arizona) by the darker blue-violet ground and thicker fuscous borders above. On the fore wing this fuscous border is nearly 1 mm thick and on the hind wing nearly half again as much and unites a series of internervural fuscous spots that are never completely free, though sometimes nearly so. All the veins are distally strongly fuscous-lined. On the underside the ground basad of the pm spots is ashy grey-tan, much darker than in most other melissa and more brownish tinged. The pm spots
and basal spots of hind wing) are well developed. Between them and the submarginal border pattern the ground is lightened to almost white, as usual. The subterminal orange on the fore wing is somewhat stronger than in Arizona specimens; on the hind wing it is somewhat thicker. The fuscous terminal spots of the distal series are silvered usually only in their basal halves (in Arizona specimens the silverying nearly eclipses the underlying black spots).

Two of the three females have the orange subterminal band on the fore wing nearly obsolete; in the third it is normally developed. Otherwise, agreement with Arizona females is close: there is a slight basal suffusion of blue on both wings above; the underside is darker, browner than the males—perhaps a little darker than in Arizona females, but not much. The terminal spots below may have less intense silverying than Arizona females but specimens are too few to be sure.

There is no appreciable size difference.

Holotype, male, Upper Rio Piedras Verdes, western Chihuahua, Mexico, ca. 7100–7300 ft, 30° 15' N lat, 108° 15' W long. 1 September 1899 (C. H. T. Townsend). Paratypes, 40 ♂, 3 ♀. same locality and collector, dated as follows: 30 May (3 ♂), May (6 ♂, 1 ♀), 21 July (1 ♂), 30 August (1 ♂), 1 September (2 ♂), 11 September (2 ♂), 14 September (3 ♂, 1 ♀), 16 September (1 ♂), 17 September (1 ♂), 18 September (1 ♂), 19 September (3 ♂), September (12 ♂, 1 ♀), no date (4 ♂). Holotype and paratypes, C.M. Ent. type series no. 510.


Everes new species. September. 1 ♂. This is being described in another paper.

Leptotes marina Reakirt. July, September. 1 ♂, 2 ♀.


Brephidium exilis exilis Boisduval. June. 1 ♀.
Hesperiidae


Autochton cellus Boisduval & LeConte. June, July. 5♂, 2♀.

Erynnis tristis Boisduval. June, August, September. 2♂, 1♀.

Erynnis propertius Scudder & Burgess (?). May, June, September. 4♂, 1♀.

Erynnis funeralis Scudder & Burgess. August, September. 5♂, 1♀.


Hesperia woodgatei Williams. September. 1♂.


Paratrytone rhexenor Godman & Salvin. May-September. 15♂, 9♀.


Amblyscirtes fimbriata Plötz (?). June, July. 1♂, 1♀.

Identifications by Lee D. Miller.
On the Pupa of Atherix variegata Walker.
(Diptera, Rhagionidae)

S. E. Neff, Virginia Polytechnic Institute, Blacksburg, Virginia

The pupa of *A. variegata* has never been described, although the larva of this species is familiar to aquatic biologists, and has been described and illustrated in the literature (Greene, 1926; Johannsen, 1935; Pennak, 1953; Usinger, 1956). No pupa of any *Atherix* species had been described until recently, in an excellent series of articles, Nagatomi (1960, '61, '61a, '62) presented descriptions of the immature stages of, and biological observations on the Japanese species of *Atherix*. Larvae of five (5) species and pupae of four (4) species were characterized and illustrated in the 1961 and '61a papers. The purpose here is to describe the pupa of *Atherix variegata*, a North American species, and compare it with the pupae treated by Nagatomi.

The material for this study was obtained from Sinking Creek, one mile east of Newport, Giles Co., Virginia, on 20 May, 1964. Mature larvae from riffle areas near the bank were brought to the laboratory where two larvae were placed in each of five 10 cm petri dishes with about 1 cm of moist, sandy gravel, and kept at 20°C. Food was provided in the form of aquatic oligochaetes and midge larvae. All larvae transformed to pupae within three weeks of the collection date.

Each pupa was formed in a cavity or depression in the sand and gravel, a depression started by the larva and enlarged by the movements of the active pupa. The pupa responded to touch by vigorous twisting and rotation of its body, motions that serve, apparently, to maintain the cavity during the pupal stage and to discourage small predators also.

It appears that in nature the larva leaves the stream and enters the moist soft earth along the bank to transform. Efforts to locate pupae along the stream bank were unsuccessful, however.

After 5½ to 6 days, the compound eyes of the developing adult become pigmented and clearly visible. Emergence occurred 7½
to 9 days after formation of the pupae, with an average pupal period, in seven cases, of 8 days. This period is consistent with Nagatomi’s observations.

The *A. variegata* pupa (Figs. 1, 2, 3) resembles closely the pupa of *Atherix ibis japonica*, as described by Nagatomi (1961a). The pupa is light yellowish brown with the basal portions of each abdominal segment and the entire eighth abdominal segment distinctly darker. Eight pupae range from 11.0 to 13.8 mm in length ($\bar{x} = 12.1$) and 2.5 to 3.4 mm in maximum width ($\bar{x} = 2.7$) at the second and third abdominal segments. The thorax is about as broad as long and is deeper than the head or abdomen. The basal abdominal segments are slightly wider than the more apical ones (from segment five posteriad).

The head bears two pairs of bristles on the orbits; one pair anterodorsally, the other pair just dorsal to the antennal capsules (Fig. 3, ac). On the ventral side the capsules covering the antennae and palpi are evident; the antennal covers are pointed apically and their ends are free from the surface of the pupal skin; the palpal capsules (Fig. 3, pc) are closely appressed to the surface. The frontal area above the antennae has some indistinct, infuscated spots, and some fine hairs near the bases of the large bristles.

The wing pads extend ventrolaterally on each side and cover most of the ventral area of the thorax and first abdominal segment. The leg coverings meet along the midventral line and lie between the wing pad margins. Dorsally and dorsolaterally three or four pairs of bristles are present; two or three bristles on each side of the midline dorsally; if three pairs (Fig. 1), the bristles on each side are arrayed as the points of an almost equilateral triangle; if two pairs (Fig. 2), the anterior and lateral bristles persist. This bristle arrangement appears to be

---

**Figs. 1-5. Atherix variegata**, pupa.

1. ? dorsal view. 2. ♂, lateral view; ps, prothoracic spiracle, s, abdominal spiracles. 3. ♂, ventral view; ac, antennal capsules, pc, palpal capsules. 4. Prothoracic spiracle, left side. 5. Abdominal spiracle, enlarged view from left side of fifth abdominal segment.
a sexual dimorphism, the female possessing three pairs, the male two pairs. The remaining pair of thoracic bristles is represented by the bristle at the base of each wing pad in a position corresponding to a notopleural bristle in the adult.

The eight abdominal segments are armed with various spines and projections distributed as follows: Segment 1 with two pairs of dorsal, setulose projections, and ventrolateral projection on each side; segments 2–7 with two pairs of setulose projections dorsally, one pair of projections on each side laterally, and three pairs of posteriorly-directed spines in a transverse row ventrally. Segments 1–7 each bear a spiracular opening (Fig. 2, s) just above the base of the upper, lateral projection. Segment 8 possesses a pair of posterolaterally-directed, thorn-like spines, a lateral spine on each side, a pair of spines ventrally, and a pair of caudally-directed, acutely pointed projections. This terminal segment has a rugose surface with small processes near the bases of the caudal projections.

Although Nagatomi (1961a) noted that the pupae of the species he described had only prothoracic spiracles, the pupa of *A. variegata* is peripneustic with longitudinal tracheal trunks extending through the first five abdominal segments. The spiracles on the remaining posterior abdominal segments are not connected to the tracheal trunk, but they have short tracheae that extend only into the segment which bears them. Each abdominal spiracle has a circular, lightly sclerotized peritreme that borders a simple funnel-like orifice (Fig. 5).

The prothoracic spiracle is a raised structure at the anterolateral margin of the thorax (Fig. 2, ps; Fig. 4). The spiracular opening forms a reversed "3" on the elevated surface which is about 1½ as broad as long. A prominent spiracular scar is evident on the posterior surface of the spiracle tube.

The elongate, setulose abdominal projections serve to distinguish *Atherix* pupae from the known pupae of other species of Rhagionidae. The *A. variegata* pupa differs from the pupae of *A. salsumana* Matsumura, *A. kodai* Nagatomi, and *A. morimotoi* Nagatomi in having smooth, thorn-like spines on the terminal abdominal segment; none of these spines are setulose, as
in the three named species. The variegata pupa appears to differ from that of A. ibis japonica in the arrangement and position of the dorsal abdominal projections, but further scrutiny is necessary for confirmation of this feature.

The apneustic larva of A. variegata is well adapted for existence in the stream community with its gill-like body projections and the crochet-bearing ventral prolegs. The peripneustic pupa shows more terrestrial adaptations and seems to betray the affinities of the genus. Pupae in other rhagionid genera are peripneustic and found in soil and rotten wood (Greene, 1926). Atherix seems to be secondarily aquatic in the larval stage with an essentially terrestrial pupa. These characteristics only serve to re-emphasize the diversity of insect adaptation and the advantages of insect metamorphosis.

Acknowledgments

I wish to thank Ruth Berberion, a former limnology student at Cornell University, for showing me how to obtain Atherix pupae. Dr. J. G. Chilcott of Canadian Department of Agriculture kindly examined the adult material.

This work was the incidental outcome of a study supported by National Science Foundation Grant GB-63.

Literature Cited

———. 1962. Ibid. 36 (10): 103-149.
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Some South African Psocoptera from Termite Nests

Edward L. Mockford, Dept. of Biological Sciences, Illinois State University, Normal, Illinois

The material reported herein was sent to me for determination by Dr. W. G. H. Coaton of the Plant Protection Research Institute, Department of Agricultural Technical Services, Republic of South Africa. The specimens were collected by Mr. J. L. Sheasby in nests of termites in Transvaal and Cape Province. Dr. Coaton provided names of the host species.

Four species are included, of which one is described as a new subspecies of Liposcelis bostrychophilus Badonnel. Another is tentatively identified as Liposcelis presolepidis (Enderlein). If the latter identification is correct, this is the second record for the species and the first African record. Both of the other two species appear to be new records for Africa, but both are readily distributed by agency of man, and both may have been introduced.

References in the literature to psocids in termite nests are very few. Townsend (1912) described Psocatropos termitorum (Vulturos termitoriun Townsend) collected in a termite nest in Peru. Badonnel (1955: 21, 41, 45) described two species of Amphientomids from termite nests in Angola. Apparently neither of the two genera reported herein have been taken in association with termites previously.
Family ATROPIDAE Pearman

Lepinotus patruelis Pearman, 1931.

The species has apparently not been reported previously from Africa. It is frequently carried in human commerce, and its introduction is possible. It has been reported from England, France, and the United States. Its original homeland is not known.

The South African specimen contains a single spermatophore of the type figured by Pearman. The specimen agrees closely with the described morphological features of British material but is somewhat smaller, with body length 1.54 mm.

Republic of South Africa: Transvaal: 9 miles from Pretoria towards Babsfontein, July 26, 1963, 1♀, in mound of *Trinervitermes trinervoides* Sjöstedt. The specimen was returned to Dr. Coaton.

Family LIPOSCELIDAE Enderlein

Genus Liposcelis Motschoulsky, 1852

Badonnel (1962, 1963) has proposed a division of the genus into two sections, four groups, and several subgroups. According to this system, *Liposcelis prenolepidis* (Enderlein), discussed below, falls in Section II, Group D.

Liposcelis liparus Broadhead, 1947.

This species has not previously been recorded from Africa. It was originally described from England, where it was taken in buildings. The South African material is somewhat larger than the British material, but agrees essentially in color, sculpture, and chaetotaxy.

Measurements¹ (in μ) :

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¹ Micrometer unit for Fl, Fw, T, and t₁ = 3.7 μ; for P₄ and t₂ = 1.7 μ; for f₁, f₂, f₃, and t₂, t₃ = 1.12 μ; for other measurements = 0.85 μ.

² P₄ = length of fourth palpal segment; V = width of vertex behind eyes; f₁, etc. = length of first flagellar segment, etc.; Fl = length of hind femur...
Republic of South Africa: Transvaal: 11 miles from Pretoria towards Derdepoort, March 4, 1963. 2 ♀, in fungus chambers of main nest cavity of *Odontotermes latericus* Hav. One specimen was retained in my collection, and the other was returned to Dr. Coaton.

**Liposcelis bostrychophilus termitophilus** n. subsp. (♀)

Diagnosis:—Differing from typical *L. bostrychophilus* in possessing very markedly areolate sculpture of vertex and abdominal terga. Differing from form *granicola* Broadhead and Hobby in that lines separating areoles more distinct on vertex and medially on abdominal terga; tubercles of areoles of abdominal terga fewer, larger, and less distinct; many areoles with only tuberculate border.


Morphology:—Lacinia (Fig. 4) seemingly with median denticle somewhat larger than in other forms of the species. Median suture of vertex weakly indicated by a wavering, unsculptured line. Median suture of pronotum a faint, irregular line; that of mesonotum distinct. Parapsidal sutures indicated by breaks in sculpturing, with several setae oriented along them. Common trunk of gonapophyses as in *L. prcnolepidis* (see Fig. 2). T-shaped sclerite (Fig. 1).

Sculpture of Integument:—Vertex (Fig. 5) with very distinct areoles, some polygonal, others arched in front, separated

+ trochanter; Fw = greatest width of hind femur; T = length of hind tibia; t1, etc. = length of posterior first tarsal segment, etc.; SI = length of longest seta on abdomen anterior to epiproct and paraprocts (actually on clunium); Se (not present in this specimen) = length of longest seta on epiproct.
by deeply depressed lines. Areoles covered with rather indistinct tubercles (appearing somewhat more distinct at 645 × than at 860 ×). Tubercles forming dense row along anterior border of each areole. Abdominal terga 3 and 4 (Fig. 6) covered in anterior pigmented portions with very distinct transverse areoles, mostly arched posteriorly, and delimited by rows of large, diffuse-looking tubercles; in some areoles, no tubercles present other than those forming border; in others, several large, diffuse tubercles within areole. Posterior pigmentless portions of terga appearing granular, but only faintly areolate.

Chaetotaxy:—Setae of vertex fine, short (7 μ), sparse. On each side of head, two large setae behind antennal insertion. Prothorax with SI short, only a little longer than 5 or 6 other setae borne on lateral lobe. Prosternum with 2 anterior and 2 posterior setae. SII not distinguishable from other short setae of the region. Parapsidal setae 5 on each side. Meso-sternum with row of 5 setae, thus sternal chaetotaxy falling within range of variation noted for type subspecies by Badonnel (1946). Abdominal pilosity fine, similar to that of vertex in length and spacing. Terga 8–10 laterally with rather sparse, short, truncated setae and with two longer setae on each side (MdX and MvX, notation system of Pearman, 1951), hence essentially same as figured by Badonnel (1962, fig. 49) for L. b. granulosus and as seen in form granicola from eastern United States. Epiproct with two lateral setae about 1.5 × as long as others; 7 terminal setae acuminate apically.

Measurements (in μ):—

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| P₁ | V | f₁ | f₂ | f₃ | Fl | Fw | T |
| t₁ | t₂ | t₃ | SII | SIII | Sa | Se |
| 75 | 260 | 45 | 48 | 49 | 260 | 140 | 220 |
| 73 | 36 | 48 | 9 | — | 31 | 20 |

Type locality:—Republic of South Africa: Transvaal: 15 miles from Roodebank towards Kinross, September 13, 1963, 1 ♀, in nest cavity of Ondontotermes badius Hav. The type is in my collection (Normal, Illinois).
Liposcelis prenolepidis (Enderlein) (?)


The species was originally described from California. The South African specimens agree with the original description in color, number and arrangement of ocelloids in the eyes, and number and arrangement of thoracic sternal bristles. The range of total body length measurements, taken on three specimens in alcohol (0.87, 0.96, and 0.97 mm) includes the figure given by Enderlein (0.95 mm). Enderlein states that the eye is small and that its pigment spot is small. These statements are true for the South African specimens as compared to other species of the genus. The identification is strengthened by ecological information; both the type series and the South African material were collected in subterranean situations and in association with colonial insects.

The following information supplements Enderlein’s very brief description:

Morphology:—Lacinia (Fig. 7) with external denticle long, median and internal denticles subequal. Median suture of vertex weakly indicated. Median suture of pronotum a faint, irregular line; that of mesonotum distinct, parapsidals visible. Common trunk of gonapophyses (Fig. 1) slender, bifurcate basally. T-shaped sclerite (Fig. 3).

Sculpture of integument:—Vertex centrally densely covered with evenly spaced tubercles of medium size; the tubercles oriented in a double (in places single, in other places triple) row in region of median suture. Certain rows of tubercles appearing larger and darker, weakly delimiting areoles, the areoles more clearly delimited peripherally by presence of spaces between them. Abdominal terga same as central portion of vertex; areolar pattern clearly indicated only on sclerites of first two segments.

Chaetotaxy:—Setae of vertex fine, of medium length (10 μ), sparsely distributed. On each side of head, two larger setae behind antennal insertion. Prothorax with SI short, only a
little longer than 6 or 7 other setae of lateral lobe (mostly posterior in position). SII scarcely distinguishable in length from other setae of mesotergum. In 3 specimens examined, no variation noted in thoracic sternal chaetotaxy. Abdominal pilosity fine, in length similar to that of vertex. Terga 8–10 laterally with many short truncated setae, but with only two longer setae on each side (MdX and MvX). Epiproct with two lateral truncated setae about twice as long as others; 3 or 4 terminal setae acuminate apically. Hence chaetotaxy of abdominal apex essentially same as in L. bostrychophilus complex.

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Discussion:—The agreement of the South African material with all of the features described by Enderlein assures that this material is at least very closely related to Enderlein’s species, if not the same. The very great distance between the type locality (California) from South Africa does not necessarily argue against the identification, as very wide distributions, with or without the agency of man, are common in the Psocoptera.

The species is undoubtedly very closely related to L. bostrychophilus Badonnel. The chief difference lies in the sculpture of the vertex and abdominal terga, that of typical L. bostry-
chophilus (figure and description of Broadhead, 1950) showing the tubercles larger and less distinctly rounded, while the grani-
cola form of that species has very distinctly areolate sculpture, as do the subspecies L. b. granulosus Badonnel and L. b. termi-
tophilus n. subsp. L. bostrychophilus is larger (body length

1.1–1.25 mm) and somewhat darker in coloration, or at least that is true for the form *granicola*, which occurs in eastern United States, as well as for the two subspecies mentioned above. The absence of males in the South African material (12 ♀) as well as in the type series (4 ♀) suggests the possibility of its being a parthenogenetic form. The complete absence, as far as is known, of males in the *L. bostrychophilus* complex suggests the possibility that these forms as well as *L. prenolepidis* may be clonal segregates of a single agamic taxon.

