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ENTOMOLOGICAL NEWS

Vol. LXXVIII JANUARY, 1967 No. 1

A Gynandromorph Grasshopper with an Ovo-Testis (Orthoptera, Acrididae)[1]

Eleanor H. Slifer[2] and Robert L. King,[3] Department of Entomology, Academy of Natural Sciences of Philadelphia, Pennsylvania

A brief review of the previous literature on acridid gynandromorphs is given in an earlier paper (Slifer, 1966). As was the individual described there, this gynandromorph was found in a colony of *Melanoplus differentialis* (Thomas) kept in the Department of Zoology at the State University of Iowa in Iowa City, Iowa. It was alive when found and was preserved with Bouin's solution injected into the body. It differed markedly from the specimen discussed earlier.

External Anatomy

The individual to be described here was largely male on its left side and female on its right. The change from structures characteristic of one sex to those of the other did not occur exactly in the mid-line and there was some overlapping. In addition, certain parts were intermediate between those found in true males and females.

On the head the left antenna was slightly longer than the right, the left lateral ocellus was closer to the antennal base than was the other and the left gena was distinctly shorter than that

[1] Supported in part by a grant from the National Science Foundation GB-4553.

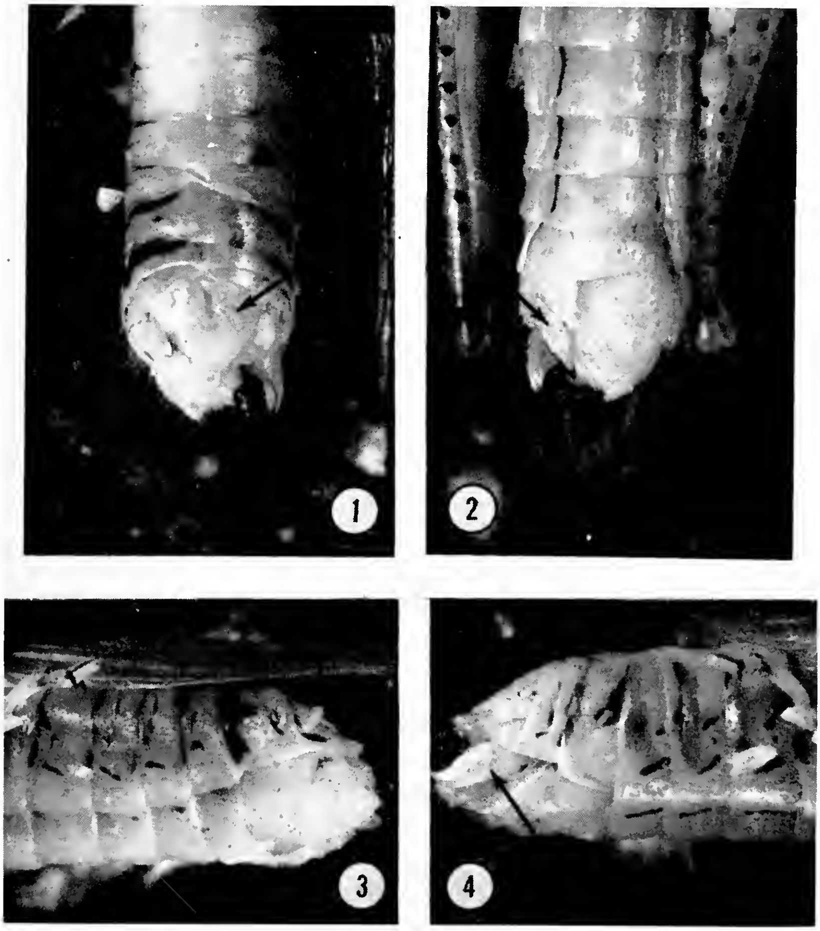
[2] Mail address: 308 Lismore Avenue, Glenside, Penna. 19038.

[3] Mail address: 1229 E. Manhatton Drive, Tempe, Arizona 85281.

on the opposite side. These differences indicate that the left side of the head was basically male and the right female. The prothoracic and mesothoracic femora, arolia and claws were larger and sturdier than those on the other side and this fact furnishes evidence that the left half of the thorax was male and the right female.

The pigmentation pattern of the abdomen was that of the male type on the left and of the female on the right (Figs. 1–4). The fenestrae or "heat-sensitive spots" on the abdominal terga were similar in size on segments II and III but much larger on the left sides of segments IV and V. The larger spots are characteristic of the male abdomen (Slifer, 1953a, b). Abdominal terga I, VI and VII were dissected off and accidentally lost before the present study was begun. Tergum VIII had a large spot on the left and none on the right. Males, typically, have a large spot on the eighth tergum while the female has none. The intersegmental membranes on the right side posterior to segment IV were wider than those on the left or male side. The larger membranes of the female permit expansion of the abdomen as the eggs develop.

The suranal plate or epiproct had the simpler outline and the transverse furrow typical for the female but a median furrow at the anterior end indicated that the plate was not completely female (Fig. 1). The cerci on both sides were abnormal and intermediate in size between those of males and females. That on the left or male side resembled a female cercus (Fig. 3) while that on the right had a notched tip suggestive of that of the male. It is curious that in these structures the tendency to exhibit characters of one sex appeared on the sides opposite those shown elsewhere. Sternum VIII extended posteriorly on the right side to form about one-third of a complete female subgenital plate while on the left sternum IX was produced posteriorly to form more than one-half of the male subgenital plate (Fig. 2). On the right side of the posterior end of the abdomen dorsal and ventral ovipositor valves were present and normal (Figs. 2, 4).



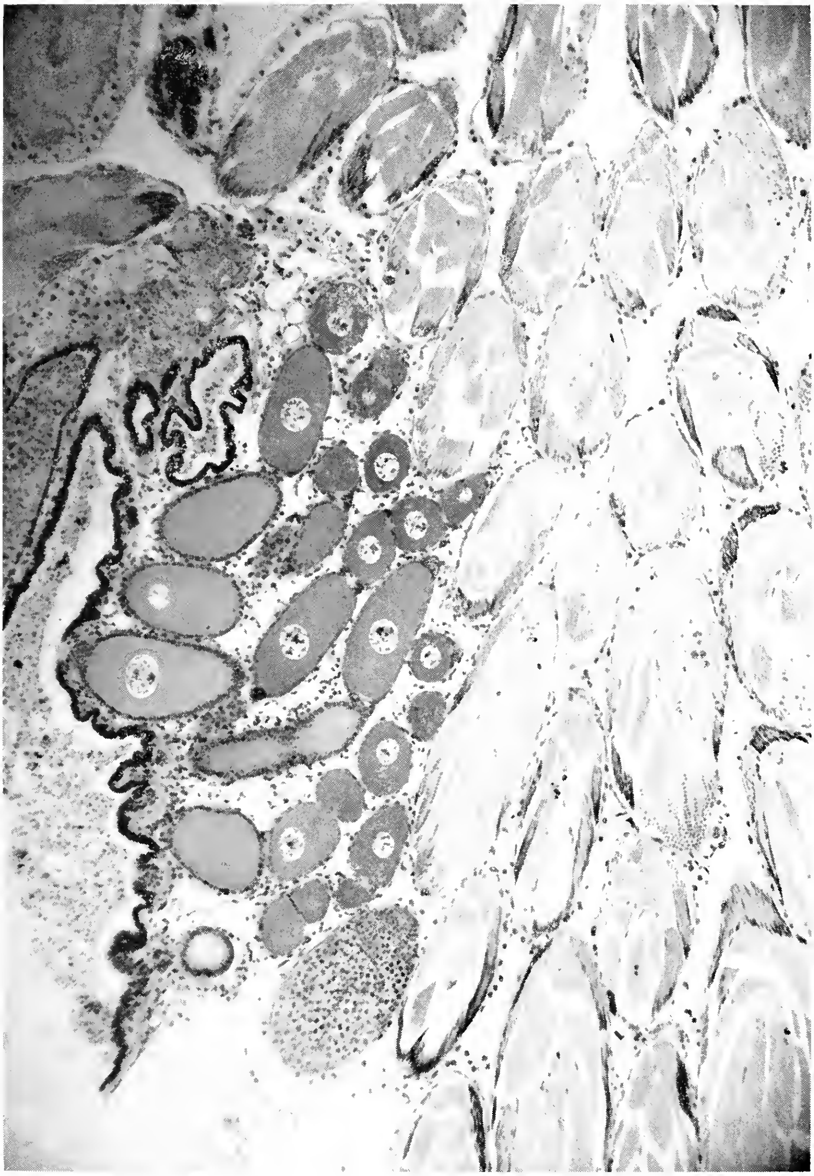
Photomicrographs of posterior end of abdomen of gynandromorph of *Melanoplus differentialis.* All × 5.

Fig. 1. Dorsal view. Note difference in pigment pattern on left (male) and right (female) sides; epiproct with both transverse groove of female and median furrow of male (arrow); and irregular junction of several terga in dorsal mid-line.

Fig. 2. Ventral view. Note difference in pigment pattern on the two sides; ventral ovipositor valve (arrow); and compare subgenital plate of female (left side of figure) with that of male (right side of figure).

Fig. 3. Left side. Note male pigment pattern. Cercus (arrow) is poorly developed and resembles that of a normal female.

Fig. 4. Right side. Note female pigment pattern and dorsal ovipositor valve (arrow).



Slifer and King, Fig. 5

Internal Anatomy

Upon opening the abdomen a large gonad was found. At first this was identified as a left testis with many follicles but upon removal from the body and examination of the ventral surface certain unusual features were seen. On the left a vas deferens extended posteriorly but its anterior end was wider than usual. On the right side was another duct, wide throughout its length, and close to it a number of small, lobulated bodies of a type never seen in a normal testis. This raised the suspicion that the gonad might be an ovo-testis such as Natori had described for a nymph of *Podisma sapporoense* in 1931. The gonad was sectioned and found to be a true ovo-testis. It will be described more fully below.

The vas deferens passed posteriorly and ventrally, in the usual manner, to disappear among a large mass of accessory glands. The ducts posterior to the gonad and the glands were removed for histological examination and the rest of the terminal segments of the abdomen treated with potassium hydroxide. The left half of the epiphallus was present and normal in appearance but it did not extend beyond the mid-line. The left halves of the endophallus and aedeagus were recognizable but feebly developed. A rudimentary aedeagal apodeme was present at the anterior end of the left side of sternum IX. No ejaculatory duct could be found. The sectioned accessory glands, seminal vesicle and the vas deferens posterior to the gonad all seemed to be entirely normal. No sperm were present in the seminal vesicle. The absence of an ejaculatory duct and the rudimentary condition of the aedeagus would have prevented the normal transfer of sperm.

Fig. 5. Frontal section through ventral region of ovo-testis. Testicular follicles, some with mature spermatozoa and others with transforming spermatids, at right (left side of gynandromorph) and ovarioles with young oocytes at left (right side of gynandromorph). Oviduct with rugose walls and densely-stained epithelium at left; lumen filled with debris. In an adjacent section both ovarioles and testicular follicles are attached to this oviduct. Bouin's fixative; Heidenhain's iron-hematoxylin. $\times 70$.

On the right side of the posterior end of the abdomen all of the usual parts of the female reproductive tract were present and in good condition. The right lateral oviduct, which arose in the ovo-testis, joined the median oviduct and this entered the floor of the genital chamber. Slightly more than half of the genital chamber was present and there was the usual opening to the exterior. The genital chamber ended anteriorly in a short pointed extension and a normal glandular pouch of Comstock and Kellogg was attached just to the right of this. The spermatheca was normal and its duct opened into the roof of the genital chamber. The spermatheca contained no sperm. An ovipositor apodeme, well covered with muscles, was present on the right. If the gynandromorph had been permitted to live for a few more weeks it is possible that it would have laid eggs as did the gynandromorph described earlier (Slifer, 1966).

Structure of the Ovo-testis

As may be seen in figure 5, which shows a portion of a frontal section through the gonad in the ventral mid-line, the ovarioles and testicular follicles are in intimate contact. Both are completely normal cytologically. The deposition of dense yolk particles has just begun in the oldest of the oocytes. Most of the testicular follicles are filled with mature sperm. In other regions of the gonad than that figured all earlier stages of oogenesis and spermatogenesis were found. Excellent metaphases of first and second spermatocytes in which twelve chromosomal elements could be counted were seen. Some with eleven were also found but their identification is less certain. Several good polar views of oogonial metaphases were present but the chromosome number in these is not easy to determine accurately. No chromosomal abnormalities were observed.

The relation of the ducts of the gonad to the male and female components is interesting. The duct on the right side of the individual is wide and its rugose walls are composed of cuboidal epithelial cells with densely-staining nuclei and little cytoplasm (Fig. 5). The duct of a young female that had not laid eggs would have this appearance. However, not only ovarioles but testicular follicles open into it. The left duct is typically male throughout most of its length. It is narrow and its smooth walls consist of columnar epithelium. At its anterior end the duct is several times wider than normal and its walls are rugose. The epithelial lining matches that of the oviduct on the right side. In normal males the vas deferans has smooth walls at its anterior end. Both ovarioles and testicular follicles were attached to the anterior end of the duct. The transition from an oviduct-like structure to a vas deferens occurred abruptly. At the distal end of the gonad a greatly enlarged and highly abnormal follicle was found on the right side. In this both oocytes and spermatozoa in various stages of development were present together. It is difficult to imagine what the earlier history of this follicle may have been. Five apical cells were identified although the normal follicle has only one. Cyst walls were present in some parts and absent in others and large numbers of sperm cells and oocytes were mixed together at random. Most of them appeared to be normal cytologically but a few pycnotic cells were scattered about. The slides warrant more intensive study and it is hoped that this may be done at some time in the future.

The authors are indebted to Dr. H. W. Beams and Mr. Fred Kent of the University of Iowa for the photomicrograph reproduced in Figure 5.

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Book

SMITHSONIAN RESEARCH OPPORTUNITIES. Fine Arts, History, Science. 1967–68. (Smiths. Publ. 4691), Pp. 153. 1966.

This paper-back outlines the organization of the Smithsonian and describes the activities of each of the 300 scientists and scholars on its staff. It calls attention to its extensive and often unique facilities in Washington and Cambridge, the special library of 630,000 volumes, and the Press. A cooperative spirit makes interdisciplinary effort possible without sacrifice of individual independence. The Museum of Natural History (R. S. Cowan, Director) in 1965 established an Office of Systematics. Among its activities "The relation between taxonomy, nomenclature, and information processing have been singled out for intensive study. Pilot projects for the modernization of museum practice in cataloging collections and handling information are under way. Proposals for improvements in the publication of species descriptions and revisionary work will be given consideration and study."

There is an Office of Ecology, headed by H. K. Buechner, that is developing a center for ecosystem study on Chesapeake Bay under K. R. Barbehenn, while the international aspects of ecology and conservation are under L. M. Talbot.

Pages 66–74 are devoted to the Department of Entomology (actually all arthropods excl. Crustacea). Research is chiefly taxonomic but is supplemented by field work on life history, ecology, and behavior. There are over 16 million specimens in the collection. Karl V. Krombein is the chairman and the Department includes O. L. Cartwright, J. F. Gates Clarke, R. E. Graybill, Jr., D. R. Davis, W. D. Duckworth, W. D. Fields, O. S. Flint, Jr., R. C. Froeschner, and P. J. Spangler.

Applications are welcomed from those who would like to work at the Museum. If financial assistance is needed there are available Postdoctoral Research Associateships, Predoctoral Internships, as well as Research Assistantships, the latter for 10-week periods under guidance of a staff member during the academic year or in the summer. Write to Office of Education and Training, Smithsonian Institution, Washington, D. C. 20560.
—R.G.S.

The Neotropical Katydid Genus Raggophyllum (Orthoptera; Tettigoniidae; Phaneropterinae)

DAVID A. NICKLE, Department of Entomology, Academy of Natural Sciences of Philadelphia

While studying the phaneropterine collection of the Academy of Natural Sciences of Philadelphia, I encountered a new neotropical genus consisting, at present, of one species represented by a series of fourteen males and one female. All are in excellent condition.

In size, general appearance, and tegmental form the genus resembles most species of *Microcentrum*. It differs from that genus in its narrow fastigia, conchate tympana on the cephalic tibiae, greater number of posterior femoral and tibial spines, non-stylate upcurved subgenital plate of the male, and distally-produced basal lobe of the ovipositor of the female.

The following symbols indicate ownership of the specimens: ANSP—Academy of Natural Sciences of Philadelphia; LACM—Los Angeles County Museum; MICH—University of Michigan.

RAGGOPHYLLUM new genus

Diagnosis. Size moderately large (49–61 mm). Fully alate; wings extending nearly a body length beyond tip of abdomen. Auritate cups shielding tympana on cephalic tibiae. Exceptionally great number of spines on inner and outer ventral margins of posterior femora and tibiae.

Description. Head. In lateral aspect, dorsum of eyes situated just below dorsum of head. Greatest width of face approximately 0.75 times its length. Frontal fastigium moderately narrow; vertical fastigium equally narrow, approximating but not touching or extending beyond frontal fastigium.

Pronotum. Surface smooth, lacking any punctation. Lateral carinae obsolete. Pronotal lobes approximately 1.3 times deeper than broad; with two transverse sulci anterior of midline.

Thorax. Mesosternal and metasternal lobes moderately developed.

Wings. Elongate. Posterior pair extending beyond anterior pair by at least 6 mm. Anterior wing 4.0–4.4 times longer than wide. Stridulatory field as figured (Fig. 2).

Legs. Distinctive symmetrical conchate tympanum on both faces of cephalic tibia. Posterior femur 6.7–7.8 times longer than wide. 11 to 23 spines on inner ventral margin of posterior femur, 16 to 28 spines on outer ventral margin. 16 to 60 spines on inner ventral margin of posterior tibia, 22 to 44 spines on outer ventral margin.

Abdomen. Male terminalia complex. Cerci unspecialized. Male subgenital plate non-stylate, greatly modified. Ovipositor short, gradually upcurved, apically crenulate. Basal lobe of ovipositor distally produced.

Type species, *Raggophyllum spinosum* n. sp.

Discussion. In size, general shape, and tegmental form, *Raggophyllum* is most similar among the phaneropterine genera of the New World to *Microcentrum*. *Microcentrum*, however, lacks the conchate tympana and the great number of spines on the ventral margins of the posterior femora and tibiae. Moreover, its frontal and vertical fastigia are much wider, the lateral carinae of the pronotum are strongly expressed, and the mesosternal and metasternal lobes are greatly developed.

The conchate tympanum is noted in various shapes and stages of development in at least fifteen other neotropical genera of phaneropterines. They are *Aegimea, Cosmophyllum, Cnemidophyllum, Eupeucestes, Hyperphrona, Itarissa, Lamprophyllum, Peucestes, Phoebolampta, Phyllolophus, Posidippus, Rossophyllum, Steirodon,* and *Steirodonopis*. The only genera among these with which *Raggophyllum* might be confused are *Lamprophyllum* and *Rossophyllum*. *Rossophyllum* is easily distinguished by its broad, diaphanous, banded tegmina. *Lamprophyllum* is distinguished in the following respects: its tegmina are glossy and broader than those of *Raggophyllum;* it lacks the tympanal shield on the outer face of the tibia; and its frontal and vertical fastigia are broader.

The genus is named after Dr. David R. Ragge in recognition of his outstanding work on the Subfamily Phaneropterinae.

Distribution. The range of *Raggophyllum* is based on the only known species, *R. spinosum*.

Raggophyllum spinosum n. sp. (Fig. 1)

Diagnosis. This species is easily identified by the symmetrical auritate cups shielding both faces of the tympanum, the great number of spines on the ventral margins of the posterior femora and tibiae, the lateral edge of the terminal tergite of the male which is drawn out over the base of each cercus as a finger-like projection, the subgenital plate of the male which upcurves acutely between the cerci, and the basal lobe of the ovipositor of the female which is drawn out as a bilaterally-compressed, posteriorly-directed process.

Types.—*Holotype* ♂, PERU, Huallaga, Aguaytia R. 400 m IX–1961 [ANSP]. *Allotype* ♀, same data as holotype [ANSP].

Paratypes 13 ♂. Peru, Loreto, Rio Napo VI–8–1920 (H. S. Parish) 1 ♂ [ANSP]; Peru, Huallaga, Aguaytia R. 400 m VII, VIII, IX–1961 5 ♂ [ANSP]; Peru, Huanaco, Leonpampa 110 km E. Huanaco (Tropical Jungle) XII–1937 (Felix Woytkowski) 1 ♂ [ANSP]; Peru, Pasco, Chontilla 22 km SE. Iscozazin VII–9–1961 (F. S. Truxal) 1 ♂ [LACM]; Peru, Pasco, Chontilla 22 km S. Iscozazin VIII–1–15–1961 (R. Etheridge) 4 ♂ [LACM]; Bolivia, Beni, Rurrenabaque, 227 m "Low Tropical Region" X–10–23–1956 (Luis E. Peña) 1 ♂ [MICH].

Description. Head. Dorsum of eyes situated just below dorsum of head; median length of eyes about one-fourth length of face. Frontal fastigium moderately narrow, rounded at tip; vertical fastigium equally narrow, bilaterally compressed, with a dorso-median sulcus, and approximating but not touching or extending beyond tip of frontal fastigium.

Pronotum. Surface smooth, lacking any punctation. Median length/width index pronotal disc 1.14 (mean of males), 1.12 (female). Lateral carinae of pronotal disc obsolete. Lateral lobes deeper than broad, with two transverse sulci situated on the anterior half of lobe. Distinct elevated border extending around entire edge of pronotum, but weakly expressed at posterior margin of disc.