**Literature Cited**


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Activation of Spider Spermatozoa

MARTIN H. MUMA and KARL J. STONE

Spermatogenesis in spiders has been studied by a number of competent investigators, including Gilson (1884), Bösenberg (1905), Wallace (1909), Sharma and Gupta (1956), and Tuzet and Manier (1959). Fairly typical flagellate spermatozoa are produced but these forthwith roll up or round up into small, compact, non-motile forms. At this point their history becomes obscure and it has only been surmised that they may later resume their flagellate condition inside the body of the female.

Because of this scarcity of information on the morphology and movement of spider spermatozoa, archnologists and cytologists may be interested in a fortuitous observation. During a morphologic investigation of spider palpal fluid, actively moving spermatozoa of Tetragnatha seneca Seeley were observed and studied.

Seminal fluid was teased from the palpi of several genera of male spiders and mounted on microscope slides in a variety of media with several techniques. In a mount prepared by teasing palpal fluid of T. seneca into a droplet of 1.0% technical NaCl in distilled water and covering immediately with a cover-slip, activation and movement of spermatozoa were observed. Although thousands of spermatozoa were contained on the slide, only a few became active even though the slide was maintained at the same temperature, 80° F, for several days.

The spermatozoa were observed and studied at 500 to 750 × magnifications with a phase-contrast microscope. Each spermatozoon was elongate with a slightly enlarged, rounded "head" and a sub-terminal flagellum. Measurement of 10 quiescent individuals gave the following means: body length 16.9 μ, flagel-
lum length 29.9 μ. Body width and head length and width were indeterminable at the magnifications available.

Activation was evidenced by the initiation of a whip-like flagellar motion. The spermatozoon then thrashed about until it was completely free. In a few instances, the anterior end of the body or the head remained trapped within what appeared to be a spherical capsule. Most of the spermatozoa swam freely, after a short struggle. The swimming motions were quite similar to those described for the sperm of other animals, Rothschild (1956) and Bishop and Austen (1957). Vibrations of the flagella of vigorous spermatozoa were too rapid for observation but in weak or dying individuals seemed to be a repeated series of backwardly flowing S-curves. Moving spermatozoa also sustained an apparently rotary vibration of the anterior half of the body which made them seem to have a broadly rounded bead and a tapered body. This anterior body movement appeared to be a reaction to the flagellar vibrations but could not be positively determined.

Since this original observation, all efforts to obtain and study active spermatozoa of this and several other species of spiders have failed. Activation has occurred during staining procedures or when slides were not under observation.

**Literature Cited**

A New Chelonus (Microchelonus) from Western United States (Hymenoperta: Braconidae)

C. W. McComb, University of Maryland, College Park, Md.

A revision of the Nearctic species of the subgenus Microchelonus is being prepared by the author. This paper is presented in order to provide a name needed now for use in a publication of a biological study of this species by Mr. R. A. Goyer of the University of Idaho. The author thanks Mr. C. F. W. Muesebeck for reviewing this paper.

Chelonus (Microchelonus) petrovae, new species

This species resembles hopplingi Viereck in size and color, and in having a notch in the apical ventral margin of the carapace. It differs from hopplingi by not having distinct lateral lobes at the base of the scutellum.

There are several known, but as yet undescribed, species of Microchelonus that rather closely resemble petrovae. The wings of petrovae are entirely hyaline and the carapace narrows gradually from the middle to the apex, while the known undescribed forms differ in either one or both of these characters.

Female: Length 2.8 to 3.2 mm. Antennae 16-segmented, very slender, filiform, extending back to a point just beyond the base of the carapace, first flagellar segment 0.6 as long as scape, the last three segments almost twice as wide as long, and about equal in length; head transverse, 0.5–0.6 as wide as long; frons rugulose; temples finely vertically rugulose, as wide at mid-eye point as greatest eye width, receding gradually from eye margins; face 2 to 2.2 times as wide as high, vertically rugulose laterally, medially transversely rugulose and with a short median longitudinal carina above; clypeus polished and weakly, sparsely punctate; malar space 1.5 times basal width of mandible; level of lower eye margins above dorsal margin of clypeus.

Scientific Article No. A1184, Contribution No. 3671 of the Maryland Agriculture Experiment Station, Department of Entomology.
Lobes of mesoscutum rugulose, shiny and very finely rugulose medially; notauli indicated; posterior median area coarsely rugose reticulate; disk of scutellum flat, rugulose laterally, medially polished and weakly, sparsely, punctate, its lateral margin distinct; lateral lobes at base of scutellum indistinct; propodeum rugose, caudal margin of its dorsal face defined by a raised line, the outer pair of projections prominent, the inner pair very weak or indistinct.

Carapace narrowing gradually from the middle to its apex; two posteriorly convergent keels on base of carapace which are quickly reduced to the size of the strong longitudinal carinae on basal half to basal two-thirds of the carapace; the apex of the ventral opening reaching almost to the apex of the carapace; a small notch in the ventral apical margin of the carapace.

Stigma a little more than three times as long as wide; radial cell on wing margin about one-half as long as stigma, and almost as long as the last abscissa of the radius.

Body black; coxae and trochanters blackish, rest of legs testaceous, darker in some specimens than in others, posterior tibiae narrowly banded distally with brown; wings hyaline.

Male: Like the female but with the antennae 21- to 23-segmented and extending back almost to the end of the carapace; foramen in the apex rather small, oval, its width equal to two-thirds the posterior metatarsus, the median dividing structure laterally compressed, extending only slightly beyond the apex of the carapace below the foramen and not attaining the apex of the carapace above the foramen; wings subhyaline; anterior femora dark, narrowly yellow distally; middle and posterior femora dark; middle and posterior tibiae brown on posterior edge, lighter anteriorly.

Type: USNM No. 66111. Type locality: Coeur d'Alene National Forest, Shoshone County, Idaho.

Described from three females (one the type) and three males (one the allotype) from the type locality reared from Eucosma recissoriana Heinrich by R. A. Goyer on July 7, 1963 (Lot 64-6141); one female and five males collected at Cathedral Park, Shoshone County, Idaho in July 1963 by R. A. Goyer;
four females and four males collected three miles northwest of Hope, Idaho in July and August of 1962–4 by R. A. Goyer and M. M. Ollieu; and eleven females and five males collected at Trestle Creek, Bonner County, Idaho on August 1 and 2, 1962 by M. M. Ollieu; all the above in association with cones of Pinus monticola.

Also included as paratypes are three females and five males reared from Petrova sp. on Pinus contorta collected at Medicine Lake, California by M. M. Furniss (Hopkins U. S. No. 33990B) on July 22, 1953.

Studies on North American Ants.  I. The Formica integra Subgroup

William L. Brown, Jr., Department of Entomology, Cornell University

This study grew out of an attempt to clarify the relationship between two taxa of the Formica rufa group in North America; these are the forms called by Creighton (1950) Formica integra haemorrhoidalis and Formica obscuripes ravidia. A study of their types and additional material convinces me that they are synonymous, and that a third synonym is Formica integra tahoensis. The senior name to be applied to this species is Formica haemorrhoidalis; it appears to be distinct from Formica integra, to which it was formerly attached as a subspecies. Offered below are a formal synonymy embodying the necessary changes, a discussion of the evidence for the revisionary conclusions, and some remarks on the position of the two species within the rufa-truncicola group.

Formica haemorrhoidalis

present selection, a major worker (appropriately labeled) from “Colorado,” in Forel Collection, Muséum d’Histoire Naturelle, Geneva. A second worker, originally on lectotype pin, in Museum of Comparative Zoology at Harvard University.


1. *Relationship of haemorrhoidalis to integra*. There seems little doubt that these two rather similar forms are closely related. At the same time, I know of no evidence indicating that they are conspecific. All of the samples of *integra* I have seen are from east of the Great Plains; all lack hairs on the frontal region and vertex, and all have the gastric pubescence rather dilute and the integumental surface here sericeous-subopaque. In *haemorrhoidalis*, on the contrary, unrubbed specimens seem always to bear at least one pair of hairs on the frontal region, and most samples have an additional pair of the vertex; the gastric pubescence is thick, opaque and grayish-
white, yielding the effect of a bluish "bloom" in fresh specimens seen without magnification. Creighton cites the Black Hills of South Dakota as the eastern limit of *haemorrhoidalis* and the western limit of *integra*, yet he does not mention intergrades from this region. Wheeler and Wheeler, on the other hand, mention finding no *integra* samples in North Dakota, while, under the present interpretation, *haemorrhoidalis* is found throughout most of that state. These apparent contradictions will have to be resolved by the study of more material from the Dakotas, but for the time being I am going to treat *haemorrhoidalis* and *integra* as the distinct species that the available evidence indicates they are.

2. **SYNONYMY OF RAVIDA.** Creighton placed *ravida* with *obscuripes* because they shared the character, "Head of the largest workers as broad as long (mandibles excluded)," versus "Head of the largest workers longer than broad (mandibles excluded)." Unfortunately, this difference cannot be confirmed by actual measurements on relevant specimens available to me. The largest of 5 syntype workers of *ravida* in the Museum of Comparative Zoology has a head length of 1.11 mm and a head width of 1.07 mm (error of measurement ± about 0.01 mm). The lectotype of *F. haemorrhoidalis* measures HL 1.10 mm by HW 1.04 mm. These measurements are made in the manner generally considered standard by modern workers, and include the clypeus in the head length. Perhaps Creighton measured in some other way. If we assume that he ignored the clypeus, and took instead the mandibular insertions as his anterior reference point, then we can arrive at head lengths equal to or less than the respective widths. But if we do measure in this way, we find that species such as *integra* and *haemorrhoidalis*, which Creighton put in the "head longer than broad" category, also have the head broader than long in the largest majors. To sum up, we can say that Creighton's head length-width character as used in his keys to *Formica* species is undefined and will not separate at least some of the species it is supposed to, including *haemorrhoidalis* and *ravida*. 
Once the head width is viewed in its proper light, it becomes difficult to see how such a disparate pair of species as *obscuripes* and *ravida* could ever have been bracketed together; their sculpture, color pattern and especially their pilosity are about as different as those of *rufa* group species can get. On the other hand, no such major differences exist between the lectotype of *haemorrhoidalis* and the syntypes of *ravida*. The lectotype of *haemorrhoidalis* was deliberately chosen because it was a large major worker in good condition, and because it was from Colorado, the state Wheeler had earlier selected as the type locality. The specimen matches very well most of the samples placed under that name in the Wheeler Collection. It also matches well the types of *ravida*, except that the latter have certain workers, especially the smaller ones, more or less infuscate over head and alitrunk, and have the gastric pilosity shorter, more delicate and sparser than in Colorado *haemorrhoidalis*. The infuscation character is held in common with the geographical variant *tahoensis*, which, as Creighton has already pointed out, differs from *haemorrhoidalis* significantly only in color.

I have a series from West Yellowstone, in extreme southern Montana (E. O. Wilson leg.), that resembles the *ravida* types in color, but has somewhat longer and more numerous gastric hairs, and is in this respect transitional to Coloradan *haemorrhoidalis* and typical *tahoensis*. G. C. and J. Wheeler (loc. cit.) describe from North Dakota 23 separate collections, of which three “compare very closely with the types of *integra* *tahoensis*” and three with the types of *ravida*. The remaining 17 collections “show various combinations of those characters which appear different on the two types.” Gregg (op. cit., p. 556) mentions two collections in western Colorado that “appear to represent intergrades between *tahoensis* and *haemorrhoidalis*,” although he also distinguishes something that he calls *ravida* on the basis of two collections from northern Colorado.

The picture emerging from these considerations is one of a single moderately variable species ranging widely in the higher Great Plains and the mountains of the West. The only evident trend in geographical variation appears to affect the color, which
is clearer red over the forebody in samples from Colorado than it is elsewhere. It may be that samples from the northern Rockies also tend to have reduced gastric pilosity, but if so, this trend is at least partially reversed in southern British Columbia. A great deal of additional material must be studied from these areas before we understand how the variation runs, but the perennially problematical name ravida is logically retired into synonymy at this time.

3. The Separation of *F. haemorrhoidalis* from Other Members of the *Rufa* Group. The task of separating haemorrhoidalis from integra appears much easier at this juncture than does that of distinguishing the former from certain members of the *F. integroides* complex. At first sight, it seemed that one might modify Creighton's couplet 21 in the *rufa* group key so as to bring out haemorrhoidalis by its lack of "gular" hairs (more than two hairs are frequently present on the petiolar crest of haemorrhoidalis workers). A review of even the limited amount of material available to me, however, shows that some workers in some haemorrhoidalis nest series have one to as many as 6, 8 or even more delicate erect hairs on the under surface of the head, thus making transition toward integroides-complex forms such as *F. propinquia*, which are very similar to haemorrhoidalis in general appearance, and especially in sculpture and gastric pubescence, but which have more abundant and widely-distributed erect pilosity on the forebody. At present, I cannot see how all of these forms can be separated from one another, if indeed they should be. The situation will be clarified by more material, especially samples having females definitely associated with workers in unmixed nests. A large component of the confusion among these species to date is traceable to mixed series, especially incorrect associations of female with worker castes.

For the moment, it seems safe to suggest that *F. integroides subfasciata* is a straight synonym (based on a slightly faded sample) of *F. integroides*, and that *F. coloradensis* is probably a good species, as judged from its apparently correctly associated female, which has rather abundant, fine erect pilosity on the head
as well as the legs, and a more dilute representation of the same on the sparsely pubescent gastric dorsum. (Other winged females from Florissant, the _coloradensis_ type locality, were originally included in the type series, but these are really ordinary hairless _haemorrhoidalis_ examples.)

The form _planipilis_, placed by Creighton as a subspecies of _F. integroides_, has been linked with _coloradensis_ by Creighton and by Gregg, who claim to have found intergrades between _coloradensis_ and _planipilis_ in Utah and Colorado. Since these two forms are only color variants so far as the literature is concerned, they may be synonymous; still, one would like to know what the female of _planipilis_ is like before deciding on this relationship.

**Acknowledgments**

Much of the work done on this study was supported by the U. S. National Science Foundation, Grant Nos. G-23680 and GB-2175. Thanks are due Dott. Delfa Guiglia, of the Museo Civico di Storia Naturale at Genoa, and Dr. Claude Besuchet, of the Muséum d'Histoire Naturelle of Geneva, for the opportunity to study the collections under their care in 1963 and 1964. Thanks are also offered to colleagues who read and commented upon drafts of this paper.
A New Species of Gnorimoschema (Lepidoptera: Gelechiidae) from Kentucky

ANNETTE F. BRAUX, Cincinnati, Ohio

The new species described below is of interest because of its unique habitat, correlated with the restricted distribution of its food plant, Silene rotundifolia Nutt., a southern species which is confined to sandstone ledges and “rock houses” or grottoes of the Appalachian Plateau and the Southern Appalachians. This species of Gnorimoschema has been found only in the shelter of such overhanging ledges.

Gnorimoschema protecta new species.

Dorsal surface of head mottled dull clay-color, face paler, unmottled; antennae blackish, with white annulations; second segment of labial palpi whitish above, scales of brush blackish, furrow paler in females, third segment sometimes narrowly white above, as long as the second, scales closely appressed scarcely attaining apex.

Thorax and fore wings pale clay-colored, the scales more or less deeply tipped with darker clay-color, areas with scales more deeply thus tipped forming cloudy patches; at four-fifths the wing length, a transverse whitish fascia; beyond the fascia the apical area of the wing is more or less densely clothed with black scales, sometimes sharply contrasting with the rest of the wing or with the black scaling reduced to a blackish subapical spot and a terminal row of black dots; inwardly, the pale fascia is bordered by an elongate costal patch of black-tipped scales; a blackish spot at end of cell, an irregular dark patch at end of fold contiguous to the fascia, a dark spot sometimes present mid-length of fold, and a darker shade nearer base; rarely a small blackish dot in middle of cell and a subbasal costal blackish spot, these latter spots more often present in females; cilia fuscous, marked with a mid-line of blackish scales along termen, beyond which the cilia are pale clay-colored, except near tornus.
Hind wings pale gray in females, darker in males toward apex, cilia darker, almost black in the darkest males.

Legs irrorate fuscons, with basal, median and apical whitish bars on tibiae, tarsal segments whitish-tipped; the prothoracic pair usually darker, whitish inwardly.

Abdomen white ventrally, varying dorsally from grayish ochrous to densely fuscons dusted or almost black, posterior margins of segments narrowly white.

Alar expanse: 12 to 14 mm.

Descriptions of the male and female genitalia are omitted, awaiting the comprehensive study of the genus by Ronald W. Hodges.

Holotype.—♂. Carter Caves State Park, Carter County, Kentucky, rearing record B1612, imago June 11, 1954. [Collection of Annette F. Braun.]


Type material will be deposited in the Academy of Natural Sciences of Philadelphia and in the United States National Museum.

Feeding larvae of the summer generation were observed and reared on the food plant, Silene rotundifolia Nuttal, in May and June, producing imagoes in June and July. At the tip of a shoot, a web is spun across the bases of two opposite leaves; the larva bores down into the tip of the stem, destroying the terminal bud; it retires into the stem, coming out to feed on the last pair of leaves spinning silk across between them. Such shoots are thus aborted and later the larvae must be searched
for on these short stems, hidden by the blooming stems; then
the larvae merely spin together the leaves of new growth. The
loose webby cocoon is sometimes found on the bored stem.

In mid-October in Carter County Co., Ky., young larvae
were webbing among the crowns of the winter rosettes, the webs
extending out onto the leaves. Larvae observed in April were
still feeding on the old overwintering growth, later transferring
to the new shoots; at this date (April 24) most of the larvae
were young; a single nearly full-grown larva produced an
imago May 8.

The full-grown larva is dull greenish, with head, first thoracic
segment and legs black, a mid-dorsal and two lateral reddish
stripes, the spiracular stripe broken.

The presence of larvae in late autumn and in spring suggests
that in the favorable microclimate of these “rock houses” where
the winter temperatures are much above those of the surround-
ing area, the young larvae can survive and perhaps feed through-
out the winter.