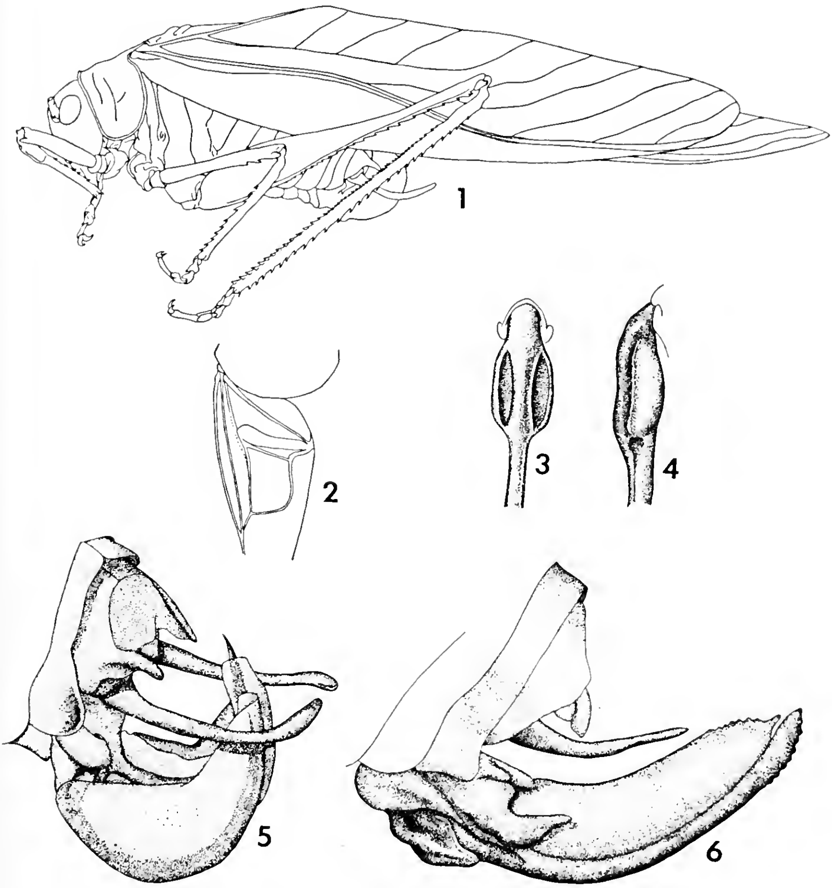
Thorax. Mesosternal lobes moderately developed, lateral edges convex, trigonal. Metasternal lobes moderately developed, laterally convex, rounded.

Legs. Cephalic coxal spine present. Cephalic femur with 2 to 6 spines along inner ventral margin. Cephalic tibiae bearing symmetrical auritate, conchate structures directed forward, shielding the tympana (Figs. 3, 4). Median femur with 1 to 5 spines along outer ventral margin. Ventral margins of posterior femora and tibiae armed with great number of small spines. 11–23 spines on inner ventral margin of posterior femur, 16–28 spines on outer ventral margin. 16–60 spines on inner ventral margin of posterior tibia, 22–44 on outer ventral margin. Posterior femora about 7.4 (♂) and 7.2 (♀) times longer than wide.

Wings. Anterior wing about 4.2 (♂) and 4.0 (♀) times longer than wide. Costal margin of posterior wing in folded position colored orange to amber. Costal vein of forewing nearly obscure or weakly expressed.

External genitalia. Male. Terminal tergite medially depressed and flattened; each lateral edge of tergite extending over base of each cercus as a short finger-like projection. Supra-anal plate slightly wider at its base than long, rounded at apex, arising from apical, medial edge of terminal tergite, and directed ventro-caudad. Cerci long, narrow, sinuous, circular in cross-section, with a ridge of about eight fine preapical teeth along median surface near apex, the distal two or three teeth being larger than the other teeth. Subgenital plate acutely upcurved between cerci as two custodite, sharp, lanceolate structures, each being surrounded by a translucent, thinly-sclerotized, crescentic outgrowth of the base of the subgenital plate. Subgenital plate extending dorso-cephalad over terminal tergite; tips of sabers barely, if at all, extending beyond crescents (Fig. 5 *).

* Fig. 5 shows subgenital plate of male pulled ventrad to expose the inner face of right saber and to show how the crescentic outgrowth envelops it. In all other specimens observed the subgenital plate upcurves acutely over the dorsum of the abdomen.



FIGS. 1–6. *Raggophyllum spinosum* n. sp. 1, male; 2, stridulatory field of male; 3, 4, tympanum on left cephalic tibia; 3, frontal aspect; 4, lateral aspect; 5, tip of abdomen, male, dorsoposterior aspect; 6, tip of abdomen, female, lateral aspect.

Localities of specimens. Figs. 1, 2, 3, 4, and 6, Peru, Huallaga, Aguaytia R. 400 m; Fig. 5, Bolivia, Dept. Beni, Rurrenabaque, 227 m.

Female. Terminal tergite truncate. Ovipositor short, gradually upcurved; ventral valve extending slightly beyond dorsal valve; edge of ovipositor distally finely scalloped with about fifteen teeth at apex only. Basal lobe of ovipositor laterally compressed, distinctly elongated posteriorly and away from body, with the appearance of the toe of a boot (Fig. 6). Subgenital plate slightly longer than its basal width; apically narrow, blunt.

Internal genitalia. Not observed.

Color. General body color katydid green. Eyes uniform dark brown. Costal border of posterior wing in folded position orange to amber. Characteristic dark brown marks on ventral surface at apex of posterior femur and at geniculum of posterior leg. (The face, thorax, abdomen, and anterior portion of the tegmen seem to have a strong tendency to lose green pigment, as ten specimens are yellow or almost white in these areas.)

Variation. Little variation other than size is noted. The female specimen at hand lacks the great number of spines on the posterior tibiae, having only 22 and 25 on the outer ventral margins, and 16 and 17 on the inner ventral margins. The males average 39 spines on the outer ventral margins and 51 on the inner ventral margins.

Distribution. *Raggophyllum spinosum* has a range of at least 700 miles (between Rio Napo, Loreto Province, Peru and Rurrenabaque, Beni Department, Bolivia). It is known only from east of the Andes Mountains.

Measurements. Values listed are means (mm). Total length ♂ 55.2, ♀ 61.0; length pronotal disc ♂ 5.8, ♀ 6.4; width pronotal disc ♂ 5.0, ♀ 5.7; length posterior femur ♂ 23.9, ♀ 26.5; width posterior femur ♂ 3.2, ♀ 3.7; length anterior wing ♂ 42.3, ♀ 47.0; width anterior wing ♂ 10.1, ♀ 11.7; length ovipositor ♀ 6.9.

Notes on Mexican and Southwestern U. S. Bethylidae (Hymenoptera): Part I, Pristocerinae[1]

HOWARD E. EVANS, Museum of Comparative Zoology,
Harvard University, Cambridge, Mass.

During the past year I have studied many Bethylidae from Mexico and the southwestern United States. These have come from a variety of sources, but especially from the collecting of Dr. W. R. M. Mason of the Entomology Research Institute, Ottawa, Canada. This paper is the first of two supplementary reports to recent revisionary studies of various genera of Bethylidae.[2] The abbreviations used will be summarized at the end of the second paper of this series.

Pristocera cockerelli Evans, 1963

Recently examined material includes the first record from CALIFORNIA (1 ♂, Bard, Imperial Co., 21 May 1965, taken sweeping cotton, W. Akins [CDAS]) and a second record from OAXACA (1 ♂, 2 mi. NW Oaxaca, 13 April 1953, E. I. Schlinger [CIS]). Both specimens agree well with the type in structure, but they show considerable contrast in color, the Oaxaca specimen having the mandibles, antennae, and legs bright testaceous, while these structures are brown to black in the California specimen.

Pristocera orizabae (Cameron), 1897

This species was previously known only from the type. D. H. Janzen has collected another male not far from the type locality, 1 mile W of Fortin de las Flores, VERACRUZ, 2 July 1962 [CIS]. The wings of this specimen are rather strongly suffused

[1] Research supported by the National Science Foundation, Grant No. GB1544.

[2] See Bull. Mus. Comp. Zool. Harvard, 132: 1–222 (1964) and 133: 67–151 (1965) and references therein.

with brown, and the eyes have numerous strong hairs. I judge that the eyes of the type have been rubbed. The claws and genitalia of this specimen are closely similar to those of the type.

Pristocera quiroga Evans, 1964

This is apparently a not uncommon species in western Mexico. I collected 1 ♂ at Guadalajara, Jalisco, 23 July 1965 and 2 ♂♂ 8 mi. NW Tequila, Jalisco, 5 Aug. 1965 [MCZ]. W. R. M. Mason collected 4 ♂♂ 15 mi. W El Palmito, Sinaloa, in July and August 1964, at 5000 feet elevation [CNC].

Pristocera hyalina Brues, 1906

This species can now be reported from Durango: 1 ♂, 3 mi. E El Salto, 8500 feet, 10 July 1964 (W. R. M. Mason) [CNC] and from Estado de Mexico: 1 ♂, 33 km. N Acambay, 7600 feet, 8 Aug. 1962 (H. E. Evans) [MCZ].

Pristocera chihuahua Evans, 1963

This species now known from two localities in central Mexico: Morelos: 1 ♂, Cuernavaca, 12 July 1965 (M. A. Evans) [MCZ] and Puebla: 2 ♂♂, 10.2 mi. W of Veracruz boundary, 5 July 1962 (D. H. Janzen) [CIS]. In the Morelos specimen the wings are strongly tinged with yellowish-brown, but in the Puebla specimens they are only moderately fumose; the Puebla specimens are the smallest I have seen (LFW 5.0–5.3 mm).

Pristocera rugifrons (Cameron), 1888

This species has been known only from the type, from Guatemala. I have recently examined a male from Quezaltepeque, El Salvador, collected by M. E. Irwin on 4 Aug. 1963 [CAS]. In contrast to the type, this specimen has the abdomen entirely bright ferruginous. It is a large specimen (LFW 7.0 mm) and has some fairly strong hairs arising from the eyes, but otherwise it agrees closely with the type.

Apenesia chiricahua Evans, 1963

This species can now be recorded from TEXAS (1 ♂, Boot Springs, Big Bend Nat. Park, 18 May 1959, H. Howden [CNC]) and from SINALOA (2 ♂♂, 20 mi. E Concordia, 3,000 feet, 8 Aug. 1964, W. R. M. Mason [CNC]) and DURANGO (2 ♂♂, El Salto, 8,500 feet, 18 July 1964, W. R. M. Mason [CNC]; 1 ♂, 24 mi. W La Ciudad, 7,000 feet, 6 July 1964, W. R. M. Mason [CNC]). The two El Salto specimens are unusually large (LFW 3.8–4.2 mm).

Apenesia malinche Evans, 1963

This species, readily identified by its unusual aedeagus, was described from two males from Puebla. I am now able to record it from SINALOA: 1 ♂, Mazatlan, 6 Aug. 1964 (W. R. M. Mason) [CNC] and from ARIZONA: 1 ♂, Picture Rock Pass, Tucson Mts., 25 July 1961 (Werner & Nutting) [UA].

Apenesia mexicana (Cameron), 1904

This poorly known species can also be recorded from SINALOA: 1 ♂, 20 mi. E Concordia, 3,000 feet, 4 Aug. 1964 (W. R. M. Mason) [CNC].