In general aspect this species differs from the species currently
included in Gnorimoschema. On palpal characters and the
slight convergence of veins 6 and 7 basally, this species would
fall into Phthorimaea Meyrick, synonymized with Gnorimo-
schema by Busck (Proc. U. S. N. M. 86: 570, 1939) on geni-
talic characters. A number of species of similar larval habits
feeding on members of the Caryophyllaceae are included in
Phthorimaea by Meyrick in his Revised Handbook of British
Lepidoptera (1927).
The Pupa of Anatopynia venusta (Coquillett) (Diptera, Tendipedidae, Pelopiinae)

Selwyn S. Roback, Curator, Department of Limnology, Academy of Natural Sciences of Philadelphia

Among the specimens received in the course of a revision of the North American Pelopiinae* was a vial of pupal skins and adults of \textit{A. venusta} (Coq.). The specimens were from Arcata, Humboldt Co., California and were sent to the author by Dr. G. Grodhaus. In the following description the setal terminology of Fittkau (1962) is used, but pending the completion of the study no attempt has been made to fit the species into Fittkau’s system of classification.

Female pupa 7.5 mm; respiratory organ as in Fig. 1, .69 mm long by .19 mm at widest point; Oth\textsubscript{1} and Oth\textsubscript{2} simple; Oth\textsubscript{3} and \textsubscript{4} not discernible; Mth\textsubscript{1} .11 mm, straight; Mth\textsubscript{2}, simple. .075 mm long; Mth\textsubscript{3} .21 mm, slightly sinuate; scar of segment 1. Fig. 6, .24 mm long by .14 mm wide; chaetotaxy of abdominal segments 2–5 similar to Fig. 4; ventral hairs on left; D\textsubscript{2} and D\textsubscript{3} about .81 mm long; D\textsubscript{1} and D\textsubscript{4} about .14 mm long; abdominal segment 6 as in Fig. 5; segment 7 with 5 large lateral filaments, about .36 mm long, in the distal half to two thirds of the segment; segment 8 with 5 large lateral filaments, about .49 mm long, evenly distributed along the margin; one specimen studied had 5 filaments on one side of segment 7 and 4 on the other; on segment 8, 5 on one side and one on the other; female genital sacs .19 mm long; anal fins, Fig. 2, 1.05 mm long by 1.05 mm width of both at base; tip of anal fins as in Fig. 3; abdominal segments brown except for lense-shaped light lateral areas; shagreen of tergites as in Fig. 7; no spines in intersegmental membranes.

LITERATURE CITED


Fittkau, E. J. 1962. Die Tanypodinae (Diptera, Chironomidae) Abhand. z. Larvalsyst. d. Insek. 6, Akademie-Verlag, Berlin: 97 (Figure 10), 218 (Figure 150).

* The support of the National Science Foundation (Grant GB2719) is gratefully acknowledged.
Figs. 1-7. Pupa of *Anatopynia venusta* (Coquillett).

The Larva of Nigronia fasciatus Walker
(Megaloptera: Corydalidae)

R. Duncan Cuyler

Introduction

*Nigronia fasciatus* (Walker), subfamily Chauliodinae, a species of the Northeastern United States, ranges southward as far as North Carolina, its habitat being small, rocky woodland streams. The larvae are most often found under rocks or in moss on top of rocks. Pupation occurs in soil adjacent to the streams, under rocks, or occasionally in rotten logs. The adults are rarely observed, but may be seen occasionally in large numbers in the immediate vicinity of the breeding site.

Three larvae of this species were collected near Durham, North Carolina, on October 18, 1955. Similarities were noted between these larvae and those of *Nigronia serricornis* (Say) which are commonly collected in the same area of North Carolina. It was noticed, however, that the caudal respiratory tubules (tubes bearing the spiracles of the eighth abdominal segment) of these larvae were longer than those of *N. serricornis* and it was therefore suspected that these larvae belonged to *N. fasciatus*. This suspicion was confirmed on May 15, 1960, when a male of that species was reared from a prepupa which was identical to the three larvae collected in 1955. Through May, 1964, a total of thirty-three adults, including fifteen males and eighteen females, was reared from prepupae, and a number of additional adults were reared from pupae collected from several streams in Durham and Orange counties.

Two larvae of this species collected near Raleigh, North Carolina, are in the North Carolina State University collection.

Larvae of the Genus *Nigronia* Banks

Larvae of the genus *Nigronia*, as well as those of other genera of the subfamily Chauliodinae, such as the western *Neohermes* Banks and *Protochauliodes* Van der Weele (collected by the
writer) and the Australasian *Archichauliodes* (Hamilton, 1940) (see also Cuyler, 1958), lack the tracheal gills on the venter of the abdomen which are characteristic of the larvae of the well-known *Corydalis cornutus* (Linnaeus) of the subfamily Corydalinae. Other differences are given in detail in Cuyler (1958, p. 582). The *Nigronia* larvae differ from those of the closely related genus *Chauliodes* Latreille (Cuyler, p. 583) in the much shorter caudal respiratory tubules and in the more numerous and conspicuous papillae on the abdomen. Larvae of other chauliodine genera and corydaline larvae lack the respiratory tubules, the spiracles being sessile on all abdominal segments.

*Nigronia fasciatus* Walker, preserved specimen from Durham, North Carolina, October 18, 1955. Enlarged ×2.2.

The following description of the larva of *Nigronia fasciatus* is based on specimens in the collection of the writer. These larvae were fixed by boiling before preservation in alcohol, so as to guard against disfiguration.

Description of Larva of *Nigronia fasciatus*

Maximum length approximately 40 mm; lateral aspect of gena subangulate, convex, the apex of the curve being one-third the
distance from base to apex; pronotum quadrangular, approximately ten per cent wider than long; lateral filament of eighth abdominal segment \(1\frac{3}{4}\) to \(2\frac{1}{2}\) times longer than width of segment; lateral filament of first segment slightly longer than width of segment; spiracles of abdominal segments 1 through 7 opposite bases of lateral filaments, on distal ends of oblique tubercles which are considerably wider than high; spiracles of eighth segment at distal ends of cylindrical respiratory tubules arising close together near the middorsum at the posterior margin of the segment; respiratory tubules slightly less than length of 9th segment, or 1–1.5 mm long, and somewhat constricted on apical two-thirds.

Labrum bearing short hairs on anterior border and with longer and stouter lateral setae; setae on sclerotized areas of thorax and on legs; short, cylindrical papillae laterally on mesothorax, metathorax, and abdomen; those of posterior abdomen may be several times longer than wide; extent of papillae variable, occasionally present on lateral filaments.

Labrum brown; clypeus tawny-white; frons and vertex dark brown; occiput dark brown, washed with lighter brown on submedian and dorsolateral areas; pronotum brown, faintly embossed with darker brown as follows: dorsolateral comma near apex 1.0 mm long; lateral arrow-shaped mark 1.75 mm long, pointing upwards, with stem laterally concave, beginning at submarginal suture; short vertical dash each side of arrow stem near base; additional dorsolateral comma at base; mesothorax and metathorax tawny; scuta variegated with darker brown; legs tawny-white; abdomen sandy-gray, mottled with paler gray, and with an obscure, pale middorsal stripe; lateral filaments sandy-gray.

Larvae of *Nigronia fasciatus* closely resemble the larvae of the more widespread *Nigronia serricornis* Say, and a third, undescribed species. It differs from these mainly in the greater length and closer proximity of the caudal respiratory tubules. In the other species the respiratory tubules are mid-lateral in position, conical, and less than 1 mm in length.
A New Moth for Pennsylvania

On V.15.65, large numbers of a species of *Ptichodis* Hbn. (Lepidoptera, Noctuidae) were observed near Schwenksville, Montgomery Co., Pa., and two were taken for identification. They proved to be *P. bistrigata* Hbn., a species previously unrecorded for the State. *P. bistrigata* occurs in the Gulf states (Georgia, IV) and locally up the coast. It has been reported from Lakehurst, N. J. (V).

Both sexes were present and fresh. About 60 individuals were seen in a four-acre area. The locality is dominated by red cedar (*Juniperus virginiana*) with fair amounts of redbud (*Cercis canadensis*), and undergrowth of poison ivy, *Rubus, Fragaria, Andropogon*, and *Tridens*.

ARTHUR M. SHAPIRO, Jessup Fellow, Academy of Natural Sciences of Philadelphia
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All insertions are continued from month to month, the new ones are added at the end of the column, and, when necessary, the older ones at the top are discontinued.

Curculionidae of the genus Curculio (formerly Balaninus) wanted for revisional study. State locality and “nut tree” found on if at all possible. Kenneth E. Weisman, 4 Balmoral Ave., Bartonville, Illinois.

Syrphidae. Exchange or purchase. Will collect any order or family in the New England area. F. C. Thompson, Dept. Entomology, University of Massachusetts, Amherst, Mass.

Membracidae wanted. Purchase or exchange. T. L. Stringfellow, Military Reservation, Box 11-A, Hudson, Massachusetts.

Buprestidae, Scarabaeidae, and butterflies wanted in exchanges for beetles and butterflies. Mr. W. van der Starre, 25 Crawley St., Warrnambool, Victoria, Australia.

Butterflies of the World wanted in exchange for those of my locality. Louis Clarke, 10435 Georgetown Drive, Rancho Cordova, California 95670.

Research Assistant in Butterflies wanted at Carnegie Museum for 1965-66; $2400 plus partial tuition in Graduate School, Univ. Pittsburgh where he must be accepted as a Ph.D. candidate. Send personal data to Dr. Richard M. Fox, Carnegie Museum, Pittsburgh, Pa. 15213, except between Dec. 1 and Mar. 1 when data should be sent to Dr. Fox at British Museum (N.H.), Cromwell Road, London S.W. 7, England.

Scoliidae of the Neotropical Region, Africa, or Madagascar wanted for study, determination, exchange, or purchase. J. Chester Bradley, Comstock Hall, Cornell University, Ithaca, N. Y., 14850.

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BUTTERFLIES OF LIBERIA

By Richard M. Fox, Arthur W. Lindsey, Jr., Harry K. Clench and Lee D. Miller

402 pages of text; colored frontispiece, 233 figures, 2 graphs, 2 tables, 3 maps, table of contents, full bibliography and a taxonomic index.

With 195 new records, this study increases the known butterfly fauna of Liberia from 280 to 475 species and another 254 species are noted as probably to be found. Two new tribes, 5 new genera, 13 new species and subspecies are described. Illustrations include photographs and, where pertinent, drawings of genitalia of all holotypes, along with photographs and drawings of closely related forms for comparison. The distribution of each species is given and those more difficult to identify or previously confused are treated at greater length. All known records from Liberia are noted. A 46 page introduction details climatic conditions and biotopes in Liberia and analyzes the zoogeographic and ecologic relationships of the butterflies of Liberia and of Occidental Africa.

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Catocala louiscae, new species. Fig. 1, upperside holotype; Fig. 2, underside holotype; Fig. 3, genitalia of male paratype (Slide no. 6). Figs. 1 and 2 twice natural size; length of forewing 20 mm.
A New Catocala from Florida
(Lepidoptera: Noctuidae)


In 1954 a Carnegie Museum field trip of several months to northern Florida was conducted with the support and inspiration of Mr. and Mrs. E. P. Mellon, II, of Pittsburgh. Among the large collections taken was a series of a new species of Catocala, named below in memory of the late Louise (Mrs. E. P.) Mellon.

This species is closely related to C. andromedae Guenée in male genitalia and forewing pattern and has the deep yellow color of C. amestris Strecker on the hind wing. C. andromedae, amestris and louiseae were found flying together.

Catocala louiseae, new species (Figs. 1, 2)

Head and thorax a mixture of gray and brown scales; anterior tufts brown, edged with white; the posterior tufts with mixed yellow and gray scales posteriorly and anteriorly edged with brown scales. Abdomen buff dorsally with lateral tufts white to light brown, and light yellow ventrally; anal tuft brown with whitish tip. Forewing upperside (Fig. 1) markings close to C. andromedae: ground color light gray dusted with brown scales; basal dash dark brown, angled directly to and touching the inner margin; a well marked trapezoid spot over base of Cu₁ and intersecting the subreniform and the transverse anterior line; transverse anterior line narrow, oblique, connected to the top of the trapezoid spot, broader toward costa; dark basal line a short narrow bar at the costa; median shade short,
broad, oblique touching the reniform spot and ending at costa; reniform spot oblong, outlined heavily by brown scales, its center a mixture of light gray and yellow-brown scales; two small prominent white spots beyond the dark ring of the reniform spot, one above the other; postmedian line dark brown bordered distally with white and with a large tooth, its top oblique from costa and slightly curved, its bottom horizontal, below which the vertical postmedian line is slightly scalloped to the inner margin; a distinct fuscous brown band separates the outer portion of the postmedian from the irregularly serrated subterminal line which is silvery; a subapical deep brown shade runs obliquely and joins the tooth of the postmedian line; fringes concolorous. Hind wings upperside, deep yellow, bands black-brown, median band narrow, angulate and narrower toward distal margin; outer band, broad, broken at Cu₂ by the yellow ground leaving a short elongated bar at anal angle; apical patch lemon yellow; fringes with overlap of brown scales along the dark outer band, then lemon yellow toward anal angle.

Underside (Fig. 2) of forewing yellowish-white with black-brown patch at base below the cell, a dusky streak at the base above the cell, a black-brown transverse curved median band from costa to inner margin and crossing the discocellulars, slightly wider than the yellowish-white band beyond it; apical and distal fourth of wing black-brown with yellowish-white apical and interval fringe spots. Underside of hindwing almost identical with the upperside.

The genitalia (Fig. 3) are close to Catocala andromedae but the clasper is less curved.


Thanks are due to Dr. George E. Wallace, Dr. Richard M. Fox, and Mrs. Jean W. Fox for advice and assistance in preparing the manuscript, and to Richard T. Satterwhite for preparation of the drawing.
A Checklist and Keys to the Muscinae and Stomoxydinae (Diptera, Muscidae) of Pennsylvania

W. H. Gotwald, Jr.

Neither a checklist nor keys to the Muscinae and Stomoxydinae of Pennsylvania exist, and although lists for adjoining states are available, they contain errors in synonymy and have not been brought up to date or revised since they were published. Leonard (1928) compiled a list of the insects of New York, Britton (1920) published a checklist to the insects of Connecticut, and Johnson (1910) provided a list of the Diptera of New Jersey. Although the present study is initially restricted to the political boundaries of Pennsylvania, its checklist and keys are applicable in any of the states of the northeastern United States.

The author is greatly indebted to Dr. W. Wayne Boyle, Curator of Insects at The Pennsylvania State University, for his guidance and supervision during this research. The author is further grateful for assistance and advice received from: Dr. George Steyskal and Mr. C. W. Sabrosky of the United States National Museum; Dr. George E. Wallace of the Carnegie Museum, Pittsburgh; Dr. Selwyn S. Roback of the Academy of Natural Sciences, Philadelphia; Dr. L. L. Pechuman, Cornell University; Dr. T. H. Cheng, The Pennsylvania State University; and Dr. H. C. Huckett of Riverhead, New York.

The specimens examined came from the United States National Museum; the Academy of Natural Sciences, Philadelphia; the Carnegie Museum, Pittsburgh; Cornell University; and The Pennsylvania State University. Some were from the collections of Dr. Tien-Hsi Cheng of the Pennsylvania State University and the author.

1 A portion of a thesis submitted to the Faculty of the Graduate School of The Pennsylvania State University in partial fulfillment of the requirements for the Degree of Master of Science.

HISTORICAL BACKGROUND

Originally, most calyptrate muscoids were included by Linnaeus (1758) in his "genera" Musca, Oestrus, and Conops. It was not until 1862 that the Muscinae were first described as a subfamily, by Schiner in his Fauna Austriaca. Schiner included also the genera belonging to the Stomoxydinae, or all those muscoids with the fourth longitudinal vein ($M_{1+2}$) bent or upcurved at its distal end, an arista plumose at the tip, an abdomen short and ovate and without strong macrochetae, and comparatively short legs. At that time the Muscinae, along with most of the genera found in the family Muscidae today, were placed in the family Anthomyiidae. Osten-Sacken (1881) noted that most Anthomyiidae, including the Muscinae, differed from the rest of the calypterate muscoids in the absence of distinct hypopleural bristles, and thus discovered a character of considerable phylogenetic importance. The Muscinae, as defined by Schiner, was later raised to family rank by Townsend in 1890.

Girschner in 1893 recognized the hypopleural bristles as a distinguishing characteristic of the Tachinidae and as a result transferred several genera from the Muscinae to the Tachinidae. He divided the calyptrate muscoids into the Anthomyiiden and the Tachiniden, the former including the Muscinae. One must remember that the Stomoxydinae were still included in the Muscinae.

A modification of Girschner's arrangement was made by Bezzi and Stein (1907); they grouped the genera of Muscinae into either the "Muscinae muscaeformes" or the "Muscinae ariciaeformes." The former included all genera with the lower calypter broadly truncate at its apex and inner margin extended close to, or under, the margin of the scutellum. This approaches the present-day definition of the Muscinae. Into the latter group went many genera then in Anthomyiidae and the genera now included in the Stomoxydinae.

Townsend in 1908 noted that the pteropleural vestiture was of taxonomic value in the Muscoidea, but continued to rely
heavily on the upturned discal vein \((M_{1+2})\). In 1925 Malloch supported the idea that *Musca* and its allies should be returned to the family Anthomyiidae, and, although he was of the opinion that the Muscinae could be included in another subfamily (Phaoniinae), recognized that they could be retained, in part, on their possession of the truncate calypter. Although Malloch (1929) later qualified this limitation by including the Stomoxydinae in the Muscinae, van Emden in 1939 used the shape of the lower calypter as the sole character in distinguishing the Muscinae from other muscoids.

More recently, Collin (1948) suggested that greater importance be attached to the pteropleural vestiture and less to the shape of the lower calypter. This would eliminate at least two genera (*Graphomya* and *Pararicia*) from the presently defined Muscinae and include one genus (*Polietes*) in Muscinae from another subfamily. Collin suggested also that significance be attached to the structure of eggs and of the posterior larval spiracles. Collin's definition of the Muscinae includes those genera presently in the Stomoxydinae. Roback (1951) also combined adult and larval characters in an attempt to define more closely the families and subfamilies of the muscid calyptrate Diptera. Roback raised the Stomoxydinae to subfamily status on the basis of both larval and adult characters, thus separating them from the Muscinae. Eldridge and James (1957) dispute Roback's conclusion regarding the separation of the Muscinae and Stomoxydinae. They have divided the Muscinae into three tribes: Muscini, Stomoxydini, and Graphomyini. This inclusion of the Stomoxydinae, tends to create greater confusion in the definition of the Muscinae by increasing the number of characters necessary to make the description all-inclusive.