Apenesia tarascana Evans, 1963

I am now able to report this species from EL SALVADOR: 2 ♂♂, Cerro Verde, 6,800 feet, 29 June 1963 (M. E. Irwin) [CAS].

Apenesia tlahuicana Evans, 1963

This species is closely related to the preceding, but the characters I used to separate them appear to hold up well. I am now able to report the species from NUEVO LEON: 1 ♂, Chipinque Mesa, Monterrey, 20 Aug. 1960 (H. Howden) [CNC] and from SINALOA: 1 ♂, 15 mi. W El Palmito, 5,000 feet, 20 July 1964 (W. R. M. Mason) [CNC].

Apenesia denticulata Evans, 1963

This minute species, previously known only from Veracruz, has also been taken by W. R. M. Mason at two localities in SINALOA: 5 ♂♂, 15 mi. W El Palmito, 5,000 feet, 11–20 July 1964; 1 ♂, 2 mi. E. Concordia, 4 Aug. 1964 [CNC].

Apenesia dissomphaloides Evans, 1963

I described this species from a single male from Superior, Arizona. I have since seen other Arizona specimens as well as several from Sinaloa, where the species occurs sympatrically with the closely related *denticulata* but nevertheless appears to maintain its identity. New records are as follows: ARIZONA: 1 ♂, Peppersauce Canyon, Santa Catalina Mts., 8 July 1961 (P. H. Johnson) [MCZ]; 1 ♂, 8 mi. N Vail, Pima Co., 20 Aug. 1962 (Werner & Nutting) [UA]; SINALOA: 3 ♂♂, 15 mi. W El Palmito, 5,000 feet, 11–21 July 1964 (W. R. M. Mason) [CNC]; 1 ♂, 20 mi. E Concordia, 3,000 feet, 8 Aug. 1964 (Mason) [CNC].

Dissomphalus altivolans Evans, 1955

This species can now be recorded from Mexico. F. G. Werner and W. L. Nutting took a male at light in Hermosillo, SONORA, 12 Aug. 1959 [UA].

Dissomphalus xanthopus Ashmead, 1893

This relatively common eastern North American species has been recorded from as far west as Arizona (Evans, 1962) and as far south as Tabasco, Mexico (Evans, 1954). Consequently it is not surprising to find that it apparently occurs over much of Mexico. The following new records are of interest: SONORA: 1 ♂, Cocorit, 23 May 1962 (F. D. Parker) [UCD]; JALISCO: 1 ♂, 21 mi. NE Tepatitlan, 18 Aug. 1960 (P. H. Arnaud, Jr.) [CAS]; CHIAPAS: 1 ♂, 2 mi. SW Guadalupe Atodia, 24 March 1953 (R. C. Bechtel & E. I. Schlinger) [CIS].

Dissomphalus californicus Ashmead, 1893

Since its description over 70 years ago, this species has remained known from a single male (now without a head), from Poway, San Diego Co., California. I have finally discovered a second specimen, this one from ARIZONA: Midgley Bridge, Oak Creek Canyon, Coconino Co., 23 Aug. 1952 (H. B. Leech) [CAS]. This specimen keys out well enough in my keys, and the pits of the second tergite are essentially as shown in my Fig. 2 (1954). However, the groove on the first tergite does not appear to extend more than half the length of the tergite as figured for the type. The following head characters will fortunately separate it readily from its close relatives *barberi* and *xanthopus*:

Mandibles with three rather large apical teeth. Clypeus with a strong, linear median carina which is straight in profile, its apical margin with a strong tooth at the end of this carina; laterad of this tooth the margin is somewhat sinuate, but there are no additional processes that could be described as "teeth." Shape of head and ocellar triangle, as well as sculpturing of front, essentially as in *xanthopus*, but the antennae more compact than in most specimens of that species, the third segment being barely longer than wide and considerably shorter than the following segments.

Pseudisobrachium masoni new species

Holotype.—♂, MEXICO: DURANGO: 3 mi. E El Salto, 8,500 feet, 10 July 1964 (W. R. M. Mason) [CNC].

Description of male type.—Length 6.0 mm; LFW 4.6 mm. Black, including mandibles, antennae, and basal parts of legs; tibiae and tarsi brown; wings lightly tinged with brown, the discoidal vein a strong brown streak nearly interstitial with media. Mandibles 5-toothed, broad, the basal three teeth rounded; median elevation of clypeus in the form of an inverted Y, slightly depressed between the arms of the Y, the apical margin truncate. Antennae slender, third segment longer than fourth, about 2 × as long as thick; flagellum with subappressed pubescence above which rise a few erect setae. WH 0.99 × LH; eyes small, protuberant, distance from eye tops to vertex crest slightly greater than eye height; WF 1.7 × HE; OOL 1.5 × WOT, front angle of ocellar triangle less than a right angle. Head and thorax shining, non-alutaceous; front with abundant small punctures; mesoscutum wholly punctate, the notauli strong, not quite reaching posterior margin. Propodeum about 1.6 × as long as wide, disc not separated from declivity; median carina not quite reaching edge of slope, flanked by several weaker and more irregular longitudinal carinae. Mesopleurum closely punctate except callus smooth and polished.

Paratypes.—MEXICO: DURANGO: 17 ♂♂, same as type except some 18 July 1964 [CNC, MCZ]; DURANGO: 6 ♂♂, 24 mi. W La Ciudad, 7,000 feet, 6 July–4 Aug. 1964 (W. R. M. Mason) [CNC]; SINALOA: 6 ♂♂, 4.5–15 mi. W El Palmito, 5,000–6,500 feet, 11 July–4 Aug. 1964 (W. R. M. Mason) [CNC].

Remarks.—The paratypes vary considerably in size (LFW 3.0–4.5 mm); WH varies from 0.91 to 0.99 × LH, WF from 1.55 to 1.75 × HE, OOL from 1.5 to 2.0 × WOT. This species differs from its closest relative, *blomi* Evans, 1961, in its consistently smaller size, darker and more slender antennae, more broadly rounded vertex, and more elongate and differently sculptured propodeum.

Pseudisobrachium cooperi Evans, 1961

This species was described from a single male from Turrialba, Costa Rica. I have seen one additional male, from TABASCO, MEXICO: Teapa, March (H. H. Smith) [BMNH].

Pseudisobrachium matthewsi Evans, 1961

Described from western Texas, this minute species can now be recorded from New Mexico and Arizona. New records are as follows: TEXAS: 1 ♂, Oak Spring, Big Bend Nat. Park, 22 May 1959 (W. R. M. Mason) [CNC]; NEW MEXICO: 2 ♂♂, Whitewater Canyon, 4 mi. NE Glenwood, Catron Co., 20 Aug. 1952 (H. B. Leech) [CAS]; ARIZONA: 2 ♂♂, Sabino Canyon, Pima Co., 3 Sept. 1963 (V. L. Vesterby) [UCD]; 1 ♂, 15 mi. S Seligman, Yavapai Co., 9 Aug. 1962 (F. Werner) [UA].

Pseudisobrachium michoacanum Evans, 1961

A male closely resembling the type was taken by W. R. M. Mason at a locality 20 mi. E of Concordia, Sinaloa, at 3,000 feet elevation, 8 Aug. 1964 [CNC].

Pseudisobrachium otiosum Evans, 1961

Since describing this species from three specimens from Arizona, I have seen several additional Arizona specimens as well as four from western Mexico. Mexican records are as follows: Sonora: 1 ♂, 5 mi. W Alamos, 14 Aug. 1959 (Werner & Nutting) [UA]; 1 ♂, 5 mi. E Navajoa, 11 Aug. 1960 (P. H. Arnaud, Jr.) [CAS]; Nayarit: 2 ♂♂, 5 mi. S Rio Santiago Ferry, 27 Nov. 1948 (H. B. Leech) [CAS].

Pseudisobrachium obscurum Evans, 1961

I have seen many additional specimens of this not uncommon, nocturnal species. The following represent new state records: Utah: 1 ♂, Benjamin, Utah Co., 24 Aug. 1960 (G. F. Knowlton) [UCD]; California: 1 ♂, Banner, San Diego Co., 13 July 1963 (J. Powell) [CIS]; 1 ♂, Boyd Dist. Res. Sta., Riverside Co., 2 July 1963 (J. Powell) [CIS]; Sonora: 1 ♂, 40 mi. N Hermosillo, 8 Aug. 1960 (P. H. Arnaud, Jr.) [CAS].

Pseudisobrachium pallidum Evans, 1961

The following are new state records for this minute, nocturnal species: California: 1 ♂, 6 mi. E Yermo, San Bernardino Co., 27 Aug. 1952 (J. W. Green) [CAS]; Sonora: 1 ♂, Cocorit, 23 May 1962 (L. A. Stange) [UCD].

The following two new species also belong to the *obscurum* group, and both will run to *pallidum* in my 1961 revision.

Pseudisobrachium demissum new species

Holotype.—♂, Mexico: Sinaloa: 20 mi. E. Concordia, 3,000 feet elevation, 12 Aug. 1964 (W. R. M. Mason) [CNC].

Description of male type.—Length 5.0 mm; LFW 3.8 mm. Head and thorax black, abdomen light castaneous; mandibles black except ferruginous on apical half; antennae light ferruginous, scape weakly infuscated; legs testaceous except front coxae fuscous; wings hyaline, veins and stigma light brown, discoidal vein only very faintly indicated. Mandibles 5-toothed, the basal three teeth small; clypeus somewhat rounded apically, the margin thickened and shining, especially at the terminus of the strong median ridge. Antennae slender, third segment longer than fourth, about twice as long as thick; flagellum rather coarsely pubescent and with a few suberect setae extending above the pubescence. WH 0.96 × LH; eyes large although not strongly protuberant, vertex broadly rounded off a short distance above eye tops. Front narrow, WF 1.18 × HE; ocelli large, DAO 0.22 × WF; OOL 0.80 × WOT; front angle of ocellar triangle less than a right angle. Front shining, somewhat alutaceous, with small but well defined punctures which are separated by 1–2 × their own diameters. Thoracic dorsum polished, non-alutaceous, distinctly punctate; notauli weakly impressed on anterior two thirds of mesoscutum, absent behind; propodeum about 1.5 × as long as wide, weakly sculptured except for a median carina which falls far short of the posterior slope. Mesopleurum polished, punctate anteriorly, the callus mostly impunctate but not strongly differentiated.

Paratypes.—2 ♂♂, same data as type except one collected 4 Aug. 1964 [CNC, MCZ].

Remarks.—One of the two paratypes is slightly smaller (LFW 3.5 mm), and this specimen has the head as wide as high. Otherwise the three specimens are extremely similar.

Pseudisobrachium werneri new species

Holotype.—♂, Mexico: Sonora: 10 mi. E. Navajoa, 13 Aug. 1959 (black light trap, W. L. Nutting & F. G. Werner) [MCZ].