Although the taxonomic status and the limitations of the subfamilies Muscinae and Stomoxydinae have been controversial for many years, they will be regarded here as being separate subfamilies and in the family Muscidae.
Figs. 1-8. Wing venation, right wing, in the Muscinae

FIGS. 9–10. Wing venation, right wing, in the Stomoxydinae

FIGS. 11–12. Lower calypteres, dorsal view
Systematic Treatment

Family MUSCIDAE

Small to medium flies; bodies normally grey but may be metallic blue, black, or green in color; proboscis may be longer than head, rigid and with labellum reduced, or not rigid, with labellum fleshy and well developed; arista bare, pubescent, or plumose; sternopleuron generally with two to four bristles; two or three humeral bristles; acrosticals usually indistinct; two presutural dorsocentrals; calypters large, with the lower calypter usually distinctly larger than upper calypter; hypopleuron with weak hair or bare; pteropleuron lightly pilose or bare; sixth longitudinal vein \((Cu_2 + 2A)\) never reaching wing margin.

Subfamily MUSCINAE

Body moderately robust, grey to metallic blue, black, or green in color; proboscis short and not rigid, labellum fleshy and well developed (Fig. 17); arista bare, pubescent, or plumose; pteropleuron haired or bare; two or more sternopleural bristles present, if three, they are never arranged in an equilateral triangle; lower calypter truncate at its apex, its inner margin lying next to, touching, or lying beneath basal lateral angle of scutellum [except Pararicia pabulorum (Fallén, 1823)] (Fig. 12).

Checklist to the Muscinae of Pennsylvania

Pararicia pascuorum (Meigen, 1826)
Pararicia pabulorum (Fallén, 1823) \(^3\)
Mesembrina latreillei Robineau-Desvoidy, 1830
Graphomya maculata (Scopoli, 1763)
Morellia micans (Macquart, 1855)
Pyrellia cyanicolor Zetterstedt, 1845

\(^3\) While no Pararicia pabulorum (Fallén) were found in the Pennsylvania material examined, it is assumed by the author that this species inhabits Pennsylvania and may be relatively common. It has been recorded in states surrounding Pennsylvania (Dodge 1951) and has been included in the key to the Muscinae and in the descriptions.
Orthellia caesarion (Meigen, 1838)
Musca autumnalis DeGeer, 1776
Musca domestica Linnaeus, 1761

Key to the genera and species of Muscinae of Pennsylvania

1. Pteropleuron with bristles or hairs .................. 3
   Pteropleuron without bristles or hairs ............. 2

2. (1) Hypopleuron with well developed hairs; meso-
   notum with vivid gray pollinose stripes; wing
   venation as in Fig. 1 .............................. Graphomya maculata (Scopoli)
   Hypopleuron without well developed hairs; meso-
   notum without vivid gray pollinose stripes .........
   Pararicia Brauer and Bergenstamm
   a. Lower calypter truncate at its apex, its inner
      margin lying next to, touching, or lying
      beneath basal lateral angle of scutellum
      (Fig. 12); wing venation as in Fig. 2 ...........
      P. pascuorum (Meigen)
   b. Lower calypter rounded at its apex and di-
      verging from scutellum (Fig. 11) ..............
      P. pabulorum (Fallén)

3. (1) Fourth longitudinal vein ($M_{1+2}$) with a sharp
   bend apically (Figs. 3, 4, 5) ........................... 4
   Fourth longitudinal vein broadly curved apically
   (Figs. 6, 7, 8) ..................................... 5

4. (3) Thorax and abdomen metallic green; presutural
   acrostical bristles present; wing venation as in
   Fig. 3 ........................................ Orthellia caesarion (Meigen)
   Thorax and abdomen dark grey to black and
   nonmetallic; presutural acrostical bristles absent...
   Musca L.
   a. Middle of the propleuron with hairs; wing
      venation as in Fig. 5 .......................... M. domestica L.
      Middle of the propleuron bare; wing venation
      as in Fig. 4 ............................. M. autumnalis DeGeer
      (An alternate key for the identification of M.
      domestica and M. autumnalis follows this key.)

5. (3) Fourth longitudinal vein ($M_{1+2}$) joining costa
   after (posterior to) wing tip (Fig. 6); base of
   wings brilliant yellow .................................. Mesembrina latreillei Rob.-Desv.
   Fourth longitudinal vein joining costa before
   (anterior to) wing tip (Figs. 7, 8); base of
   wings not brilliant yellow .............................. 6
6. (5) Middle tibia with a strong anteroventral bristle beyond the middle (Fig. 20); thorax and abdomen metallic blue (sometimes blue-green); sternopleurals usually 1:3; wing venation as in Fig. 7. ............. **Pyrellia cyanicolor** Zetterstedt

Middle tibia without an anteroventral bristle beyond the middle; thorax and abdomen metallic black; sternopleurals usually 1:2; wing venation as in Fig. 8. ........ **Morellia micans** (Macquart)

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**Fig. 13.** Head of *Musca domestica* Linnaeus, male, dorsal view.
**Fig. 14.** Head of *Musca autumnalis* DeGeer, male, dorsal view.
**Fig. 15.** Head of *Musca domestica* Linnaeus, female, dorsal view.
**Fig. 16.** Head of *Musca autumnalis* DeGeer, female, dorsal view.
Fig. 17. Head of *Musca domestica* Linnaeus showing the nonsclerotized proboscis and fleshy labellum, lateral view.

Fig. 18. Head of *Stomoxys calcitrans* (Linnaeus) showing the sclerotized proboscis, lateral view.

Fig. 19. Head of *Haematobia irritans* (Linnaeus) with long palpus, lateral view.

Fig. 20. Middle tibia of *Pyrellia cyanicolor* Zetterstedt with a strong anteroventral bristle beyond the middle.
Alternate key to the species of Musca L. of Pennsylvania.
[In part after Vockeroth (1953) and Sabrosky (1959).]

The author found that the best single character for separating *M. domestica* and *M. autumnalis* is the condition of the propleuron (Vockeroth, 1953) as described in the above key. Since it is sometimes difficult to locate and distinguish the condition of the propleuron, an alternate key has been provided to separate the species.

1. Males (eyes more-or-less holoptic) .................. 2
   Females (eyes dichoptic) ............................ 3

2. (1) Eyes above separated by less than width of ocellar triangle (Fig. 14); abdomen above with second and third tergites, except for median line, yellow to orange-brown; remainder dark to black....
   .................................................................... *M. autumnalis* DeGeer
   Eyes above separated by at least twice the width of ocellar triangle (Fig. 13); abdomen above usually with posterior half of first tergite and all of second tergite, except for median line, yellowish, remainder dark to black; abdomen occasionally all dark ......... *M. domestica* L.

3. (1) Orbital stripe gray pollinose; abdomen dark above; anteromedial margin of eye as seen from above angled at the middle (Fig. 16) ..........
   .................................................................... *M. autumnalis* DeGeer
   Orbital stripe golden-yellow below, black above; abdomen above usually with posterior half of first tergite and all of second tergite, except for median line, yellowish, remainder dark to black; abdomen occasionally all dark; antero-medial margin of eye as seen from above rounded at the middle (Fig. 15) .......... *M. domestica* L.

Subfamily STOMOXYDINAE

Proboscis heavily sclerotized, porrect, and fitted for piercing (Figs. 18, 19); pteropleuron haired; hypopleuron bare or haired; usually at the most one sternopleural bristle; lower calypters rounded at apex, its inner margin diverging from scutellum (Fig. 11).
Checklist to the Stomoxydinae of Pennsylvania

Stomoxys calcitrans (Linnaeus, 1758)
Haematobia irritans (Linnaeus, 1758)

Key to the genera and species of Stomoxydinae of Pennsylvania

1. Palpi short, not as long as sclerotized portion of proboscis (Fig. 18); sternopleural bristles strong and black, 0:1; hypopleuron haired.

Stomoxys calcitrans (L.)

Palpi long and prominent, as long as sclerotized portion of proboscis (Fig. 19); sternopleural bristles weak and pale, 1:0 or 1:1; hypopleuron bare.

Haematobia irritans (L.)

References Cited


A New Species of Enoclerus from the Western United States (Coleoptera: Cleridae)

JOSEF N. KNULL, Department of Zoology and Entomology, The Ohio State University, Columbus, Ohio 43210

This article is an attempt to separate two species of Enoclerus which have been called *E. moestus* (Klug) (1842).

Enoclerus *barri* n. sp.

Male.—Form of *E. moestus* (Klug), although smaller: shining black; abdomen reddish yellow; elytra with white pubescent markings at base and back of middle.

Head convex; surface densely minutely punctate, a long white hair arising from each puncture; antennae extending to past middle of pronotum when laid alongside, last three segments transverse, forming a club.

Pronotum slightly wider than long, wider at apex than at base; sides slightly constricted back of apex, then broadly rounded to strongly constricted base; disk somewhat flattened, a sinuate transverse depression on apical third and a transverse depression at base; surface densely, minutely punctate, each puncture bearing a long black hair, longer white hairs at sides and at base. Scutellum rounded in rear, densely clothed with white pubescence.
Elytra much wider than widest part of pronotum, widest in apical third; sides subparallel back of base, then diverging to apical third and broadly rounded to separately rounded apices; disk somewhat flattened, a slight depression at middle and one on each side at base; surface with irregularly placed raised smooth areas, densely minutely punctate, a short black hair arising from each puncture, an irregular band of short white pubescence extending diagonally from unibone to suture, another similar band along suture from about middle to apices, the band widened at middle, and extending diagonally to side margin, apical area with white pubescence, scattered long flying hairs arising from elytra. Apical white pubescence interrupted by a patch of short black pubescence.
Abdomen beneath densely minutely punctate, a long fine white hair arising from each puncture. Legs with long and short white pubescence.

Length 7.7 mm; width 3 mm.

Female.—Abdomen slightly inflated.


Type, allotype and paratypes in collection of the author, paratypes in collections of W. F. Barr, Museum of Comparative Zoology and The Ohio State University.
This species has been combined with *E. moestus* in collections. It can be distinguished from it by being usually smaller in size and lacking an obtuse tubercle on base of each elytron and rugose base. The apical white pubescence is separated by a spot of black hairs.

I am indebted to W. F. Barr for examining a specimen and loan of material; to F. Hieke, Humboldt University for privilege of studying the type of *E. moestus* and to J. F. Lawrence for comparing specimens with the type of *E. truncatus* (Lec.) (1849), which is a synonym of *E. moestus*.

Literature Cited


New Exotic Crane-Flies (Tipulidae: Diptera).

**Part XI**

**Charles P. Alexander, Amherst, Massachusetts**

The preceding part under this general title was published in *Entomological News*, Vol. 76 (2): 41–48. The species discussed at this time were taken in Assam and Kumaon, India, by Fernand Schmid, with the exception of a single fly that was collected in Nepal by Edward I. Coher. I am greatly indebted to the collectors for these interesting specimens.

**Epiphragma (Epiphragma) dysommata**, new species

Size small (wing of male 9 mm); mesothorax variegated with buffy yellow, brownish yellow and dark brown; antennae

1 Contribution from the Entomological Laboratory, University of Massachusetts.
short, fusion-segment yellow, comprised of two segments; femora yellow with two pale brown rings, one median, the other subterminal; wings pale yellow with a pale brown pattern that includes very broad ocelli with narrow darkened margins, their centers at origin of Rs, anterior cord, outer end of cell Ist M₂ and the outer fork of M; darkened pattern heaviest in the cubital and anal cells; Rs spurred near origin; male hypopygium with more than the outer half of the interbase a long slender rod, acute at tip.

♂. Length about 9 mm; wing 9 mm; antenna about 1.6 mm.

Rostrum brownish yellow; palpi black. Antennae relatively short; scape and pedicel brownish black, fusion-segment of flagellum yellow, the remainder dark brown; fusion-segment consisting of two completely fused elements, remaining segments becoming progressively more elongate, subcylindrical, shorter than the very long verticils. Head light brownish yellow, center of posterior vertex narrowly darker brown.

Pronotum yellow, scutum with a narrow brown central line. Mesonotal praescutum variegated with buffy yellow, brownish yellow, and dark brown; intermediate stripes brownish yellow, narrowly blackened on posterior fourth and at cephalic end, lateral stripes more yellowed, humeral and lateral borders dark brown; scutum brown, posterior margins of lobes narrowly yellow pollinose; scutellum yellow pollinose, parascutella brown; mediotergite grayish yellow on anterior half, infuscated behind and on sides, katapleurotergite similarly darkened, with a small pruinose central area. Pleura chiefly dark brown, variegated with still darker brown areas on the dorsopleural membrane, before the wing root, as a narrow stripe that includes the propleura and ventral anepisternum, and on the dorsal sternopleurite, continued across the central part of the pteropleurite and the ventral sternopleurite. Halteres brownish yellow, base of stem narrowly yellow, knob dark brown, its apex very narrowly yellowed. Legs with coxae and trochanters yellowed; femora yellow with two pale brown rings, one at near midlength, the other subterminal, slightly wider than the yellow tip; tibiae
yellow, very narrowly and vaguely darkened at apex; tarsi yellowed, outer two segments pale brown. Wings with ground pale yellow, slightly more saturated on anterior fourth; a pale brown pattern, heaviest in the cubital and anal fields; anterior half of wing with very broad ocelli with narrow darker margins, the most evident of these with their centers at origin of $Rs$, anterior cord, outer end of cell $1st M_2$ and the outer fork of $M_1$; an X-shaped area at basal third of cells $R$ and $M$; cell $2nd A$ uniformly darkened except for two small ground spots at one-third the length and before the apex; veins yellow, pale brown in the darkened parts. Longitudinal veins beyond general level of origin of $Rs$ with short macrotrichia, lacking on $1st A$, present on outer half of $2nd A$. Venation: $Rs$ long-spurred at origin; $R_{1+2}$ about two-thirds $R_{2+3+4}$; cell $M_1$ subequal to its petiole; $m-cu$ just before one-third the length of $M_{3+4}$.

Abdominal tergites light brown, the lateral borders blackened; outer sternites with posterior borders yellowed; hypopygium and preceding segments more uniformly darkened. Male hypopygium with the tergal lobes very small, darkened, triangular, with short delicate setulae. Interbase with almost the basal half dilated, the long apical rod nearly straight, terminating in an acute spine. Outer dististyle setiferous on basal half, the outer end a decurved slender spine; inner style a flattened paddle, the tip obtuse.


Epiphragma (Epiphragma) dysomnata is readily told from the other regional species by the pattern of the wings and especially of the legs, including the two darkened femoral rings.

Epiphragma (Epiphragma) scoptes, new species

General coloration of head and thorax yellow; antennae of male relatively long, black, first flagellar segment brownish yellow, tip darkened; flagellar segments with a dense pale pubescence and short verticils; scutum, scutellum and posterior part of praeascutum brown; pleura with a short more or less inter-
ruptured brown stripe; femora obscure yellow with a narrow brown nearly terminal ring that is preceded by a vague more yellowed annulus; wings cream yellow with a conspicuous brown pattern that is paler in the male, the discal areas more or less ocelliform, becoming confluent; m-cu before midlength of cell 1st M₂; outer abdominal segments darkened; male hypopygium with the interbase long and slender, tip acute.

♂. Length about 8.5 mm; wing 9.5 mm; antenna about 3 mm.
♀. Length about 8 mm; wing 8 mm; antenna about 2.2 mm.

Rostrum obscure yellow; palpi black. Antennae of male relatively long; scape and pedicel brownish black, first flagellar segment brownish yellow basally, the tip blackened, succeeding segments black; flagellar segments long-cylindrical, with a dense pale pubescence and scarcely longer verticils that are only one-third to one-fourth as long as the segments. In the female, antennae uniformly blackened, pubescence lacking, verticils longer and more numerous, scattered over the segment. Head orange, center of vertex more chestnut brown; vertical tubercle relatively conspicuous, microscopically notched.

Pronotal scutum light yellow, posterior half in front narrowly margined with dark brown; scutellum testaceous. Mesonotal praescutum obscure brownish yellow in front, the posterior two-thirds darker brown; extreme lateral border before suture with a dark brown spot; scutum and scutellum brown; postnotum brownish yellow. Propleura dark brown; mesopleura yellow with a small brown area on ventral anepisternum, the two dark markings more or less confluent to form a short pleural stripe. Halteres long, stem obscure yellow, knob infuscated. Legs with coxae yellow, fore pair vaguely more darkened on anterior face; trochanters yellow; femora obscure yellow with a narrow brown nearly terminal ring that is preceded by a vague more yellowed annulus; tibiae and tarsi brownish yellow to pale brown. Wings cream yellow with a conspicuous brown pattern that is much paler and less distinct in the male than in the female; dark and yellow areas subequal in extent; most of the discal dark markings ocellate, becoming crowded and confluent at and beyond the cord; before cord the yellow color more extensive, especially
in the medial, cubital, and anal fields; outer cells with circular yellow spots at or just back from margin, smaller in the radial and medial fields, very extensive in the anal cells; prearcular field chiefly darkened; veins brown in the patterned areas, yellow in the ground portions. Venation: \textit{m-cu} before midlength of cell 1st \textit{M}$_2$. In the type male, vein \textit{M}$_1$ is interrupted before midlength.

Abdominal tergites of male brown, the basal impressed lines yellow, proximal sternites light yellow; outer segments more uniformly darkened. In the female the abdominal tergites more variegated with pale on the lateral and posterior borders. Male hypopygium with the posterior margin of tergite slightly produced medially, with a shallow V-shaped emargination to form two triangular lobes. Interbase long and slender from a darkened sinuous base, the apex acute. Dististyles much shorter than the interbase, outer style strongly curved at tip into an acute spine; inner style subequal in length, tip broadly obtuse, lower margin near base with a group comprising several strong setae. Aedeagus short.


Although it is generally similar to certain other regional species, including \textit{Epiphragma} (\textit{Epiphragma}) \textit{kenpi} Brunetti, \textit{E. (E.) ornatipennis} (Brunetti) and \textit{E. (E.) vicina} Brunetti, the present fly appears to be quite distinct in the coloration of the body, legs, and wings, and in the details of venation.

\textbf{Pseudolimnophila (Pseudolimnophila) spatiosa}, new species

Size very large (wing 10 mm or more); general coloration of mesonotum light brown, pronotum and praescutum with a capillary darker central vitta; legs brown, tarsi passing into black; wings strongly tinged with medium brown, only vaguely patterned; \textit{R}$_{1+2}$ long, \textit{R}$_{2+3+4}$ short, strongly arcuated; abdominal tergites dark brown, sternites yellow.

\text{♂}. Length about 8.5 mm; wing 10 mm.

\text{♀}. Length about 10–12 mm; wing 10–11.5 mm.
Rostrum very short, buffy; palpi brownish black. Antennae black, pedicel more brownish black, base of first flagellar segment obscurely yellowed; flagellar segments elongate, shorter than the longest verticils. Head gray above, in cases (including the type) more brownish yellow on front and beneath.

Pronotal scutum yellowish brown with a dark central vitta; scutellum and propleura light yellow. Mesonotal praescutum with the very restricted ground buffy, with four vaguely indicated reddish brown to light brown stripes, the intermediate pair divided by a capillary darker vitta; scutum light brown; scutellum light brown, the posterior border broadly more yellowed; mediotergite light gray, the anterolateral parts more yellowed. Pleura and pleurotergite obscure yellow, the anepisternum and sternopleurite vaguely more reddened, dorsopleural membrane weakly darkened. Halteres with stem yellow, knob slightly infuscated. Legs with coxae and trochanters light yellow; femora yellow basally, passing into brown, darkest outwardly; tibiae brown, tarsi passing into black. Wings strongly tinged with medium brown, the prearcular and costal fields vaguely more yellowed, stigma slightly indicated; veins brown, more yellowed in the brightened fields and along vein Cu. Macrotrichia present on outer veins, lacking on proximal two-thirds of M and the bases of Cu and the Anal. Venation: $Sc_1$ ending about opposite fork of $Rs$; $R_{2+3+4}$ short, strongly arcuated; $R_{1+2}$ unusually long, at least one-half longer than $R_{2+3}$; cell $M_1$ deep; $m$-$cu$ shortly beyond fork of $M$.

Abdominal tergites dark brown, sternites yellow; female with genital shield light brown; cerci long and slender, horn yellow.

Habitat. India (Kumaon). Holotype: ♀, Tungnath, Pauri Garhwal, 9,000 feet, June 1, 1958 (Fernand Schmid). Allotopotype: ♂. Paratopotypes: 2 ♀♀, on a single pin.

Pseudolimnophila (Pseudolimnophila) spatiosa is most similar to the smaller P. (P.) apicinigra Alexander, of Kashmir, which differs in the gray coloration of the thorax and the black tipped femora. The present fly is one of the largest members of the genus so far discovered.
Hexatoma (Eriocera) citrina, new species

Allied to aurantia; size small (wing of male 8 mm); general coloration of body uniformly orange or yellowed, with a small darkened spot on the dorsal anepisternum; legs darkened; wings strongly darkened, especially the base and costal region; cell $M_1$ present, relatively shallow, its petiole from two to four times $m$.

♂. Length about 7 mm; wing 8 mm; antenna about 1.4 mm. ♀. Length about 9.5 mm; wing 10 mm; antenna about 1.8 mm.

Rostrum orange yellow; palpi black. Antennae of male 8-segmented; scape orange, pedicel brownish black; basal flagellar segments black, the outer ones paler; first flagellar segment stout, remainder slender, all with long coarse setae. Head orange; vertical tubercle low, entire.

Thoracic dorsum almost uniformly dark orange, scutellum slightly more yellowed; pleura, pleurotergite, and posterior end of mediotergite strongly yellowed; a circular brownish black spot before wing root on dorsal anepisternum. Halteres brown, knobs brownish black. Legs with coxae and trochanters yellow; remainder of legs dark brownish yellow, appearing to be more darkened by abundant dark colored setae and elongate flattened scales. Wings strongly darkened, the prearcular and costal regions more intensely so; veins brown. Longitudinal veins beyond cord with long macrotrichia, present also on $Sc$, lacking on $Cu$ and the Analts, a few on outer ends of $R$ and $M$. Venation: $Sc_1$ ending opposite or shortly before $r-m$; $R_2$ slightly oblique; cell $M_1$ variable in length from subequal to nearly three times its petiole, the latter from two to four times $m$; $m-cu$ at near midlength of $M_{3+4}$.

Abdominal tergites orange, the outer ones slightly more brownish orange, sternites more orange yellow. Ovipositor with cerci very long and slender.

The present fly is allied to *Hexatoma (Eriocera) aurantia* (Brunetti), being distinguished by the small size and the details of venation, especially of the medial field.

**Hexatoma (Eriocera) rufoantica**, new species

General coloration of body and appendages black, anterior part of praescutum, the scutellum and mediotergite orange or yellow; wings strongly blackened, extreme apex and a larger discal area white; cell $M_1$ lacking; abdomen relatively long, dull black, the intermediate segments with shiny basal rings.

♂. Length about 13–16 mm; wing 12–13 mm; antenna about 3–3.3 mm.

Rostrum and palpi black. Antennae of male 8-segmented, black throughout; flagellar segments outwardly gradually decreasing in length and diameter; terminal segment from about two-thirds to nearly equal to the penultimate; all segments with long coarse setae. Head dull black; posterior vertical tubercle low, rounded; anterior tubercles unequally trilobed.

Pronotum dull brownish black. Mesonotal praescutum with the posterior half or more dull black, the anterior part bright rufous to orange, the blackened color extended slightly more cephalad on central portion; scutum uniformly black; scutellum light orange, mediotergite more yellowed, parascutella and pleurotergite blackened; sparse erect setae on praescutal interspaces, with still fewer on scutellum. Pleura dull black, ventral sternopleurite slightly more pruinose. Halteres and legs black. Wings strongly blackened, Anal cells paler, especially 1st $A$; a conspicuous whitened discal area before cord, involving cell $R$ and parts of $R_1$ and $M$; wing tip in cell $R_4$ with a small but conspicuous white spot; veins brown, yellowed in the white areas. Certain longitudinal veins beyond cord with trichia, including $R_{2+3}$, $R_5$, $R_4$ and especially $R_3$. Venation: $Sc_1$ ending beyond fork of $R_{2+3+4}$; $R_{1+2}$ from about one and one-half to nearly twice $R_{2+3}$; $R_2$ transverse; cell $M_1$ lacking; $m-cu$ at from about three-fourths to four-fifths $M_{3+4}$.

Abdomen relatively long; segments with conspicuous shiny
more nacreous rings on bases of segments two to seven, broader on the tergites; remainder dull black, including the hypopygium.

**Habitat.** **India (Assam).** **Holotype:** ♂, Lithan, Manipur, 4,000 feet, August 11, 1960 (Fernand Schmid). **Paratypes:** 3 ♂♂, with the type. **Paratype:** ♂, Hanggoi, Manipur, 3,300 feet, July 31, 1960 (Fernand Schmid).

By means of Edward’s key to the Old World species of **Eriocera** (1921), **Hexatoma (Eriocera) rufoantica** runs to species such as **H. (E.) leucotela** (Walker), of Singapore, and **H. (E.) selene** (Osten Sacken), of Sumatra. There are no more closely related species in the Indian fauna.

**Hexatoma (Eriocera) cincta** fuscithorax, new subspecies

♂. Length about 13.5 mm; wing 14 mm; antenna about 3 mm.

Characters as in typical **cincta** (Brunetti), described from the Darjiling District, Eastern Himalayas, differing especially in the coloration of the thorax. Mesonotum almost entirely dark brown with faint tints of reddish, these most evident on sides of praescutum and scutum and posterior borders of the scutellum and postnotum. Pleura brownish black, including the dorsopleural region. Tips of femora rather broadly and abruptly black, of the tibiae less so. Abdomen dull black, the bases of tergites three to six shiny nacreous, more silvery on sides.

In typical **cincta**, the mesonotal praescutum and scutum are dark reddish brown, the posterior sclerites of notum and the pleura black.

**Habitat.** **India (Assam).** **Holotype:** ♂, Minghti, Manipur, 2,500 feet, July 30, 1960 (Fernand Schmid).

**Hexatoma (Eriocera) cincta** ignithorax, new subspecies

♂. Length about 17 mm; wing 14 mm; antenna about 3 mm.

Rostrum light brown; palpi dark brown. Antennae with scape and pedicel brown, proximal flagellar segments yellowish brown, outer segments dark brown. Head light gray.

Pronotum light brown. Entire mesonotum fiery orange, with conspicuous erect setae on praescutum, scutum, and scutellum.
Pleura dull orange below, the dorsal pleurites and dorsopleural region more infuscated; an extensive light silvery gray sheen over the dorsal sternopleurite and anterior pteropleurite. Halteres infuscated. Legs with coxae reddish brown, pruinose; trochanters brown; femora yellow, tips on dorsal surface very narrowly dark brown; tibiae and tarsi brown. Wings generally as in cineta, the whitened spot in cell $R_1$ very small. Venation: $Sc_1$ ending opposite $R_2$.

Abdomen with first tergite orange, second tergite obscure orange at base, posterior border dull velvety black, the intervening ring shiny silvery nacreous; succeeding segments with bases nacreous, this becoming more extensive on outer segments, restricting the black borders; sixth and seventh segments with bases more brightened with orange; hypopygium light orange.

Habitat. INDIA (Assam). Holotype: $\delta$, Hat Nongshken, Manipur, 200 feet, April 4, 1960 (Fernand Schmid).

The general coloration of typical cineta (Brunetti) has been diagnosed briefly in the account of the preceding subspecies.

Review


This book remains essentially the book reviewed earlier (Ent. News 60:139 and 68:82). It is still the only American text that provides an introduction to the whole field of modern entomology. One continues to admire the author's insight into the many areas of entomological research and his excellent judgement; as reflected in the condensed accounts that the book gives of these areas, accounts that give the true essence of what is known, withal in clear, simple language.

There are improvements in appearance due to new type-faces and new arrangements in the chapter and paragraph headings.
The text shows many small changes, single words and paragraphs, but also entirely new pages. Greater emphasis is given phylogeny which is now becoming more and more important in many kinds of investigations from biochemistry to behavior. Especially in the Hemiptera, Hymenoptera, Coleoptera, Diptera, and Lepidoptera, there are extended discussions of family relationships, as well as new, Ross-style, family trees that help to visualize the family groups and the criteria that determine each dichotomy.—R. G. SCHMIEDER.

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Two Cases of Synonymy in the North American Acleris Species (Lepidoptera, Tortricidae)

NICHOLAS S. OBRAZTSOV *

The present paper deals with the synonymy of *Acleris boreana* Wolff and *Peronca walkerana* McDunnough and of *Peronca caryosphena* Meyrick and *Eutrachia tripunctana* Hübner. In addition, the nomenclature of the last named species is discussed. This work was carried out under the auspices of the National Science Foundation.

*Acleris walkerana* (McDunnough)

*Peronca walkerana* McDunnough, 1934, Canadian Jour. Res. 11: 303, 326, fig. 6 (male genitalia), 330, fig. 5 (female genitalia); 1939, Mem. Southern California Acad. Sci. 2: 58, no. 7487; 1942, Canadian Ent. 74: 70.


*Acleris boreana* Wolff, 1964, Meddel. Groenland 159 (11): 37, pl. 5, figs. 8-10 (moths), pl. 15, figs. 1, 2 (male genitalia), pl. 16, figs. 1, 2 (female genitalia). New synonym.

*Research Fellow, Department of Entomology, the American Museum of Natural History.

(225)
Recently Wolff (1964) described from Greenland *Acleris boreana*, as a new species for the following reason: “According to McDunnough (1934: 301) a great confusion exists within the difficult *hastiana* group in North America, and a number of closely allied species have been named. As none of those, the genitalia of which are illustrated by McDunnough (1934), agree with the Greenland species, this is described below as a distinct species.” Unfortunately Wolff (1964) overlooked the fact that in the cited paper McDunnough (1934) described and figured *Peronea walkerana* McDunnough, the characters of which correspond well to those of *boreana*. If the female genitalia of *boreana*, as they are rendered by Wolff (1964), show the antrum as being wider, this effect is caused by the pressure of the cover glass on the genitalia which, on the slides examined by Wolff, appeared to be rather flattened. As to the remaining characters, neither the male nor the female genitalia of *walkerana* and *boreana* differ.

The confusion of the species from Greenland with *caryosphena* Meyrick, done by Lesse and Viette (1949), also led Obraztsov (1963) to treat the latter species as a synonym of *walkerana*. Now that new data on the nominate *caryosphena* have been published by Wolff (1964), the four specimens from western Greenland, treated by Obraztsov (1963) as this species, must be referred to *boreana* and there remains no doubt as to the conspecificity of this latter species and *walkerana*. This circumstance also requires the removal of *caryosphena* from the synonymy of *walkerana*.

*Acleristripunctana* (Hübner)

Additional synonymy to that given by Obraztsov (1963: 220–223):


Acleris (Peronea) caryosphena Meyrick: Wolff, 1964, Meddel. Groenland 159 (11): 39, pl. 5, figs. 11, 12 (moths), pl. 17, figs. 1–4 (male genitalia), pl. 18, figs. 1, 2 (female genitalia).

Wolff (1964) examined the holotype of Peronea caryosphena and some additional material on this species from Greenland, and stated that caryosphena has nothing in common with the hastiana group of the genus Acleris (Hiibner) and in many aspects reminds one of Acleris tripunctana (Hiibner). He also published very detailed photographs of the moths and their genitalia, thus providing a more complete knowledge of this species. Wolff described the male genitalia of caryosphena as “very similar to those of ferrugana. The socii seem a little shorter and broader in caryosphena than in ferrugana, but it must be admitted that it is extremely difficult to obtain equivalent positions in the mounts. The cornuti consist, as in ferrugana, of a plate, and a short as well as a longer spine.” Of the female genitalia Wolff (1964) wrote that they “differ from those of ferrugana in having the lateral lobes of the ostium plate shorter and broader, the sclerotized portion of the ductus bursae longer, not evenly sclerotized, more distinctly separated from the membranous portion, and the signum smaller.” He also suggested that “although none of the illustrations of the North American Acleris species published by McDunnough (1934: 325–332) fits in with caryosphena, his description (loc. cit.: 321–322) of North American ferrugana (which he does not picture) may point to caryosphena instead of ferrugana.” Wolff (1964) also indicated that the larvae of caryosphena were reared from Betula nana.

The present knowledge of Acleris tripunctana (= ferrugana Wolff, not Schiffermiller and Denis) in North America is limited to three specimens: one ♀ taken at Hampton, New

1 Although in Wolff's opinion, the species treated in this paper as Acleris tripunctana (Hiibner) must be named A. ferrugana (Treitschke) (Wolff, 1952: 59), the present author cannot accept this nomenclature for the reasons explained below.
Hampshire (Obraztsov, 1963: 223), one ♂ from the Ottawa district, and one ♀ from Salt River, Northwest Territories (McDunnough, 1934: 321). The present author examined the first of the above, deposited in the American Museum of Natural History, and found it to be conspecific with the European *tripunctana*. Similar results were also obtained by McDunnough (1934) who compared the genitalia of the two above Canadian specimens with those of the European specimens as well as with the figures of the *tripunctana* genitalia published by Pierce and Metcalfe (1922: pl. 8) and Filipjev (1931: pl. 25, fig. 3, and pl. 28, fig. 3).

In order to clarify the variation of the genitalic characters of *tripunctana* in Europe, the present author examined 17 ♂♂ and nine ♀♀ of this species from Estonia (Reval), Pfalz (Speyer), and Bavaria (Landshut, vicinity of Munich, Regensburg), all in the Zoological State Collection in Munich. The male genitalia showed no important differences from those of the North American specimen taken at Hampton, New Hampshire, and a specimen of *tripunctana* ("ferrugana") from Denmark figured by Wolff (1964: pl. 17, fig. 5). They also did not differ from the genitalia of *caryosphena* on the photographs by Wolff (1964: pl. 17, figs. 1–4). In some of the European specimens the valvae had a convexity at the middle of the ventral margin of the sacculus less developed, similar to that in the *caryosphena* genitalia figured by Wolff. The cornuti set was very constant in all of the male specimens, and always consisted of a plate and two spines, one longer than the other. Most of the female genitalia of the European *tripunctana* appeared to have the laterocephalic processes of the sterigma (= "lateral lobes of the ostium plate" of Wolff) rather long and narrow, similar to the of *tripunctana* in Wolff’s paper (1964: pl. 18, figs. 3, 4; "ferrugana"). In one female (Speyer, Pfalz, slide No. M.192) these processes were found as unequally developed, and the left one was shorter and broader, similar to the laterocephalic processes of the sterigma in *caryosphena* on Wolff’s photograph (1964: pl. 18, fig. 1). The variation of these processes in the European form of *tri-
*Tripunctana* may also be confirmed by a drawing of the female genitalia of this species in Sovinskij (1937: pl. 2, fig. 7, "*ferrugana*"). This drawing shows the laterocephalic processes of the sterigma developed in the same manner as they are seen from the above photograph by Wolff representing the female genitalia of *Carosphenia*. The sclerotization of the ductus bursae showed itself as being rather inconstant in the European specimens of *Tripunctana*. In some specimens it was quite weak, in the others rather strong, not differing from that in *Carosphenia* on Wolff's photographs (1934: pl. 18, figs. 1, 2).

Thus it becomes clear that *Carosphenia* must be treated as a synonym of *Tripunctana*. Should it be proven in the future that female specimens with the shorter laterocephalic processes of the sterigma and a somewhat stronger sclerotization of the ductus bursae, both described by Wolff (1964) as characteristic of *Carosphenia*, are more abundant in North America and Greenland than in Europe, *Carosphenia* might merely be separated as a subspecies. The adaptation of the larvae of both *Tripunctana* (Ford, 1939: 58, "*ferrugana*") and *Carosphenia* (Wolff, 1964: 39–40) to the birch, as well as the flight period of moths beginning in August and after hibernation again in May, give one more reason for treating *Carosphenia* and *Tripunctana* as one species.