Description of male type.—Length 3.3 mm; LFW 2.6 mm. Head and thorax piceous, abdomen medium brown; apical two thirds of mandibles testaceous; antennae light ferruginous except scape weakly infuscated; front coxae fuscous, legs otherwise strawcolored; wings very pale, stigma light brown, veins almost colorless, discoidal vein absent. Mandibles 5-toothed; clypeus truncate; head wider than high, WH 1.06 × LH, the eyes large and strongly protuberant. Third and eleventh antennal segments both about 1.6 × as long as wide; flagellar pubescence rather coarse, also some short erect setae extending above the pubescence. Front narrow, WF 1.07 × WH; ocelli large, DAO 0.26 × WF, OOL only 0.55 × WOT, front angle of ocellar triangle approximately a right angle. Front alutaceous, obscurely punctate, thoracic dorsum similar. Notauli weakly impressed on anterior half of mesoscutum; propodeum elongate, about 1.6 × as long as wide, sculpturing weak except for a strong median carina which stops well short of the slope. Mesopleurum alutaceous, obscurely punctate, the callus not well differentiated.

Paratypes.—MEXICO: SONORA: 10 ♂♂, same data as type [UA, MCZ, USNM]; SINALOA: 1 ♂, 20 mi E Concordia, 4 Aug. 1964 (W. R. M. Mason) [CNC]; ARIZONA: 1 ♂, Sonoran Desert Mus., Pima Co., 9–16 Aug. 1962 (light trap, W. L. Nutting) [UA].

Remarks.—The Sonora series is very uniform in size and in standard measurements. The Arizona male is also very similar, but with even larger ocelli (DAO 0.30 × WF; OOL 0.45 × WOT), and with a somewhat narrower front (WF 0.91 × HE). The Sinaloa male has slightly smaller ocelli (DAO 0.23 × WF; OOL 0.70 × WOT) although it is otherwise very similar indeed. Three other males from the same locality in Sinaloa [CNC], not designated paratypes, are also similar, but the vertex is more produced above, so that the head is higher than wide (WH about 0.95 × LH); these are very small specimens (LFW 2.0–2.1 mm) and have the body mostly rather pale. These specimens, especially, approach *pallidum*, but the latter species has considerably shorter and less roughly pubescent antennae as well as a shorter propodeum. *P. demissum* also differs from *pallidum* in these same features, while differing from *werneri* in its larger size, much more strongly punctate front and thoracic dorsum and pleura, and more rounded clypeus.

Pseudisobrachium aztecum Evans, 1961

This species can now be recorded from PUEBLA: 1 ♂, 3 mi. E Azucar de Matamoros, 25 April 1962 (F. D. Parker) [UCD].

Pseudisobrachium minimum Evans, 1961

This species is rather variable in size (LFW 1.5–3.0 mm) and apparently best separated from *minutissimum* by its much broader and more truncate vertex. Since describing *minimum* I have seen several more Arizona specimens and the following from Mexico: SINALOA: 1 ♂, Los Mochis, 6 May 1963 (E. I. Schlinger) [CIS]; MICHOACAN: 10 ♂♂, Patzcuaro, 15 July 1965 (H. E. Evans) [MCZ]; ESTADO DE MEXICO: 1 ♂, 22 mi. N Toluca, 8,800 feet, 17 Aug. 1954 (J. G. Chillcott) [CNC]: 1 ♂, Valle de Bravo, 6,500 feet, 3 Aug. 1962 (H. E. Evans) [MCZ].

Pseudisobrachium krombeini Evans, 1961

This species can now be recorded from TEXAS: 4 ♂♂, Boquillas, Big Bend Nat. Park, 13 May 1959 (W. R. M. Mason) [CNC] and from SONORA: 1 ♂, 40 mi. SW Ciudad Obregon, 16–23 May 1961 (H. Howden) [CNC].

Pseudisobrachium comanche Evans, 1961

This is a fairly common species in southern Arizona. It can now be recorded from SINALOA: 3 ♂♂, 15 mi. W El Palmito, 5,000 feet, 8–26 July 1964 (W. R. M. Mason) [CNC].

Pseudisobrachium foutsi Evans, 1961

This widely distributed desert species can now be recorded from SONORA: 4 ♂♂, Cocorit, 23 May 1962 (F. D. Parker) [UCD].

Pseudisobrachium flavinervis Fouts, 1928

I have seen many additional specimens of this species from Texas, Arizona, and Sonora. A very typical male is before me from NAYARIT: Tepic, 15 Sept. 1963 (B. Malkin) [CAS].

Crichtonia macleani, a New Genus and Species of the Hedobiini (Coleoptera: Anobiidae) from the Baltic Amber [1]

MOHAMMAD ABDULLAH [2, 3] and ABIDA ABDULLAH, Department of Entomology, Macdonald College of McGill University, P. Q., Canada

Mr. Ralph Baker of the Department of Palaeontology, British Museum (Natural History) kindly sent us the material described here. The specimen has a bostrychoid pronotum, strongly deflexed head, long trochanter (i.e., femoro-trochanteral junction not oblique), and femoral plate (i.e., extension of the postero-ventral edge of the excavate hind coxa which could cover the retracted femur) present. Furthermore, the prosternal inter-coxal process is not received in the mesosternum. For these reasons one could not place it in any other family of the Coleoptera except the Anobiidae (*vide* Crowson, 1955). Within the Anobiidae, there is no difficulty in placing the specimen in the Hedobiini near the Nearctic genus *Eucrada* LeConte, 1862,

[1] Senior author's paper number 44 on the Coleoptera.

[2] The research was supported by a Postdoctorate Fellowship awarded to the senior author by the National Research Council of Canada.

[3] Now Senior Research Officer in Entomology, Pakistan Council of Scientific and Industrial Research, Central Labs., Karachi 32.

in the keys of Arnett (1962: 569) or LeConte and Horn (1883: 222).

Handlirsch (1908) gives a list of fossil Anobiidae and the following species and genera have subsequently been recorded although none in the Hedobiini:

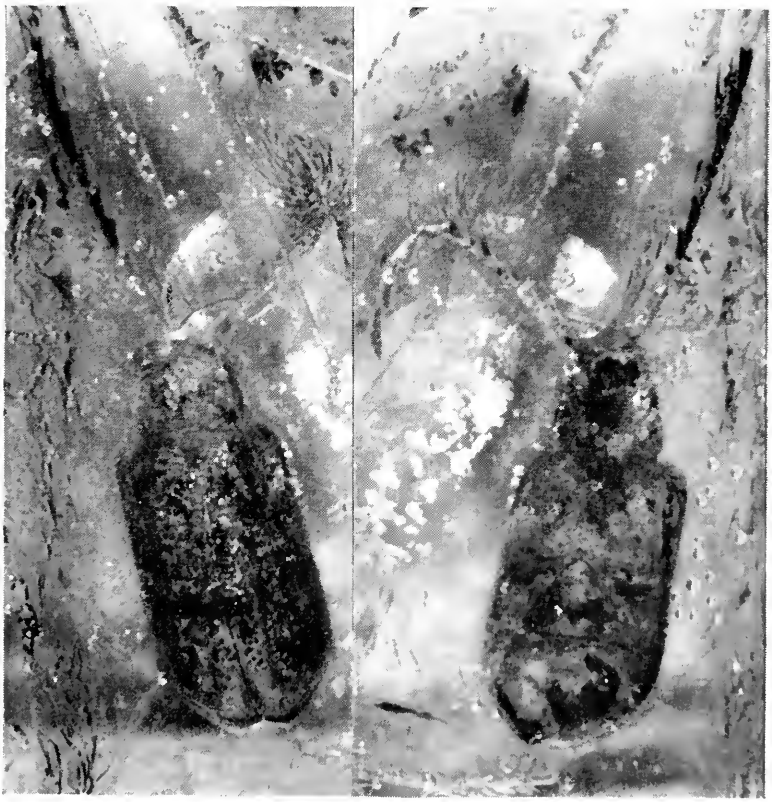
Anobichnium Linck, 1949.
A. simile Linck, 1949, p. 180, Keuper wood, Germany.
Anobium domesticum, ? fossil, Lesne, 1920, pp. 486, 626, Pliocene.
Ernobius effetus Wickham, 1914 b, p. 450, pl. vi, fig. 1, Florissant, Miocene (? Oligocene).
E. ? electrinus Quiel, 1909, p. 49, Baltic amber.
Gastrallanobium Wickham, 1914 a.
G. subconfusum Wickham, 1914 a, p. 261, pl. vi, fig. 12, Florissant, Miocene (? Oligocene).
Hadrobregmus sp., fossil, Lesne, 1920, p. 486, Pliocene.
Oligomerus ? duratus Wickman, 1914 b, p. 451, pl. vi, fig. 3, Florissant, Miocene (? Oligocene).
O. florissantensis Wickham, 1914 b, p. 451, pl. vi, fig. 2, Florissant, Miocene (? Oligocene).
Vrilletta monstrosa Wickham, 1917, p. 468, pl. xxvii, fig. 5, Florissant, Miocene (? Oligocene).
V. tenuistriata Wickham, 1913 a, p. 16, pl. iv, fig. 12, Florissant, Miocene (? Oligocene).
Xestobium ? alutaceum Wickham, 1913 b, p. 363, pl. i, fig. 5, Florissant, Miocene (? Oligocene).

The specimen originally belonged to the Museum Stantien & Becker (number 13692) and was collected by Dr. Richard Klebs. The following amber pieces of the Anobiidae comprised the Klebs collection as identified by Dr. E. Reitter (Klebs 1910): "*Anobium* 89, Bei *Anobium* 11, *Coenocara* 1, Bei *Dorcatoma* 1, *Dryophilus* 11, Bei *Dryophilus* 1, *Ernobium* 13, *Gastrallus* 11, Bei *Hedobia* 1, *Lasioderma* 16, *Mesocoelopus* 14, *Mesothes* 2, Bei *Nicobium* 1, *Niptus* 3, *Ptinus* 16, *Rhadine* 12, *Theca* 12, *Xyletinus* 10, Bei *Xyletinus* 1, Gen. fremd 3, Gen. ganz bes. auffallend. 1, Gen. unbestimmt 6." It is our considered opinion that this is the specimen referred to as "Bei *Hedobia*" above.

This is the first Hedobiini to be formally described from the Baltic amber. General information on the latter may be obtained in a recent paper by one of us (Abdullah, 1964).

Key to the genera of the Hedobiini

1. Antennae filiform in both sexes........................2
   Antennae serrate (or flabellate in the male)..............3
2. Antenna with segments three and four subtriangular, compressed; elytra irregularly punctate; tarsi and tibiae nearly equal in length......*Hedobia* Latreille, 1829
   Antenna with segments three and four moniliform, not compressed; elytra striate punctate; tarsi and tibiae not nearly equal in length..*Neohedobia* Fisher, 1919



Crichtonia macleani gen. et sp. nov., holotype. FIG. 1, dorsal view; FIG. 2, ventral view. (University of Reading photographs).

3. Tibia with a large terminal spur; head across eyes narrower than pronotum at its widest part; gula narrow........................*Eucrada* LeConte, 1862
   Tibia with spurs short, slender; head across eyes nearly as wide as pronotum at its widest part; gula wide..........................*Crichtonia,* new genus

Arnett (1962: 569) places *Ptilineurus* Reitter, 1901, in the Hedobiini which could be distinguished from the above-mentioned genera by its pygidium which is exposed and it further has a margined pronotum.