Wolff (1952: 56–61; 1964: 40) applied to the European specimens of this species the name *ferrugana* Trietschke and designated its lectotype. Unfortunately this name is pre-occupied by a homonymous *Phalaena Tortrix ferrugana* Schiffermiller and Denis (1776: 128) which latter is a distinct species and belongs to the same genus *Acleris* Hübner. This latter name cannot be treated as a "*nomen nudum*" and thus "invalid," as Wolff (1952: 57–58, 60) recommended. Schiffermiller and Denis (*l.c.*) described their *ferrugana* as a "Rostbrauner Wickler" (rust-brown leaf-roller). This distinctive manner of description, resembling a German colloquial name, was very characteristic of these authors, and it has been accepted by the younger authors for most of the Lepidoptera species established by Schiffermiller and Denis. Thus, there is no reason to reject
the name *ferrugana* by Schiffermiller and Denis. Hübner (1796–1799: pl. 20, fig. 127) figured this species as *rufana*, and Treitschke (1830: 263) stated that two specimens matching well this figure were found by him in the Schiffermiller collection under the name *ferrugana*. Later, Treitschke (1835: 136) confirmed that "*Rufana, Hbnr. Fig. 127*" was the "Hauptart" (e.g., the typical form) of his *ferrugana*, and in this way he selected the lectotype of *ferrugana* Treitschke (1830), as well as of *ferrugana* Schiffermiller and Denis (1776). The lectotype selection for *ferrugana* Treitschke (1830), made later by Wolff (1952), has thus become a secondary designation and is therefore not decisive for the nomenclature. The name *Phalaena Tortrix ferrugana* Schiffermiller and Denis (1776) has to be applied in its modern binominal combination *Acleris ferrugana* for the species also known as *lithargyrana* Herrich-Schäffer (1851: 147) and *fissurana* Pierce and Metcalfe (1915: 324). More detailed explanations on the synonymy of *Acleris ferrugana* (Schiffermiller and Denis, 1776) were published by Obraztsov (1957: 328–329). He re-introduced this oldest name before the publication of limitations proposed by the new International Code of Zoological Nomenclature (Stoll, 1964: 23, Article 23b) and concerning the so called *nomina oblitera*. These limitations are not retroactive to the nomenclature changes made before 1960, and the name *Acleris ferrugana* (Schiffermiller and Denis, 1776; Treitschke, 1835; Obraztsov, 1957) still retains its validity. This name indicates a Palearctic species not found in North America; its larvae feed on oak, beech, and willow.

The name *tripunctana* was originally introduced by Hübner (1796–1799: pl. 20, fig. 129) unimonomially, and was later binominally validated as *Lutrachia tripunctana* by the same author (Hübner, 1822: 65). Established in combination with another generic name, the name *tripunctana* Hübner (1822) cannot be treated as a junior homonym of *Phalaena Tortrix tripunctana* Schiffermiller and Denis (1776: 131), recently known as a synonym of *Epiblema (Pardia) cynosbatella* Linné (1758: 536; Lhomme, 1939: 366; Obraztsov, 1946: 36; Hannemann, 1961: 144). The name *Acleris tripunctana* (Hübner) is the only one
available for the species known as *Acleris ferrugana* (Wolff), and it cannot be rejected, despite the opposite opinion of Wolff (1952: 58). The latter author also suggested that Hübner's figure 129 of *tripunctana* represents "a characteristic form of *Acleris fissurana* (Pierce and Metcalfe), with shining pale yellow-ochreous ground colour and the costal patch substituted by three sharply defined blackish spots." As a matter of fact, the variation of color and markings of the forewings is very similar in both *tripunctana* Hübner and *ferrugana* Schiffermuller and Denis, and the characters mentioned by Wolff (1952) as "characteristic," cannot be used for separation of these two species. More determinative is the shape of the termen of the forewing which is more or less concave below the wing apex in *tripunctana* and almost flat in *ferrugana*. In this way Hübner's figure 129 of *tripunctana* with its termen distinctly concave can only be referred to the species treated under this name in the present paper. *Acleris tripunctana* (Hübner) is a Holarctic species, also found in North America and Greenland; its larvae feed exclusively on birch.

### References Cited


— and —. 1922. The genitalia of the group Tortricidae of Lepidoptera of the British Islands. Oundle, Northants. XVII + 101 pp., 34 pls.


Further Descriptions of the Eggs of Plecoptera of Western United States

ALLEN W. KNIGHT,² ALAN V. NEBEKER and ARDEN R. GAUFIN, Department of Zoology and Entomology,
University of Utah, Salt Lake City, Utah

In an earlier paper³ the eggs of common species of Plecoptera were described and the need for specific identification of such eggs was discussed. This publication has proven very useful and prompted the authors to prepare the present paper which includes the descriptions of stonefly eggs not recorded in the previous paper.

METHODS

The methods utilized are identical to those described in the earlier paper. Every attempt was made to obtain living mature eggs which were fully developed, but when these could not be obtained, preserved adults were dissected in order to prepare the illustrations.

DESCRIPTION OF THE EGGS

In the following section an outline (Table 1) and illustrations (Figs. 1–38) are presented showing the eggs obtained in the course of our investigation.

¹ This study was aided by a grant from the National Science Foundation, G-20703; a training grant from the Division of Water Supply and Pollution Control, WP-54; and a predoctoral fellowship from the Division of Water Supply and Pollution Control, WP-12,746.

² Present Address: Kellogg Research Laboratories, Michigan State University, Hickory Corners, Michigan.

### Table 1. Description of Stonefly Eggs

<table>
<thead>
<tr>
<th>Species</th>
<th>Color</th>
<th>Shape</th>
<th>Body of Eggs</th>
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<td>Av. Width</td>
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<tr>
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<td></td>
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<td>Oval—longitudinally</td>
<td>550</td>
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<tr>
<td>totoni* Ricker (Fig. 1)</td>
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<td>ridged</td>
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<td></td>
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Fig. 1
Arcynopteryx watertonii

Fig. 2
Arcynopteryx curvata

Fig. 3
Arcynopteryx parallela

Fig. 4
Isogenus aestivalis and tostonus

Fig. 5
Isogenus frontalis

Fig. 6
Isogenus zionensis

Fig. 7
Isogenus modestus

Fig. 8
Isoperla ebria

Fig. 9
Isoperla fusca

Fig. 10
Isoperla longiseta

Fig. 11
Isoperla mormona

Fig. 12
Isoperla pinta

Fig. 13
Isoperla petersoni

Fig. 14
Isoperla sordida
### Table 1. Description of Stonefly Eggs (Contd.)

<table>
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<tr>
<th>Species</th>
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Fig. 15 Isoperla trictura
Fig. 16 Alloperla medveda, pintada
Fig. 17 Alloperla autumna
Fig. 18 Alloperla severa, lamba
Fig. 19 Alloperla lineosa
Fig. 20 Alloperla pacifica diversa, and revelstoki
Fig. 21 Alloperla fraterna
Fig. 22 Diura knowltoni
Fig. 23 Acroneuria californica
Fig. 24 Acroneuria theodora
Fig. 25 Acroneuria internata
Fig. 26 Perlomyia utahensis
Fig. 27 Nemoura cinctipes
Fig. 28 Brachyptera occidentalis
Fig. 29 Brachyptera pacifica
### Table 1. Description of Stonefly Eggs (Contd.)

<table>
<thead>
<tr>
<th>Species</th>
<th>Color</th>
<th>Shape</th>
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<td>Pteronarcys princeps Banks (Fig. 36)</td>
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Fig. 30 Neoperla clymene

Fig. 31 Pteronarcella regularis

Fig. 32 Leuctra forcipata

Fig. 33 Perlesta placida

Fig. 34 Capnia poda

Fig. 35 Alloperla coloradensis

Fig. 36 Pteronarcys princeps

Fig. 37 Alloperla albertensis

Fig. 38 Pteronarcys nobilis
The Genus Ochrus (Coleoptera: Cerambycidae)

CARL FARR MOXEY, Academy of Natural Sciences of Philadelphia

Lacordaire erected the genus *Ochrus* in 1869 to receive his new species *O. grannmoderus*, from Cayenne, placing it in the group Oemides (Methiitae of Thomson) near *Hyphus* Lacordaire. Until now, no other species have been added.

**Genus OCHRUS** Lacordaire, 1869.


♂: Form elongate, moderately slender. Head short, slightly prominent; palpi long, unequal; antennae longer than body, slender; antennal segments neither spinose nor dentate, second segment shorter than any of the others, remaining articles subequal; eyes deeply emarginate, embracing antennal insertion. Pronotum as wide as, or wider than long, constricted basally; surface with three triangularly arranged tubercles; anterior coxae prominent, intercoxal process very narrow, lamelliform; metepisterna narrow, subparallel. Elytra subparallel, bicostate. Femora club-shaped.

♀: Unknown at present.

Type species: *Ochrus grannmoderus* Lacordaire, 1869, by original designation and monotypy.

The new species herein described appears to be quite distinct from Lacordaire’s, but I have not seen a specimen of his form. The new species is slightly larger than *Ochrus grannmoderus* Lacordaire (1869, Genera des coléoptères 8: 225), the pronotum is broader than long, the third antennal segment is shorter than all but one (number 10) of the distal segments, and the elytra are patterned differently.

1 I am deeply indebted to Dr. Harold J. Grant, Jr., Chairman of the Department of Insects, for permitting me to work with the collections under his charge.
Ochrus improvisus Moxey, new species.

♂: Form elongate, depressed; color light brown; head, thorax, underside, distal portion of femora, and distal part of antennal segments 3–10, brownish-testaceous; elytral pattern fuscous; pubescence fine, moderately long, pale yellowish, that of the elytra sparse. Head narrower than pronotum, densely and shallowly punctured; antennae slender, strongly pubescent, about $1\frac{1}{2}$ times length of body; antennal segments coarsely and rugosely punctured, in ratio of 10:5:15:16:17:16:18:16:15:13:16. Pronotum 1.1 times broader than long, constricted basally; sides gently rounded, widest just before the middle; apex slightly wider than base; disc flattened, with a median tubercle, bordered on each side by a slightly curved costa, each costa bearing anteriorly a single tubercle. Elytra more than three times as long as their basal width, a little wider than pronotum, faintly tapering posteriorly; surface with two feeble, irregular costae; apices bidentate; pattern as figured. Legs slender, finely pubescent; femora swollen distally; first tarsomere longer than the next two combined. Abdominal sternites finely punctulate, clothed with fine pubescence; fifth sternite feebly emarginate apically.

Length: 17.0 mm. Breadth of elytra at humeri: 4.0 mm.

♀: Unknown at present.

Type: ♂; Caracas, VENEZUELA; F. R. Mason collection. Type in the collection of the Academy of Natural Sciences of Philadelphia. The unique specimen was determined to the genus Ochrus by Aurivillius.
Distributional and Biological Records of Idaho Caddisflies (Trichoptera)

STAMFORD D. SMITH, Department of Entomology, University of Idaho

The caddisfly fauna of Idaho is very poorly known, and there is little information on the distribution or the biology of the species. During the past three years several significant observations have been made and some new records obtained within the state that are worthy of note. However, no attempt has been made to include in this paper all the species previously unrecorded from Idaho. Acknowledgment should be made of the kindness of Dr. Glenn B. Wiggins of the Royal Ontario Museum, Dr. D. G. Denning of the Chemagro Corp., and Dr. H. H. Ross of the Illinois Natural History Survey in confirming several of the author's identifications. The work reported in this paper was supported in part by N. I. H. Predoctoral Fellowship 1-F1-WP-26,026-01. Unless otherwise indicated all collections were made by the author.

Rhyacophilidae

Rhyacophila bifila Banks

This species is widely distributed throughout the western montane region, but has not been taken in large numbers. On July 21, 1963 well over one hundred adult males and females were collected under concrete bridges along the Lochsa River between Lolo summit and Lowell, Idaho Co., Idaho. On July 15, 1964 several hundred mature male and female pupae were taken from the Yankee Fork of the Salmon River, near Sunbeam, Custer Co., Idaho. The pupae occurred in dense mats that often completely covered the upstream surface of submerged boulders. The pupal case was of sand, somewhat smooth in texture, and symmetrical. The inner cocoon was typical for the genus. This clustering habit of the pupae, especially in such large numbers, has not been recorded for any member of the genus.
The larva of *R. bifila* is unknown, and the author has been unsuccessful in collecting it in streams where pupae and adults were found. The larvae must be numerous, but probably have an unusual habit or microdistribution.

**Rhyacophila vao** Milne

The following records are eastward extensions of the known range, the Cascade region of Washington and Alaska. On June 27, 1962 one male was swept from streamside vegetation at Slate Creek Ranger Station, 19 miles north of Riggins, Idaho Co., Idaho, and on July 16, 1964 three males were found resting under a concrete bridge over the headwaters of the Big Wood River, two miles north of Galena, Blaine Co., Idaho.

**Rhyacophila vemna** Milne

This species was described from Mt. Ranier, Washington, and Denning (1948) cited two additional collections from the same area. Ross (1956) states, “so far as is known, the *vemna* line [*R. vemna* and *R. gemona*] is restricted to two neighboring high mountains in the Cascades; . . .” On May 8, and on May 14, 1962 males were collected at White Pine Gulch, eight miles east of Harvard, Latah Co., Idaho. These specimens were observed flying approximately 30 to 40 feet above ground among trees in cold, drizzly weather. Occasionally they flew near the surface of the small rapid stream where they were captured. Denning (1948) described the stigma of this species as brown and golden; however, these specimens had a bright green stigma which faded to a brownish color after being preserved in 70% alcohol.

**Limnephilidae**

**Amphicosmoecus canax** (Ross)

The only record for this species is its type locality, Logan Canyon, Utah. On October 6, 1964, W. F. Barr collected one
male at Hayden Creek, two and one half miles above Hayden Lake, Kootenai Co., Idaho. Several specimens were observed flying over the stream at dusk, but were present for only a short period.

_Halesochila taylori_ (Banks)

Several males and females of this uncommon species were collected in northern Idaho at Crater Lake, 13 miles east of Clarkia, Shoshone Co., on August 9, 1962 by R. W. Brown. This species has been recorded previously from British Columbia and Washington. No biological data are available for the Idaho collection.

_Lenarchus brevipennis_ (Banks)

This species is known only from the type locality (Colorado). One male was collected by W. F. Barr sweeping grasses and annual vegetation along a small, intermittent creek near Dixie, Elmore Co., Idaho, on June 27, 1964.

_Oligophlebodes sierra_ Ross

This species is known from the Sierra Nevada Mountains of California and the Cascade Mountains of British Columbia. On July 21, 1963, G. B. Hewitt made two collections of _O. sierra_ in the extreme southeastern corner of Idaho. Six males were taken five miles west of St. Charles, Bear Lake Co., and eight females four miles west of Bloomington, Bear Lake Co. They were from streamside vegetation near large springs that give rise to the St. Charles and Bloomington Creeks respectively.

_Psychoglypha pritus_ (Milne)

This species has only been recorded from Alberta, Canada. On October 15, 1964 the author and W. F. Barr collected one male (and one female tentatively identified as this species) approximately 13 miles south of Cottonwood, Idaho Co., Idaho,
along Rice Creek which is a small tributary of the Salmon River. These were flying at dusk over the runoff from a small spring. It should be noted that these individuals did not have an obvious silver stripe on the wing that is considered typical for the genus.

**Goeridae**

**Goerita genota** Ross

This species has been recorded only from western Oregon and Washington. On April 13, 1964 a series of males and females was collected along the North Fork of the Payette River, near Banks, Valley Co., Idaho. They were flying in swarms over small creeks and trickles of water from melting snow only where the sun was shining through trees. A few inactive individuals were swept from streamside vegetation in shaded areas. This adds a new family to the list of Idaho Trichoptera and extends the known distribution of the species approximately 300 miles eastward.

**Leptoceridae**

**Athripsodes transversus** (Hagen)

Ross (1944) states that this species extends from the eastern states southwestward to Texas and northwestward to Minnesota. Denning (personal communication) reports that it has been collected from various west coast localities, which indicates a transcontinental distribution. The west coast collections, however, have not been mentioned in the literature. On July 29, 1964, R. L. Westcott collected one male and four females in flight over a small stream near Malta, Cassia Co., Idaho.

**Literature Cited**


Food Plants and Parasites of Anagrapha falcifera and Autographa precatiorinis (Lepidoptera: Noctuidae) Collected at Long Island, New York

DOUGLAS W. S. SUTHERLAND

Anagrapha falcifera (Kirby) and Autographa precatiorinis (Gueneé) were among five common Plusiinae which came to black light traps or were collected on cultivated crucifers, ornamentals, and weeds during the summers of 1960 through 1963 (Sutherland, 1965).

Larvae of A. falcifera were collected on broccoli, cabbage, lambsquarters (Chenopodium sp.), Rugels plantain (Plantago rugelii), wild mustard (Brassica kaber), and wild radish (Raphanus raphanistrum). Of 51 A. falcifera larvae collected from June 12 to July 14, 1963, three (collected June 12 and 17) were parasitized by Copidosoma truncatellum (Dalman) (Encyrtidae), a common polyembryonic parasite of the cabbage looper, Trichoplusia ni (Hübner).

A. precatiorinis larvae were collected on cabbage, giant ragweed (Ambrosia trifida), ornamental white snakeroot (Eupatorium urticaefolium frascrici), P. rugelii, tomato, B. kaber, R. raphanistrum, and Zinnia hybrids. Additional records for both species are given in Crumb (1956) and Tietz (195?). Six of 34 A. precatiorinis larvae collected from June 8 through Sept. 14, 1963 were parasitized, three by C. truncatellum (collected June 9, 27, and September 14) and three by Apanteles plathytenae Muesebeck (Braconidae) (collected June 8, 9, and 17).

The mature A. plathytenae larvae emerge from the last instar larvae of A. precatiorinis and spin their white cottony cocoons into

Acknowledgments: My appreciation to Dr. B. D. Burks, Dr. C. F. W. Muesebeck, and Miss L. M. Walkley for determining the Encyrtidae, Braconidae and Ichneumonidae, respectively.

Graduate Assistant, Department of Entomology and Limnology, New York State College of Agriculture at Cornell University, Ithaca, New York.
a single dome-shaped mass approximately one-half inch in diameter.

Groups of 74 and 35 adult *A. plathypenae* emerged on June 23 and 27 from larvae collected June 9 and 17, respectively.

In addition, four masses of cocoons produced by *A. plathypenae* were collected on wild mustard and wild radish foliage on June 16 and 17. Adult *A. plathypenae* emerged from two masses on June 20 and 22. A total of 13 imagos emerged in one case and four in the other. Another species, *Mesochorus discitergus* (Say) (Ichneumonidae), probably a hyperparasite, emerged from all four masses between June 22 and 25. Counts of 67 and 122 *M. discitergus* were obtained from masses which also produced *A. plathypenae*. The other two masses produced 72 and 77 adults.

**Literature Cited**


**Reviews**

**Arnett, Ross H., Jr.** *An Introduction to the Study of Beetles.* 1963. Catholic University of America Press; Washington, D. C. 40 pp., 100 figs. $1.00.