CRICHTONIA new genus

DIAGNOSIS. The absence of a large terminal tibial spur and the presence of a wide head (not smaller than pronotum at their widest parts) should serve to distinguish this genus from others in the tribe.

Head transverse across eyes. Eyes lateral, very convex, bulging, finely faceted. Mandible (? appears to be) toothed near apex. Maxillary palp four segmented, filiform, apical segment pointed at apex. Gula wide. Antenna eleven-segmented, segment two smallest, apical segment longest, segments nine to eleven elongated, segments three to ten serrate.

Thorax. Pronotum not broader than head across eyes; hood-like; central portion of disc slightly elevated, like a large tubercle; widest near base, gradually narrowed apically. Scutellum rounded at apex. Elytra coarsely, densely punctate, punctures becoming sparse and fine near apex (apparently) arranged in longitudinal rows. Tibial spurs short, slender (visible on one leg only). A prominent, projecting, roughly triangular piece of sclerite visible laterally on hind coxa before its junction with trochanter.

Abdomen. Five sternites visible. First visible sternite excavate for hind legs.

Type of the genus: *C. macleani,* new species.

We have the pleasure of naming this genus in honor of Dr. M. Ian Crichton of the Department of Zoology, University of Reading.

Crichtonia macleani new species (Figs. 1, 2)

Holotype. In. 18795 (Klebs numbers 281, 92–74), in the Department of Palaeontology, British Museum (Natural History) London.

Color. Black, eyes lighter.

Vestiture. Fine, sparse. Eyes very sparsely, finely hairy.

Punctures. On pronotum coarse. On elytra coarse, dense, becoming fine toward apex. Ventrally sparse, fine.

Total length 4 mm (without antennae); maximum width 1.8 mm.

The fifth visible abdominal sternite has a big (artificial) hole and the sex is hard to determine but if the specimen is a female, it is possible, as in the allied genus *Eucrada,* the male may have flabellate antennae. The surface is not clearly visible at many places. Only the tibia-tarsi of one leg is preserved in the specimen. An idea of the proportions of some of the antennal segments may be obtained from the photographs.

The species has been named in honor of our photographer, Mr. Ian Maclean of the University of Reading, England.

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New Genera of Old World Sphecidae (Hymenoptera)[1]

A. S. Menke[2]

The two new genera described here are an outcome of research directed towards a generic revision of the Sphecidae. This study is being conducted by R. M. Bohart and the author. Because the revision, when published, will emphasize the genera of the New World, we are publishing descriptions of new exotic genera in separate papers so that they can be given fuller treatment.

I am indebted to Dr. Edgar Riek, C.S.I.R.O., Canberra, Australia, for sending an example of "*Sericophorus*" *abnormis* Turner and other Australian Sphecidae.

Larrisson[3] Menke, new genus

Type of genus: *Sericophorus abnormis* Turner, 1914.

Generic characters (based on male only): Antenna short, low on face, sockets contiguous with frontoclypeal suture, flagellomeres about as broad as long, male with 11 flagellomeres (Fig. 1); eyes diverging above and below (Fig. 1); ocelli normal; clypeus with a simple median truncate lobe; mandible with broad external notch, inner margin with two weak teeth (Fig. 1); no

[1] Research supported by a grant from the National Science Foundation, GB-3074.

[2] Dept. of Entomology, Univ. of California, Davis.

[3] *Larra* and *Nysson*, referring to the combination of features which superficially suggest that this genus is intermediate between the Larrinae and the Nyssoninae.

malar space; mouthparts very short; occipital carina disappearing just before meeting hypostomal carina; thorax compact, pleural details as in Fig. 2, propodeum very short, dorsal area very narrow and enclosure not defined, propodeum with a stout, rounded projection posterolaterally (Fig. 2); media of forewing interstitial with cu–a, and diverging from M + Cu at an obtuse angle; marginal cell truncate apically and appendiculate, second submarginal cell triangular but not petiolate and receiving only the second recurrent vein (Fig. 5); media of hind wing diverging from M + Cu well beyond cu–a; jugal lobe small, about two-fifths the length of the anal area; foretarsal rake present; forecoxa without posteromedian projection or tuft of setae; foretrochanter and femur not notched or otherwise excavated; midtibia with one apical spur; mid- and hindtibiae with several parallel rows of short, stout spines; hindfemur with a subapical carina on which are numerous, small, short spines (Fig. 6); tarsomeres II–IV of middle and hind legs short, triangular and strongly flattened, tarsomere V not enlarged, claws simple and pulvilli small (Fig. 6); abdomen sessile (Fig. 3), tergite I truncate basally, tergites I and II with lateral carinae, tergite VII broadly triangularly flattened but pygidium not defined by carinae; pygostyles absent; sternite II with a thick, transverse flange, sternite VIII as in Fig. 4; genital capsule with simple volsella, gonoforceps with dense tufts of hairlike setae, and a pair of narrow appendages on inner surface (Fig. 7).

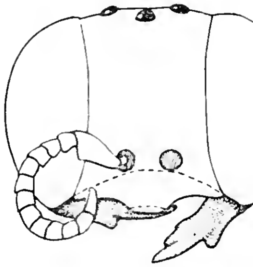
Included species: *Sericophorus abnormis* Turner, 1914.

Distribution: Australia.

Discussion: The single midtibial spur, wing venation, low placement of the antennae, external notch of the mandible and the simple volsella place *Larrisson* in the subfamily Larrinae. The normal ocelli and small hindwing jugal lobe ally the genus with the tribe Miscophini.

FIGS. 1–7. Genus *Larrisson* (all figures are of male).

1, head; 2, lateral view of thorax; 3, lateral view of abdomen (8th segment not shown); 4, eighth sternite of abdomen; 5, portion of forewing showing marginal and submarginal cells; 6, hind leg in lateral view (6a), in dorsal view (6b—tarsus only); 7, ventral view of genitalia.



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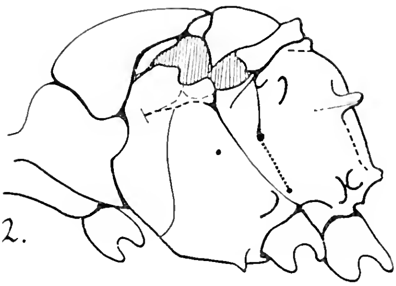

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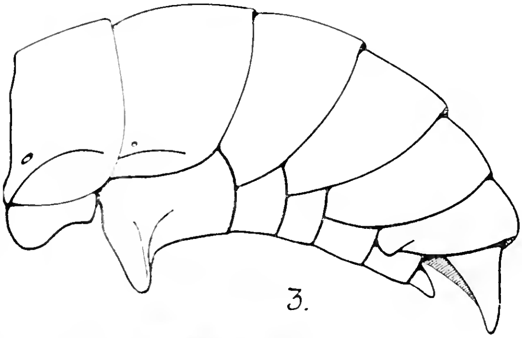

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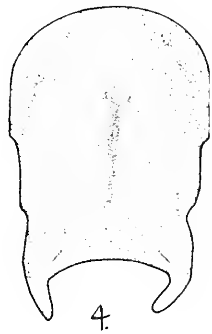

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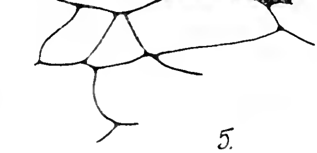

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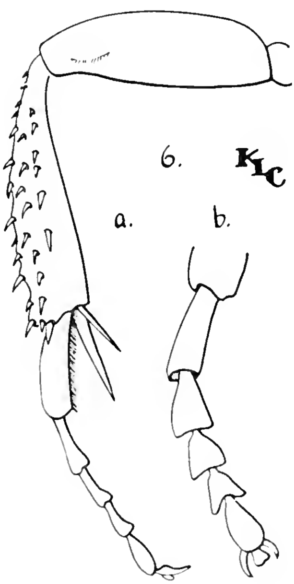

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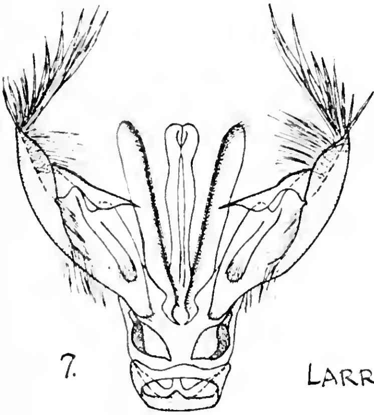

7.

LARRISSON

Larrisson may be related to the group of endemic Australian miscophine genera (*Sericophorus, Sphodrotes*) that Turner (1914) considered as a subfamily, the Paranyssoninae (which also includes the Ethiopian and Oriental genus *Paranysson*). However, without knowledge of the female, it is difficult at this point to ally *Larrisson* definitely with any of the genera in this assemblage.

Larrisson differs from *Sericophorus* in the following points: male with 13-segmented antenna (12 in *Sericophorus* males), male abdominal sternite II with a thick transverse flange (none in *Sericophorus*), occipital carina not attaining hypostomal carina (occipital carina strongly indicated at juncture with hypostomal carina in *Sericophorus*), the strongly flattened tarsomeres, unenlarged tarsomere V and small pulvilli (tarsomeres not flattened, V and pulvilli usually greatly enlarged at least on front legs in *Sericophorus*), large volsella (greatly reduced in *Sericophorus*), and the partial pygidium in the male (none at all in *Sericophorus*). Although some *Sericophorus* species have a posterolateral carina on the propodeum which sometimes forms a blunt tooth or angle (*S. relucens* Smith for example), these do not approach the prong found in *abnormis*.

In some respects, the genus *Sphodrotes* appears close to *Larrisson*. This genus has 13-segmented male antennae, an occipital carina which fades just before joining the hypostomal carina, somewhat flattened tarsomeres and small pulvilli, and a small posterolateral tubercle on the propodeum. *Sphodrotes* differs from *Larrisson* in the other characters listed in connection with *Sericophorus* however, and furthermore, it has a petiolate second submarginal cell which receives both recurrent veins.

On the other hand, the true affinities of *Larrisson* may be with one of the two isolated larroid genera, *Palarus* and *Heliocausus*. The abdominal structure is similar in all three of these

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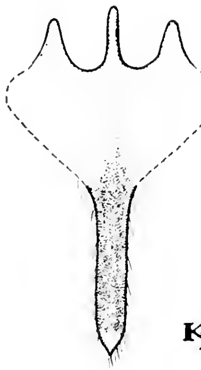
FIGS. 8–13. Genus *Afrogorytes*

8, eighth sternite of male; 9, male antenna; 10, female head; 11, lateroventral view of thorax; 12, hind leg; 13, abdomen in lateral view (7th and 8th segments not shown).



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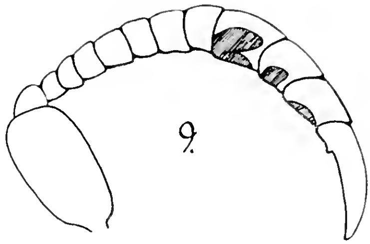

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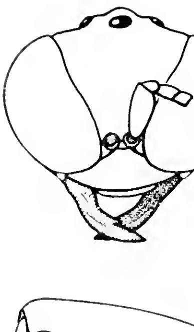

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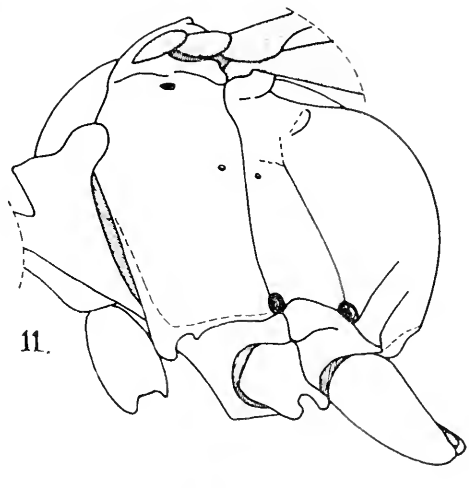

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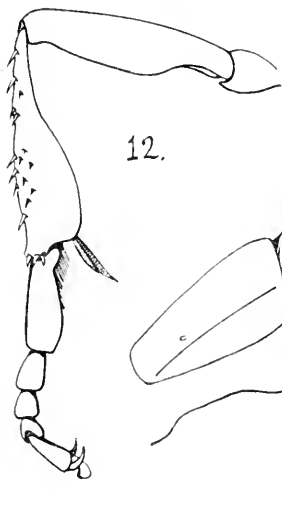

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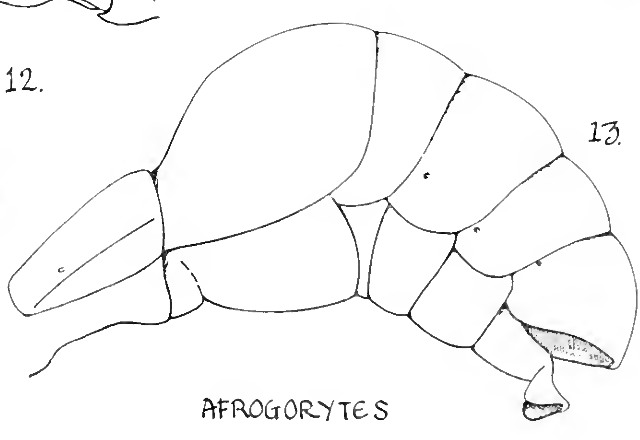

13.

AFROGORYTES

genera, and other resemblances especially with *Palarus* can be found in the antenna, thorax, legs, wings, and subgenital plate.

AFROGORYTES[4] Menke, new genus

Type of genus: *Gorytes monstrosus* Handlirsch, 1894.

Generic characters: Antenna short, basal flagellomeres about as long as wide, distal articles longer and with concavities ventrally in the male on VIII to XI, terminal flagellomere elongate and arcuate in male (Fig. 9); eyes strongly converging below, frons narrowest at antennal sockets, which are low on face, nearly contiguous with frontoclypeal suture (Fig. 10); labrum protruding slightly beneath clypeus; mandible subapically dentate within; mouthparts very short; vertex behind ocellar triangle mound-like; gena broad but occipital carina angling forward below, becoming evanescent towards mandible base; female foretarsal rake present; pronotal collar short, closely adhering to scutum; lateral margin of scutum with an oblique carina opposite posterior edge of tegula, setting off a posterolateral declivous area; mesopleuron without episternal and scrobal sulci, omaulus represented by a strong carina which forms a large tooth-like projection below at its juncture with the acetabular carina and sternaulus (Fig. 11), mesosternal area behind acetabular carina very short (Fig. 11); metapleuron wide, broadest below; propodeum without a stigmatal groove, propodeal enclosure well defined, triangular; forewing media arising from M + Cu before cu–a, stigma small, veinlet of second submarginal cell between recurrent veins shorter than parallel veinlet opposite, and about one-tenth as long as first discoidal cell; hindwing jugal lobe about two-fifths as long as anal area, media diverging from M + Cu at or just beyond cu–a, cu–a leaving M + Cu at a right angle but then curving abruptly basad; trochanter of middle leg with a small dorsomedian tooth; hind femur excavated basally (Fig. 12); hind tarsomeres short and broad (Fig. 12); abdomen subpetiolate (Fig. 13); a well defined pygidium pres-

[4] Africa and *Gorytes*, referring to the distribution of this genus.

ent in female; male sternites without specialized transverse rows of dense fimbriae; eighth sternite as in Fig. 8.

Included species: *Gorytes monstrosus* Handlirsch, 1894, *G. silverlockei* Turner, 1913, *Arpactus gibbosus* Arnold, 1936.

Distribution: Africa.

Discussion: *Afrogorytes* is related to the gorytine genus *Hoplisoides* but differs chiefly in the form of the metapleuron; the strongly cariniform omaulus with its ventral process; the short, broad, hind tarsomeres; the more strongly converging eyes and the subpetiolate abdomen. The sixth male abdominal sternite in the species studied terminates in two lateral down-turned lobes which may be of generic importance (Fig. 13).

Arnold (1929) placed *silverlockei* in synonymy with *monstrosus* but this may prove to be an error. The species studied in connection with this description and the one from which the illustrations have been made appears to agree best with *gibbosus* Arnold.

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Books

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A summary of present knowledge that begins with a chapter on the organization of the nervous system based on electro-micrographs, and proceeds to tell what is known of the chemical and physiological events during transmission.

Picromerus bidens (Linn.), a Beneficial, Predatory European Bug Discovered in Vermont (Heteroptera: Pentatomidae)

KENNETH W. COOPER, Hanover, New Hampshire

Along the margins of a marshy pasture at Union Village, Vermont (600 ft. el.), the European pentatomid bug *Picromerus bidens* (Linn.) may be swept from tall sedge and low shrubs during late August to early October. Almost certainly the population of this bug at Union Village is a long established one, for specimens (16 in all) have been obtained in the fall of each year from 1962–66. So far as I can determine, this is the first published record of the occurrence of *Picromerus bidens* in the New World; nevertheless, it was taken in Maine some thirty years earlier. A single example of *Picromerus bidens* was found among unsorted material at the U. S. National Museum by Drs. R. C. Froeschner and Jon L. Herring when identifying my specimens. It bears the labels: Lincoln Co., Me./ 7.22.32/ J. C. Lutz, Collector/ D. J. Borror Collection. The Vermont and Maine localities are alike in short growing season (118–120 days), severe temperature range ($\leqslant -37°$ F–$\geqslant 100°$ F), and abundant precipitation (37–42 in.).

Picromerus bidens is readily distinguished from all of our northeastern *asopine* pentatomids. Eleven to 14 mm long, it has an acute spine at the apical third of the profemur, and very prominently and sharply spined humeri behind which, at the level of the first visible abdominal sternite, the hind body is narrow (from above appearing gently pinched); ventral spine small, convex, just reaching posterior margin of metacoxae. Dull brown above, with deep, fine black punctures; anterior margin of pronotum pale, apical two-thirds of humeral spines piceous to black; an impunctate, pale orange spot at each pronotal callus, and at basal angles of scutellum; apical margin of scutellum pale; underside lighter, with an overall salmon tint; antennae, legs, and osteolar peritremes orange; 3 orange, impunctate spots on propleuron, and 3 on mesopleuron; a wide, elongate, polished black spot on "sixth" ventral abdominal segment of female; a similar spot, but much narrower on male.

Specimens of *Picromerus bidens* run to *Alcaeorrhynchus* in Blatchley's key (1926, p. 178), but their small size (11–14 mm, as compared with 18 mm or more) disqualifies them. With Torre-Bueno's key (1939, p. 245), *P. bidens* may be confounded with both *Alcaeorrhynchus* and *Andrallus*. From the latter it differs by having a relatively diminutive ventral spine, and by the sharp, thorn-like spine on the anterior femora (in contrast to *Andrallus'* femoral tubercle). A useful illustration of *Picromerus bidens* will be found in Southwood and Leston (1959, pl. 4, fig. 3).

Picromerus bidens is widely distributed in the Old World, ranging from the British Isles, Norway and Finland, across most of Europe to Siberia, Turkestan, Portugal and Algeria (Stichel 1925–38, 1960–61). Over much of its native area *P. bidens* encounters very considerably less extreme annual temperature ranges (and generally higher annual mean temperatures) than those experienced at Union Village, Vermont, and in Lincoln County, Maine. Nevertheless, *P. bidens* is evidently not at an environmental extreme in these two colonized sites, for quite comparable conditions are found within its range in regions of Germany, Poland, Czechoslovakia and West Russia; indeed in both Norway and Finland they may be much more severe.

According to Southwood and Leston (1959), this bug is found in "lush, flowery places, especially near woodlands and near water" (and such is the alder-rimmed pasture that it inhabits in Union Village, Vt.). Although variations in the life cycle evidently occur (*cf.* Butler 1923), Southwood and Leston state that eggs are laid on shrubbery in late August to October, overwintering and hatching between mid-May and mid-June; adults first appear in late July and early August. Such seems to be the case for *P. bidens* in Vermont as well.

My earliest records for adult *Picromerus* are mid August. By September females are laying, for two commenced laying in the laboratory on September 6 and September 12. Each deposited their eggs on the surface of crumpled chemwipe tissue in a single batch, one of 78 eggs, the other of 57. In both cases the eggs were arranged in regular, coherent, flat clusters, with each egg firmly affixed to its immediate neighbors by a dried film (often broken into short threads between eggs) of cementing substance. This is contrary to Schumacher's observation (cited by Butler 1923) that the eggs are laid irregularly and do not adhere.

The egg of *P. bidens* is barrel-shaped, 1.1 mm high by 0.8 mm wide, with a crown of clavate filaments encircling it immediately adjacent and below the broad lid that caps the upper pole. The range in numbers of clavate filaments (25–32) did not differ in the two batches of eggs, nor did the mean numbers (29.6 ± 0.33 and 29.2 ± 0.46). When laid, the eggs appeared waxy, and were cream colored. One batch darkened to near black, as Butler (1923) states this bug's eggs do, but the other became only tinged with gray. Eggs of both batches developed a pearly luster having a dominant coppery reflection. Most eggs of both clusters (on November 9) seem normal and in diapause.

This bug sucks *both* plants and insects (especially chrysomelid and lepidopterous larvae), even as an adult. Southwood and Leston report that at one time *Picromerus bidens* was hoped to become an aid in controlling the Colorado potato beetle in Europe. The tendencies of adults to disperse thinly through their habitat, and to take a variety of prey, however, limited its usefulness. Nevertheless, Dr. J. S. Kelleher, Importation Officer, Canada Department of Agriculture, has kindly sent me information that in Bavaria, in 1961, *P. bidens* played a more effective role than usual as a controlling influence on the larch sawfly. What is more, Butler (1923), among others, records it as feeding upon lymantriid larvae. All in all, it seems a decidedly beneficial insect; indeed it appears to have been among the first insects to have been deliberately and successfully employed as a control of pests (in the 18th C., against bed bugs!).