This small book will be especially valuable to the novice coleopterist or the amateur collector who would like to determine his miscellaneous beetles to the proper family. The entomology student will find a more detailed general discussion of the Coeloptera than is presented in most text-books.
A foot-note on the first page states that the little volume “is a slight revision of the introduction to ‘The Beetles of the United States.’” And that is all that it is. A very short section is added on the origin of beetles. But Arnett has not taken a definitive stand on which of the several ancestral possibilities he thinks is more plausible. Nor, unfortunately, are the relevant papers by Handlirsch, Packard, Crampton or Bradley included in the bibliography. The concluding paragraph appears to imply support for the notion that the Cantharoida are primitive, but in the discussion of the classificatory scheme, the Archostemata are declared to be the most primitive. A short discussion of the number of species of Coleoptera is presented. What follows for the remaining 38½ pages is virtually unchanged from ‘The Beetles.’

The anatomical section is presented very clearly and gives a sufficient knowledge of coleopterous morphology to allow ready use of the keys by anyone who has mastered the anatomy; the numerous line drawings are especially helpful in giving understanding.

The paragraphs on classificatory scheme give the overall tone of this work and of ‘The Beetles’: one of conservatism, but not stasis. Arnett recognizes 124 families, basically in the arrangement of Crowson. The Cicindelinae are again resurrected to familial status, something North American coleopterists repeatedly insist upon doing. Also, unfortunately, the Strepsiptera are once more reduced to a mere family next to the Rhipiphoridae. Somehow, this seems a bit too conservative.

Almost nothing needs to be said about the keys. I have been using them with success ever since ‘The Beetles’ was first published in 1960; in other words, they work. The bibliography contains more than 110 entries and will be particularly valuable to the beginning coleopterist who might want to explore some aspects a little more deeply. For some reason, Crowson’s 1960 paper, referred to several times in the text, is not included. Rounding out the volume, there is an index to the various morphological terms and taxa included.

Every amateur collector, if he does not already possess ‘The Beetles,’ should at least have a copy of this little book. The professional will find it a refreshing review. Entomology instructors might easily be able to use the book as an addition to their courses.—Carl Farr Moxey.
A Measuring Device for Use in Insect Systematics

HAROLD J. GRANT, JR., Department of Insects, Academy of Natural Sciences of Philadelphia

With the current quantitative approach in systematic research, the need for more adequate measuring devices is now acute. Entomologists principally use dial calipers for larger specimens, ocular micrometers for smaller ones. Neither method is as satisfactory as the precision measuring device described and figured below.¹

The instrument consists of a base with suitable clamping screw to mount on the microscope stage, a gross measurement traveling slide driven by rack and pinion gears and impinging against a dial indicator, and a fine adjustment slide superimposed above a ruled plate (Figs. 1, 2).

The fine adjustment slide carries the glass plate on which the specimen is placed and the ruled plate is lined at 0–25–50 and 75 mm intervals. For minute specimens in fluid, the watch glass or other container may be placed directly on the glass slide. Larger specimens may be pinned on a standard entomological angle board or other suitable substrate.

Since the dial gauge is limited to a travel of 25 mm, the specimen must be placed over the line suitable to the specimen length and zeroed under the cross hair by turning the horizontal knurled screw.

As the gross classification is accomplished with the ruled plate, the fine graduations read from the dial are simply added to the proper increment of 25. Specimens which are 25 mm or less in length require no adjustment of the slide. These measurements are read directly from the dial indicator.

The accuracy is limited only by the viewing technique of the operator as the dial gauge is accurate to less than .01 mm.

Use of this device reduces fatigue and improves the accuracy of the person making the measurements well beyond that

¹ The development and production of this instrument was supported by NSF grant GB-1374 which is here gratefully acknowledged.
achieved with optical micrometers. In addition, it lessens the differences so frequently encountered when the same object is measured by two or more workers.

The instrument was produced by the Drummond Scientific Company, Brommall, Pennsylvania. Its cost is approximately $300. Technical notes for this article were supplied by Mr. Edward Drummond.

Fig. 1. Microscope with measuring device.
Photos by Jay Sacks.

Fig. 2. Measuring device.
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The Proventriculus of Adult Mecoptera and Siphonaptera ¹,²

A. Glenn Richards, Department of Entomology, Fisheries and Wildlife, University of Minnesota

Classically the fleas have been phylogenetically associated with the Diptera, and even today are placed next to the Diptera in textbooks of general entomology, except the most recent edition of Ross (1965). Yet the improbability of the Siphonaptera being most closely related to the Diptera was pointed out 30–40 years ago. Snodgrass (1946) emphasized the distinctness of the Siphonaptera from other orders of insects, but it has been frequently suggested that they are most closely related to the Mecoptera, and Hinton (1958) associates them with the family Boreidae which he raises to ordinal rank (the Neomecoptera). According to Essig (1942) it has also been suggested that the Siphonaptera might have a common origin with the Staphylinidea (Coleoptera).

The present short note does not presume to argue on the phylogeny of these groups. Incidental to another study it was noticed that serial sections of various Mecoptera show a band of spinelike structures in the proventriculus (Figs. 1–3). Such rings of spinelike projections in the proventriculus are well known in the Siphonaptera (Figs. 5–6), and are sometimes listed as a characteristic of the order. With representatives of

¹ Paper No. 5747, Scientific Journal Series, Minnesota Agricultural Experiment Station, St. Paul, Minnesota 55101.
² Acknowledgment is made of financial support from the National Science Foundation (Grant No. GB 365).

(253)
other orders also available for comparison (see list in Richards, 1963) a set of spinelike projections was seen in the proventriculus of only one other group, namely an unidentified adult Staphylinid beetle (Fig. 4).

Fleas of the genera *Ctenocephalus* and *Foxella* were examined in serial sections. In addition, adult fleas mounted on microscope slides in the University of Minnesota collection were examined. These represented 48 species in 47 genera of the families or subfamilies Pulicidae, Malacopsyllidae, Vermipsyllidae, Hystricopsyllidae, Amphipsyllidae and Ceratophyllidae. Almost all of these showed a distinct proventricular ring of spinelike projections; the remainder were not really exceptions but only specimens not sufficiently well cleared to permit seeing internal structures. Incidentally, the ring is usually visible in specimens macerated in alkali as well as in mounts made without maceration of the internal tissues. This finding is to be expected since the cuticular lining of the esophagus holds the proventriculus in place. Severe pummeling to flush out the macerated tissues can dislodge the esophagus and proventriculus but more gentle handling results in the proventriculus remaining in situ. This study, then, agrees with anatomical treatises which include this proventricular ring as a characteristic of adult fleas.

Seven families are listed for the order Mecoptera but only the four of these occurring in North America were available for examination. For the Mecoptera proper these were *Panorpa* sp. (collected in Minnesota), *Bittacus strigosus*, *B. banksi*, and *Merope tuber*, and for the Neomecoptera *Boreus brumalis* and *B. nivoriundus*. Adults of all of these possess the proventricular ring of spinelike projections. The only larvae available were of *Boreus*; these did not possess any spines in the proventricular region.

**Explanation of Figures**

Figs. 1-6. Photomicrographs of cross sections of proventriculi of adults.

Richards: Figs. 7-14
The structure of these spinelike projections is only partially shown by my preparations which are of histological but not of cytological quality (Figs. 7–13). They are of fairly constant length in any one species: 30 μ in Foxella, 50–60 μ in Ctenocephalus, Merope and Borceus, 140–150 μ in Panorpa, and even longer but not accurately measurable in my preparation of the gigantic Bittacus banksi. In shape they are either cylindrical (Panorpa and Bittacus) or somewhat flattened (Borceus and Merope); they arise from a somewhat triangular swollen base; and the tips are pointed (Panorpa, Bittacus and fleas) or blunt (Borceus) or truncated (Merope). Clearly there is no socket and hence they cannot be compared with setae. Also clearly they are not lined with epidermal cells, and hence differ from spines which represent multicellular projections of the epidermis. They do have hollow bases with what appears to be a single epidermal cell extending into the projection; thus they differ from microtrichia which are thought to be formed around pore canal filaments. No specific term appears to be applicable to these projections but it seems to me preferable to leave them nameless until the details of their structure are worked out.

The number of projections varies, at least partly correlated with the size of the insect. In the flea Foxella ignota there are only some 600–800, in Borceus and Merope there is an estimated 5,000–8,000, and in the larger Panorpa and Bittacus species there are some 10,000–15,000.

The degree and details of sclerotization of these projections differ. Using Mallory’s triple stain, procuticle and endocuticle stain blue, mesocuticle red, and exocuticle is refractory to staining (Richards, 1966). In the fleas Ctenocephalus and Foxella

**Explanation of Figures**

Figs. 7–14. Higher magnification photomicrographs showing some of the details of the proventricular spinelike projections.

7. Borceus nivoriundus, note the blunt tips, 430× magnification. 8. B. nivoriundus, showing the differentiation at the bases, 430×. 9–10. Merope tuber, showing pyramidal bases and truncated tips, 430×. 11–13. Panorpa sp., showing swollen bases and the differentiation of sclerotization, 430×. 14. Unidentified Staphylinid beetle, showing tufts of spinelike projections which do not have swollen bases or the basal differentiation of sclerotization, 290×.
the bases of the projections stain blue, the remainder is amber and unstained. In *Boreus* the bases stain blue, then there is a ring of unstained amber, the remainder of the projections stain red. In *Merope* most of the projections stain as in *Boreus* but some are unstained (conceivably this might be due to the fact that the only specimen available of this rare species had been in alcohol for over 30 years and was badly decomposed internally). In *Panorpa* the bases stain blue, then there is a ring of unstained amber, the remainder of the projections stain red. In *Mcrope* most of the projections stain as in *Borens* but some are unstained (conceivably this might be due to the fact that the only specimen available of this rare species had been in alcohol for over 30 years and was badly decomposed internally). In *Panorpa* the bases stain blue, then there is a narrow ring that is red-stained, and the bulk of the projection is amber and unstained. Such differences in degree and pattern of sclerotization are common in insect cuticles and seem to bear no necessary relation to homology.

While long spinelike projections are found in the proventriculus of my one adult Staphylinid beetle, the details are different. The ring is interrupted rather than complete, with resulting tufts of projections (Fig. 4), there are no swollen bases, and the projection is completely sclerotized (Fig. 14). It is difficult for me to believe that this situation is homologous to that in fleas and scorpion flies.

In conclusion, the Mecoptera, Neomecoptera, and Siphonaptera all have a ring of spinelike projections in the swollen proventriculus. No other insects whose proventriculi are known to me show this characteristic.

**Literature Cited**


The Identity of some Ammophila Observed by C. H. Hicks, H. E. Evans and Others in Connection with Biological studies (Hymenoptera, Sphecidae)

A. S. Menke, University of California, Davis

Revisionary work now in progress on the North American Ammophila has resulted in some name changes. It is not surprising, therefore, that some species names used in conjunction with biological data already published have subsequently been found to be incorrect. To insure that future students of Ammophila biology can make meaningful comparisons of their data with those of previous workers, I offer the following notes. The verification or correction of species identities presented here are based on my examination of the original material studied by the author cited, unless otherwise stated.

I would like to thank Dr. U. Lanham, University of Colorado, and Dr. L. L. Pechuman, Cornell University, for the loan of specimens studied by Hicks and Evans, respectively.

Ammophila observed by Hicks

C. H. Hicks (1932-1935) presented a series of important papers dealing with Ammophila biology. He usually sent his material to H. T. Fernald for identification but the latter's determinations often were incorrect. Furthermore, because Hicks did not always capture the wasp on which he reported, it is impossible now to confirm species identifications in some cases.

"Sphe. aberti" of Hicks (1932a) = Ammophila aberti Halde-

man

Although Hicks stated in the introduction of this paper that he studied aberti in Colorado and California his account was based almost entirely on his Colorado observations. All of the
Colorado material (Boulder, Owen Lake) is *Ammophila aberti*. The California material (Huntington Beach, Burbank, Los Angeles) is also *aberti* except one female from Burbank (August 28, 1929) which belongs in the *Ammophila pruinosa* complex. This specimen was determined by Fernald in 1933, one year after Hicks published his notes, so that probably it did not figure in any of the observations he published on “aberti.”

Hicks mentioned a chrysidid, “*Chrysis (Holochrysis) perpulchra* Cresson,” in connection with some of his Colorado observations on *aberti*. According to R. M. Bohart, *perpulchra* is now placed in *Ceratochrysis*. On the same pin with one of Hicks’ females of *aberti* from Boulder, Colorado (September 9, 1926), is a chrysidid which Bohart has determined as *Ceratochrysis trachypleura* R. Bohart. A note on the pin says “digging in hole of wasp trying to get inside.” This species occurs with *perpulchra* according to Bohart.

“*Sphex xanthopterus*” of Hicks (1932b, 1934a) = *Ammophila placida* Smith

All of Hicks’ published observations of *xanthopterus* were made at Los Angeles, California. The material I have examined bears Fernald’s determination “*Sphex xanthopterus* (Cameron),” but the specimens are *Ammophila placida* Smith. I have not seen a specimen that agrees with the data in Hicks’ 1934a paper (September 16, 1928) but doubt that his observations could pertain to any species other than *placida*. In the United States *Ammophila xanthoptera* is known only from Arizona and New Mexico.

“*Sphex breviceps*” of Hicks (1933) = *Ammophila azteca* Cameron,* in part

Hicks discussed four separate observations in this paper. All were made in California; the first (pp. 49–51) at “Los Angeles River at Griffith Park, Thanksgiving day, 1927,” and

* *Ammophila azteca* Cameron is a senior synonym of *pilosa* (new synonymy based on my examination of the types of both species). Evans’ (1963) and Powell’s (1964) notes on *pilosa* also refer to *azteca*. 
the remaining three at "Long Beach" with no date cited. The Griffith Park specimen is *Ammophila azteca* Cameron but it bears a Fernald determination label: "*Sphex breviceps* Smith.”

The true identity of the Long Beach wasps cannot be ascertained. Of the three wasps discussed, Hicks apparently captured only the one he discussed on pages 53–54. Unfortunately, since he gave no capture date, it is impossible to tell which (if either) of the two Long Beach "brevices" (August 12, 1928) in his collection is the one he described on these pages. In any case, it is probable that none of his Long Beach observations were based on true *brevices*. Of the two wasps that I have seen from Long Beach, one is *Ammophila azteca* and the other is *A. californica* Menke (both determined as *brevices* by Fernald).

According to R. M. Bohart, the chrysidid Hicks mentioned on page 52 ("*Chrysis (Holochrysis) pacifica* Say") now is placed in the subgenus *Chrysura*.

"*Sphex wrightii*” of Hicks (1934b) = *Ammophila wrightii* Cresson

The identity of this wasp probably is correct although I have seen only a male from the University of Colorado collection. The data on this specimen agree with that cited by Hicks. It is curious, however, that he stated that “the male was not taken at all.”

"*Sphex craspedotus*” of Hicks (1936) = *Ammophila nasalis* Provancher.

The first of the three *craspedotus* which Hicks observed (pp. 97–99) have been examined and have proven to be *nasalis*. The third female (p. 99) has not been located but it also was *nasalis*. The adult that Hicks reared from the third wasp’s nest (Aug. 3) is a female *nasalis* and it is in the collection of the United States National Museum.
"Sphex aculeatus" of Hicks (1935) = Ammophila azteca Cameron

At the bottom of page 99 and on pages 100-101, Hicks discussed observations he made on aculeatus at several Colorado localities: "White Rocks, Boulder (p. 99); Gregory Canyon, Boulder (p. 100); Owens Lake, and Fort Collins (p. 101)." All of these specimens have been seen with the exception of the second Gregory Canyon wasp (bottom p. 100), and they are all Ammophila azteca Cameron. Fernald determined the Owens Lake and Fort Collins specimens as Sphex arvensis (Dahlbom), and the remainder as aculeatus.

"Sphex procerus" of Hicks (1935) = Ammophila procerana Dahlbom

Examination of the wasp that Hicks discussed at the bottom of page 101 (Boulder, Colorado) in connection with "tool using" has confirmed its identification.

Ammophila observed by Evans

Evans (1959) summarized most of the published biology for North American Ammophila and presented his own original observations. The identifications of the species he studied are correct with one exception. Evans' observations on "Ammophila juncea" (Pottawatomie Co., Kansas, p. 461) actually pertain to Ammophila cleopatra Menke.

Ammophila fernaldi of Evans (1964)

Dr. Evans sent me the specimen on which his biological notes were based (p. 242) and I can confirm his determination.

Ammophila placida Smith and Ammophila pictipennis Walsh

These two species are distinct but Evans (1959) summarized all the published data for the two under one name, placida. Although Evans' own observations made in Texas do pertain to
placida, those of the other authors that he cited (Walsh and Riley, Rau and Rau, Strandmann) almost certainly refer to pictipennis as do Rau's (1922, p. 23) notes which were not cited by Evans. This assumption is based on the fact that pictipennis is found only east of the Rocky Mountains while placida occurs only west of the Rockies except in the south where it ranges into Texas.

**Literature Cited**


Generic Names of the Recurvaria Group
(Lepidoptera: Gelechiidae)

RONALD W. HODGES, Entomology Research Division, Agric. Res. Serv., U. S. Department of Agriculture

In Freeman's (1960) discussion of the genus *Recurvaria*, he stated that most of the North American species described in *Recurvaria* are not congeneric with the type-species of the genus, *R. nanella* (Denis & Schiffermüller); and he proposed that *Evagora* Clemens, the type-species of which is congeneric with many of our species, be used as the valid generic name; however, *Evagora* Clemens, 1860 is preoccupied by *Evagora* Péron & Lesueur, 1810. In 1963 Freeman described a new genus *Pulicalvaria* for six species of the group in question.

Work on a revision of the Nearctic Gelechiidae has shown the following relationships for this group: *Coleotechnites* Chambers is an available name for most of the North American species presently placed in *Recurvaria*; *Encordylea* Dietz and *Pulicalvaria* are synonyms of *Coleotechnites*; *Sinoe* Chambers is distinct from both *Coleotechnites* and *Recurvaria*; and some species presently retained in *Recurvaria* belong to other genera, both described and new. The reasons for these statements will be presented later; however, in order to make the combinations available, the synonymy of the generic names of the *Recurvaria* group and their type-species as well as those combinations for which accurate species determinations can be made are presented.

**RECURVARIA** Haworth, Lepidoptera Britannica, 547, [1828].

Type-species: *Tinea nanella* Denis and Schiffermüller, [1775].
Designated by Walsingham, in Godman and Salvin, Biologia Centrali-Americana 42 (Lepidoptera Heterocera, 4): 43, 1910.

**TELEA** Stephens, Illustrations of British Entomology, Haustellata 4: 244, 1834. Preoccupied by Telea Hüblner, 1819.
Type-species: (Phalaena Tinea leucatella Linnaeus, 1761) = [Phalaena] leucatella Clerck, 1759. Designated by Westwood. Introduction to the modern classification of insects 2: 113 (Synopsis), 1840.

APHANAULA Meyrick, A handbook of British Lepidoptera, 579, 1895.

Type-species: [Phalaena] leucatella Clerck, 1759. Designated by Westwood, Introduction to the modern classification of insects 2: 113 (Synopsis), 1840.


Type-species: [Phalaena] leucatella Clerck, 1759. Mono-basic.

R. nancella (Denis and Schiffermüller). [1775].
R. leucatella (Clerck), 1759.

The following species are retained in Recurvaria but may or shall be transferred when the group is revised: graphicella (Busck), 1908; ecanothiella Braun, 1921; francisca Keifer, 1928; consimilis Braun, 1930; stibomorpha Meyrick, 1929; taphiopis Meyrick, 1929; and vestigata Meyrick, 1929 (I have not seen authentic specimens of vestigata).


Type-species: Coleotechnites citriella Chambers, 1880. Mono-basic.


Type-species: Evagora apicitripunctella Clemens, 1860. Mono-basic.

EIDOTHEA Chambers, Canad. Ent. 5: 186, 229, 1873. Preoccupied by Eidothca Risso, 1826.

Type-species: (Eidothca vagatioella Chambers, 1873) = Gelechia (Tclcia?) dorsivittella Zeller, 1873, Mono-basic.

EIDOThoA Chambers, Canad. Ent. 5: 186, 1873. Lap-sus calami.

Type-species: *Eucordylica atrupictella* Dietz, 1900. Mono-basic.


Type-species: *Recurvaria gibsonella* Kearfott, 1907. Original designation.

*C. citricella* Chambers, 1880 and the following new combinations in *Coleotechnites*: *alnifructella* (Busck), 1915; *starki* (Freeman), 1957; *dorsivittella* (Zeller), 1873; *pinella* (Busck), 1906; *quercivorella* (Chambers), 1872; *biopes* (Freeman), 1960; *ardas* (Freeman), 1960; *lewisii* (Freeman), 1960; *resinosae* (Freeman), 1960; *milleri* (Busck), 1914; *moreonella* (Heinrich), 1920; *florae* (Freeman), 1960; *nigra* (Busck), 1903; *condignella* (Busck), 1929; *canusella* (Freeman), 1957; *apicitripunctella* (Clemens), 1860; *variella* (Chambers), 1872; *cryngiella* (Bottimer), 1926; *bacchariella* (Keifer), 1927; *piceaella* (Kearfott), 1903; *obliquistrigella* (Chambers), 1872; *juniperella* (Kearfott), 1903; *gibsonella* (Kearfott), 1907; *stanjordia* (Keifer), 1933; *australis* (Freeman), 1963; *atrupictella* (Dietz), 1900; *gallicola* (Busck), 1915; *clucidella* (Barnes and Busck), 1920; *mackiei* (Keifer), 1932; and *huntella* (Keifer), 1936.

*Sinoe* Chambers, Canad. Ent. 5: 229, 1873.

Type-species: *(Sinoe fuscopalidella* Chambers, 1873) = *Anacampsis robiniella* Fitch, 1859. Mono-basic.

*S. robiniella* (Fitch), 1859, new combination.

**References Cited**


The Male Genitalia of the Genus Sphecomyia Latreille (Diptera: Syrphidae)

KENNETH E. WEISMAN, Department of Biological Sciences, Western Illinois University, Macomb, Illinois

This paper is the second part in a revisionary study of the syrphid genus *Sphecomyia* Latreille.

A discussion of the morphology of the male abdomen, particularly the genitalia, is presented to add to our understanding of the relationships within this genus. Two separate keys, based respectively on the male genitalia and on conventional morphological characteristics, differentiate the members of the genus. The males can be divided into two groups based on the structure of their axial system. The character of the scutellum, being nonpollinose or pollinose, at least in part, will also facilitate species recognition in both sexes within the groups.

All figures were drawn free-hand and to scale; preparation of genitalia and morphological terminology is based primarily on Metcalf (1921).

**Morphology of the Male Abdomen**

**Preabdomen**: Consists of the first four segments which are normally developed, the tergites being wider and more convex than the sternites but about equal in length. *Sphecomyia occidentalis* is the only member of the genus in which the posterior margin of the fourth sternite is modified (Fig. 5).

**Postabdomen**: Consists of segments five through nine which have undergone a clockwise rotation of 360° from their original or primitive condition, but as a result of the folding-under effect they are actually displaced only 180° from their original plane. This is termed a "genitalia circumversion" (Aczel, 1954), in which the genitalia are directed cephalad instead of caudal. All descriptions refer to the original or nonrotated condition.

The fifth segment is confined to a narrow lightly sclerotized band ventrally and dorsally, both portions concealed by the fourth segment. The sixth segment is, for the most part, also
concealed by the fourth. Segments seven, eight, and nine constitute the terminal portion of the abdomen in its rotated condition (Figs. 3, 4). The seventh segment of *S. occidentalis* possesses a ventrally projecting tubercle which is unique in the genus (Figs. 5, 6).

The transformation and reorientation of the postabdominal segments have resulted in a "genital pouch" (Metcalf, 1921) i.e., an invagination along the internal margins of the sixth, seventh, and eighth segments which receives the genitalia when at rest.

The male genitalia consist of the epandrium (ninth segment) and its associated structures, paired anal cerci, paired claspers, and a single penis sheath which houses and acts in support of the axial system (Fig. 1). The epandrium is somewhat saddle-shaped in structure and rather consistent in shape throughout the genus.

The paired anal cerci, which are clothed with pile, arise on the mid-caudal angle of the epandrium and articulate with the epandrium. In *S. dyari* and *S. brevicornis* the cerci possess a slight invagination on their caudal border.

The paired claspers are parallel to each other and are located on the caudo-lateral borders of the epandrium with which they articulate to some degree. They possess pile of varying length on their dorsal surface and minute spines on the ventral surface; the apical $\frac{1}{2}$ to $\frac{3}{4}$ of the inner lateral surface is densely spined. With the exception of *S. dyari*, which exhibits only a slight evagination, the basal $\frac{1}{4}$ of the ventral surface is produced into a lobe that varies in shape throughout the genus. In *S. occidentalis* the lobe is modified into a hook-like structure and directed cephalo-dorsally.

The penis sheath articulates with the epandrium and may be

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**Explanation of Figures**

Figs. 1 and 2. Diagramatic representation of epandrium and axial systems.
Fig. 3 and 4. Dorsal and ventral view of abdominal segments.
Fig. 5. Ventral view of postabdomen of *S. occidentalis*.
Fig. 6. Lateral view of postabdomen of *S. occidentalis*. 
1. cercus, epandrium, clasper, superior lobes, penis sheath

2. ejaculatory apodeme, ejaculatory duct, sustentacular apodeme, chitinous box, ejaculatory hood

3. scutellum, 1, 2, 3, 4, 5, 6, 7, 8, 9

4. 5, 6, 7, 8, 9

5. 1, 2, 3, 4

6. 1, 2, 3, 4, 5, 6, 7, 8, 9
considered to be composed of two sections, a caudal and a cephalad portion, although it comprises a single unit, with the cephalad portion exhibiting little modification.

The caudal portion is cylindrical and open to a varying degree on its apico-ventral border. The superior lobes, the most noticeably modified structures of the penis sheath, compose the apico-lateral borders. They are heavily sclerotized on their ventral border and to a lesser degree on their caudal border. A row of minute serrations is continuous with the rounded ventral margin.

Cephalad to and continuous with the superior lobes are apertures of varying size and shape. I have proposed the terms open system and dehiscent system to apply to their distinctive conditions. The aperture of the open system is about equal to or greater than the width of the superior lobes; the dehiscent system consists of a linear aperture which is narrowed dorsally. An open system is represented by S. dyari, S. occidentalis, S. nasica, and S. fusca; the remaining species exhibit a dehiscent system.

The axial system is composed of a sustentacular apodeme, a chitinous box, and an ejaculatory hood; the ejaculatory apodeme, although not considered part of the axial system, is attached to the chitinous box by the ejaculatory duct (Fig. 2).

The sustentacular apodeme has its base in the epandrium and projects into the penis sheath where its caudal end articulates with the chitinous box; it functions in support of and aids in directing the chitinous box and ejaculatory hood. In S. occidentalis, S. nasica, and S. fusca the sustentacular apodeme is keeled and sclerotized laterally. In the remaining members of the genus it is rod-shaped and unkeeled. With the exception of S. dyari, those species whose sustentacular apodeme is keeled

**Explanation of Figures**


are also the species possessing an open system. Conversely, those species whose sustentacular apodeme is unkeeled possess a dehiscent type of penis sheath.

The chitinous box of *S. pattonii*, *S. dyari*, *S. brevicornis*, *S. vittata*, *S. vespiformis*, and *S. columbiana* has its dorsal surface produced into a horn-like prominence; the remaining three species lack this structure.

The genus *Sphecomyia* can be divided into two major groups characterized by (based on) the structure of the sustentacular apodeme and the presence or absence of a dorsal horn on the chitinous box; further morphological variations within the genitalia facilitate the construction of a key to species identification.

*Key to the Species of the Genus Sphecomyia based on the Male Genitalia*

1. Sustentacular apodeme unkeeled, chitinous box with dorsal horn (Species of *S. vittata* Group) ............ 2

1'. Sustentacular apodeme keeled, chitinous box without dorsal horn (Species of *S. occidentalis* Group) ....... 7

2(1). Apex of claspers directed upward (Figs. 9, 10) ....... 3

2'. Apex of claspers directed downward or caudo-ventrally (Figs. 7, 8, 11, 12) ..................................... 4

3(2). Claspers short with well defined basal-ventral lobe (Fig. 10) ................................................. *pattonii* Williston

3'. Claspers longer, without well defined basal-ventral lobe (Fig. 9) .............................................. *dyari* Shannon

4(2'). Claspers short, apex acute and directed downward; basal-ventral lobe directed caudally (Fig. 11) .......................... *columbiana* Vockeroth

4'. Not as above, claspers longer, lobe variable (Figs. 7, 8, 12) ......................................................... 5

5(4'). Apex of claspers acute, directed downward; basal-ventral lobe directed downward (Fig. 12) ...........

................................. *brevicornis* Osten-Sacken

5'. Apex of claspers rounded, basal-ventral lobe directed caudo-ventrally (Figs. 7, 8) .............................. 6

6(5'). Ejaculatory hood with well defined ridge on caudal face (Fig. 16) ................................. *vespiformis* (Gorski)
6'. Ejaculatory hood without well defined ridge on caudal face (Fig. 17) \textit{vittata} (Wiedemann)

7(1'). Claspers with basal-ventral lobe hook-like, apex acute (Fig. 15) \textit{occidentalis} Osburn

7'. Claspers not as above, basal-ventral lobe rounded (Figs. 13, 14) \textit{vittata} (Wiedemann)

8(7'). Axial system more than 1 mm. in length, horn of ejaculatory hood rounded apically (Fig. 22) \textit{nasica} Osburn

8'. Axial system less than 1 mm. in length, horn of ejaculatory hood acute apically and directed cephalad (Fig. 23) \textit{fusca} Weisman

Keys for the genus based on general morphological characters were constructed as follows; Williston (1886), Osburn (1908), Shannon (1925), and Curran (1932).

\textit{Key to both sexes of the species of Sphcecomyia}

1. Scutellum pollinose, at least in part (Species of \textit{S. vittata} Group) \textit{vittata} (Wiedemann) ........................................... 2

1'. Scutellum black, nonpollinose (Species of \textit{S. occidentalis} Group) ........................................... 7

2(1). First tergite with a pollinose fascia ..... 3

2'. First tergite without a pollinose fascia ........................................... \textit{columbiana} Vockeroth

3(2). Thoracic scutum with pollinose vittae, interrupted medially forming four areas ........................................... 4

3'. Thoracic scutum without vittae ........................................... 6

4(3). First two antennal segments each about three times length of third segment ........................................... 5

4'. First two antennal segments short, not as above ........................................... \textit{brevicornis} Osten-Sacken

5(4). Pteropleuron yellow pollinose \textit{vittata} (Wiedemann)

5'. Pteropleuron nonpollinose \textit{vespiformis} (Gorski)

6(3'). Pteropleuron yellow pollinose \textit{dyari} Shannon

6'. Pteropleuron nonpollinose \textit{pattonii} Williston

7(1'). Thoracic scutum with a pollinose fascia along posterior border \textit{occidentalis} Osburn

7'. Thoracic scutum not as above ........................................... 8

8(7'). All tergites with one pollinose fascia \textit{nasica} Osburn

8'. Third and fourth tergites without pollinose fascia ........................................... \textit{fusca} Weisman
Synonymical Notes on the Genus Cerceris—V.¹
(Hymenoptera: Sphecidae)

HERMAN A. SCULLEN, Oregon State University, Corvallis

A study of type material in Europe in 1959 together with additional specimens borrowed from several institutions and collectors or collected by the author has shown the following cases of synonymy.

¹ Grants from the National Science Foundation and grants for General Research administered by the Graduate School. Oregon State University have assisted in these studies. Department of Entomology.
Cerceris simplex simplex F. Smith


A study of types and other available material from North and South America has shown the following described species, in the opinion of the author, should be considered subspecies of C. simplex F. Smith. Structurally all species appear to be the same except for an increase in the amount of lighter markings and a browning of the background color. The nominate subspecies is recorded only from Brazil. It is almost entirely black except for small spots back of the eyes and small patches on the propodeum which are yellow.

Cerceris simplex graphica F. Smith


The holotype female of C. graphica F. Smith is in the British Museum (No. 21.1,427). This subspecies is recorded from Ecuador and Peru north through Central America and Mexico with one record from Portal, Cochise Co., Arizona. Its background color ranges from fuscous to fuliginous with yellow markings.

Cerceris hæbes Cameron (1890. Biol. Cent.-Amer. 2: 124–125) belongs to this group of subspecies and from its type location would doubtless be a synonym of C. simplex graphica F. Smith. The type of this species was not found at the British Museum by the writer in 1959 when other Cameron types were studied.

Cerceris simplex larvata Taschenberg


The type male of C. larvata Taschenberg is at the Zoologisches Institut, Martin-Luther-University, Halle (Saale), Germany. The type male of C. elephatinops Holmberg is in the Museo Nacional de Buenos Aires. This subspecies was described from Brazil but it is also taken in Argentina. Its background color is black and the yellow markings more extended than on C. simplex simplex F. Smith. Narrow yellow bands appear on all terga.

Cerceris simplex macrosticta Viereck and Cockerell


The type female of C. macrosticta Viereck and Cockerell is at the Philadelphia Academy of Natural Sciences, No. 10381. The type male and allotype female of C. ampla Banks are at the Museum of Comparative Zoology, No. 13769. This is the lightest form of all the subspecies and is the common form of the southwestern states and northern Mexico.

Cerceris atra Scullen


The new name C. atra Scullen is here proposed for C. nigra Brethes which is preoccupied by C. nigra Ashmead (Ent. Soc. London Trans. p. 227 (1900)).
A New Species of Machaerilaemus (Mallophaga: Menoponidae) from the Red-Plumed Bird of Paradise

ROGER D. PRICE, University of Minnesota, St. Paul, and K. C. EMERSON, Stillwater, Oklahoma

Several recent collections of lice from a New Guinea bird of paradise contained a distinctive new species of Machaerilaemus, which we are here describing.

Machaerilaemus raggianae, n. sp.

Type host. Paradisaca apoda raggiana Sclater.

Female. As in Fig. 1. Head with pointed sclerotized ventral process at each lateroanterior corner; gula (Fig. 2) open anteriorly, each side with pair of short bifurcate pointed latero-posterior projections and 4-6 setae; without evidence of Y-shaped dorsal suture. Pronotum marginally with 1-2 short setae at each corner, then 1 long, 1 short, and 4 long setae medially; prosternal plate (Fig. 2) with 7 setae in addition to minute pair anterior to plate. Mesosternal plate (Fig. 2) with 6-8 setae, limited to posterior portion of plate. Metanotum with 11-14 marginal setae; metasternal plate (Fig. 2) large, with 17-22 setae. Marginal abdominal tergal setae, including very long postspiracular and shorter adjacent setae: I, 15-17; II-VI, 17-25; VII, 16-19; VIII, 13-16; IX, 19-22. No evidence of abdominal sternite I. Each latero-posterior corner of sternites II-IV with 4-8 short spiniform setae, V, 1-5, and VI, 0-4. Sternites with following number of setae, exclusive of spiniform setae: II-IV, 30-38; V-VI, 30-44; VII, 23-31; and composite VIII-IX, 29-34. Sternites VII-IX fused. Anal fringe ventrally and dorsally with 30-37 setae of various lengths. Dimensions (in mm): preocular width, 0.44-0.45; temple width, 0.53-0.55; head length, 0.25-0.28; prothorax width, 0.39-0.41; metathorax width, 0.47-0.54; total length, 1.36-1.52.

1 Paper No. 5724, Scientific Journal Series, Minnesota Agricultural Experiment Station, St. Paul, Minnesota 55101.
Male. Head and thorax essentially as for female. Most abdominal tergites with fewer marginal setae: I, 12–14; II–IV, 16–20; V, 15–16; VI, 13–14; VII, 12–13; VIII, 9–11. Slightly fewer lateroposterior spiniform setae on abdominal sternites: II–IV, 3–7; V, 2–3; VI, 0–3. Much smaller number of other sternal setae: II, 1, 2–3; III–IV, 16–20; V–VI, 12–17; VII, 9–11; composite VIII–IX, 12–16. Terminalia as in Fig. 4. Genitalia as in Fig. 3. Smaller than female, with dimensions (in mm): preocular width, 0.38–0.39; temple width, 0.45–0.47; head length, 0.23–0.26; prothorax width, 0.32–0.33; metathorax width, 0.36–0.39; total length, 1.09–1.15; genitalia length, 0.34–0.37.

*Machaerilaemus raggianae*, in possessing the ventral sclerotized processes at the lateroanterior head margin, differs markedly from all other known species in the genus. However, all other features, including the abdominal chaetotaxy and male genitalia, are essentially in agreement with those cited by Emerson (1947) and Clay (1947) as typical of *Machaerilaemus* and we do not believe that the presence of these processes merits, at least for the present, more than an expansion of the *Machaerilaemus* concept. Aside from this, the shape and chaetotaxy of the gular and thoracic sternal plates differs to varying degrees from the other species in this rather uncommonly collected genus from the Passeriformes.


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