Though it appeared likely that *Picromerus bidens* had been imported for trial in control of insect pests in eastern North America, it is not listed in the summations of such releases given by Dowden (1962), by McLeod (1962), and by McGugan and Coppel (1962); nor does the Canada Department of Agriculture, according to Dr. J. S. Kelleher, or the U. S. Department of Agriculture, according to Dr. R. I. Sailer, have any record of the deliberate introduction of *P. bidens* into North America for any purpose. *Picromerus bidens* (Linn.), then, is evidently an accidental or perhaps clandestine importation, first entering the country before 1932, and now well-established at Union Village, Vt., and perhaps also in Lincoln County, Me. In general it must be considered a beneficial insect, perhaps much more wide-spread in New England than these few records suggest.

Dr. Sailer has pointed out to me that *P. bidens* "belongs to a class of predators that are notoriously difficult to colonize." Furthermore, he feels that it is most unlikely that *P. bidens* was accidently introduced into New England for, ". . . aside from the plant feeding *Nezara viridula* (Linn.), no pentatomids have demonstrated a tendency to follow avenues of commerce and colonize new lands." Considering these facts and views, it is perhaps no coincidence that reasonably close by the colony of *P. bidens* in Vermont, namely at Plainfield and South Barre, Vt. (Bell 1957), and similarly at Orono in Maine, there are well-established colonies of the palearctic beetle, *Carabus auratus* Linn., of uncertain and possibly accidental origin (Smith 1959, Dowden 1962). Can it be that the puzzling presence of both *Picromerus bidens* and *Carabus auratus* in Maine and Vermont has a single solution?

To the entomologists mentioned in this note, and to Dr. P. B. Dowden and the late Dr. H. Ruckes as well, I am grateful for kind and helpful responses to my questions.

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Some Avian Ectoparasites in New England

JAMES E. KEIRANS, Durham, New Hampshire [1]

During the past three years while conducting a survey of the Mallophaga of New England birds, several other ectoparasites were found. All of these were collected in the state of New Hampshire by the author except where noted. The numbers in parentheses represent infested and total birds examined, respectively.

HIPPOBOSCIDAE

Ornithoica vicina (Walker)

This was the most commonly found louse-fly, and the one found in greatest numbers on a single host.

[1] Published with the approval of the Director of the New Hampshire Agricultural Experiment Station as Scientific Contribution No. 388.

Strix varia, 2 ♀ (1–4), Northwood, 11 Oct 65. A. H. Mason, Coll.
Tyrannus tyrannus, a) 1 ♀, b) 1 ♀ (2–7); a) Washington, 20 Aug 64; b) Durham, 24 Aug 64.
Sayornis phoebe, 1 ♂, 1 ♀ (1–22), Durham, 23 Aug 64.
Cyanocitta cristata, 1 ♀ (1–26), Durham, 27 Aug 64.
Turdus migratorius, 1 ♀ (1–27), Duralm, 28 Aug 64.
Passer domesticus, 1 ♀ (1–42), Durham, 18 Aug 65.
Quiscalus quiscula, 3 ♀ (1–33), Durham, 31 Aug 64.
Carpodacus purpureus, a) 9 ♀, b) 1 ♀ (2–18); a) Durham, 28 Aug. 64; b) Hampton, 10 Oct 64.
Melospiza georgiana, 2 ♀ (1–3), Hillsborough, 20 Aug 64.

Ornithomyia fringillina Curtis

Tyrannus tyrannus. a) 3 ♀, 1 ♂, b) 5 ♀ (2–7); a) Washington, 20 Aug 64; b) Durham, 24 Aug 64.
Sayornis phoebe, 1 ♀ (1–22), Durham, 23 Aug 64.
Parus atricapillus, 1 ♂ (1–24), Washington, 20 Aug 64.
Hylocichla guttata, 1 ♀ (1–8), Durham, 21 Sep 64.
Sturnus vulgaris, 1 ♂ (1–53), Durham, 6 Jul 65.
Agelaius phoeniceus, 1 ♀ (1–6), Durham, 31 Aug 64.
Quiscalus quiscula, a) 4 ♀, b) 1 ♀ (2–33); Durham; a) 28 Aug 64; b) 22 Jul 65.
Carpodacus purpureus, 2 ♀ (2–18), Durham, 28 Aug 64.
Passerculus sandwichensis, 1 ♀ (1–5), Madbury, 22 Sep 64.

Ornithoctona fusciventris (Weidmann)

Seiurus aurocapillus, 1 ♀ (1–5), Albany, 4 Aug 64.

This single ♀ *O. fusciventris* represents a new state record for this species of Hippoboscidae, and the Ovenbird is a new host record.

SIPHONAPTERA

Ceratophyllus gallinae (Schrank)

Dendrocopos villosus, 1 ♀ (1–5), Sandwich, 3 Aug 64.
Hylocichla guttata, 1 ♀ (1–8), Bartlett, 23 May 64.
Sturnus vulgaris, 1 ♂, 1 ♀ (1–53), Durham, 20 Nov 63.

Ceratophyllus idius Jordan & Rothschild

Iridoprocne bicolor, 1 ♀ (1–4), Hampton Falls, 10 May 65.

Orchopeas howardii (Baker)

Strix varia, 1 ♀ (1–4), Northwood, 11 Oct 65. A. H. Mason, Coll.
Pheucticus ludovicianus, 1 ♀ (1–4), Augusta, Maine, 19 May 64. A. E. Brower, Coll.

Acarina

Family Ixodidae

Haemaphysalis leporispalustris (Packard)

Bonasa umbellus, a) 1 ♀, b) 1 ♀ (2–9), Durham; a) 28 Oct 63, b) 13 Oct 64.
Phasianus colchicus, 2 ♀ (2–7), Strafford, 5 & 7 Oct 64.
Cyanocitta cristata, 1 ♀ (1–26), Lee, 15 Aug 65.
Dendroica caerulescens, 1 ♀ (1–1), Albany, 29 Jul 64.
Sciurus aurocapillus, 1 ♀ (1–5), Albany, 4 Aug 64.
Quiscalus quiscula, 1 ♀ (1–33), Durham, 31 Aug 64.
Zonotrichia albicollis, 1 ♀ (1–10), Sandwich, 6 May 64.
Melospiza georgiana, 6 ♀ (1–3), Hillsborough, 20 Aug 64.

Haemaphysalis chordelis (Packard)

Aix sponsa, 2 ♀ (1–5), Ossipee, 3 Aug 65. A. H. Mason, Coll.
Bonasa umbellus, 1 ♂ (1–9), Durham, 13 Oct 64.

The collection from *Aix sponsa* appears to be the first record of *H. chordelis* from any member of the Anseriformes.

Neosothes, a New Genus with Three New Species, from the Americas (Coleoptera: Anobiidae)

Richard E. White, Entomology Research Division, Agr. Res. Serv., U. S. Department of Agriculture, Washington, D. C.

The new species described herein, two from Baja California and one from Cuba, are sufficiently distinct from known genera to require a new generic name. This new genus belongs in the subfamily Dorcatominae.

NEOSOTHES gen. nov.

Type-species: *Neosothes bicarinatus* n. sp.

General: Body elongate-oblong; pubescence very fine, appressed, silky, uniform in direction, moderate in density, not obscuring surface sculpture; punctures very fine, dense, those of elytra, side of pronotum, and metasternum indistinctly of 2 sizes.

Head: Front nearly evenly rounded, slightly declivous before clypeus, latter appearing depressed, clypeo-labral suture distinct; eyes entire, moderate in size; antennae 11 segmented, serrate from 4th segment, 1st segment large, oblong, curving, 2nd and 3rd segments small, triangular, 2nd widest apically, 3rd widest near middle (each longer than wide), 4th to 10th segments inclusive produced laterally, about as wide as long, 11th segment oblong, about 2 times as long as wide; last segment of maxillary palpus elongate triangular, broadest before apex, tip pointed; last segment of labial palpus elongate triangular, broadest apically; underside of head not excavate for antennae, shallowly depressed.

Dorsal Surface: Pronotum at posterior half nearly evenly rounded throughout, more gradually rounded to anterior margin; posterior margin somewhat raised before elytral humeri; pronotum at extreme side bordered by a very fine carina, lateral margins sharp and distinctly explanate, anterior angle produced, acute, posterior angle broadly obtuse; scutellum rather large, broadly rounded apically, about as wide as long; elytra with no evidence of striae, humeri distinct.

Ventral Surface: Prosternum short and broad, sharply, longitudinally carinate at center, carina produced posteriorly and rounded, margins before coxae sharply produced ventrally, these at center attaining ventral limit of carina; front coxae transverse, contiguous, completely concealed in repose; mesosternum distinctly hollowed at center, apparently receiving antennae in repose, posterior half nearly vertical; middle coxae flat, distinctly separated, concealed in repose, only trochanter visible in this attitude; metasternum at center broadly, not deeply, longitudinally grooved, groove shallower apically, at apex of groove metasternum produced between hind coxae into a pointed, forked process, this nearly or quite attaining posterior limit of hind coxae, surface of metasternum rather bulging each side of median groove, anterior fourth of metasternum inflexed, transversely grooved, receiving middle tibiae and tarsi in repose, groove bordered anteriorly and posteriorly by a carina, anterior carina curving posteriorly behind middle coxae thus narrowing groove, posterior carina more or less interrupted at center by metasternal groove, inflexed portion at center with a short, sharp, distinct, longitudinal carina, this terminating at posterior transverse carina of inflexed portion; metepisternum narrow, elongate, visible throughout, somewhat broadened at each end; metepimeron not visible; hind coxae separated, widest at sides; 1st, 2nd, and 5th abdominal segments at center subequal in length, 3rd segment short, about 2/3rds length of 2nd, 4th segment shortest, slightly shorter than 3rd, 1st segment not grooved for legs, 1st suture feeble to nearly obsolete at center, more distinct at sides, very broadly, posteriorly arcuate at center, other sutures distinct throughout, faintly arcuate posteriorly.

Neosothes is most similar to the largely Palearctic genus *Mesothes* Mulsant and Rey (1864, p. 311). I have seen an individual of *Mesothes ferrugineus* (Mulsant and Rey), the type-species of *Mesothes* by monotype. The differences from *Neosothes* shown by the above specimen are as follows, the parenthetical notations referring to the contrasting condition in *Neosothes:* The anterior median longitudinal carina of the metasternum crosses the posterior transverse ridge delimiting the inflexed portion of the metasternum and extends posteriorly into the median longitudinal metasternal groove (this carina terminates at the posterior transverse ridge); the 1st abdominal segment is very short and nearly concealed by the legs in repose (not short and only partly concealed by the legs in repose); each elytron bears a lateral stria (no lateral stria); lateral margins of pronotum sharp but not explanate (lateral margins of pronotum sharp and distinctly explanate); prosternal intercoxal piece consisting of produced posterior margin (prosternal intercoxal piece an extention of median carina); metepimeron visible (metepimeron not visible); 1st abdominal suture rather weak, following sutures successively more distinct, all more distinct laterally (1st abdominal suture weak at center only, following sutures distinct throughout). The description and illustrations of *M. tenuibrachium* Scott agree with the first three of the above characters and do not cover the other characters. The descriptions of *M. sydowi* Reitter and *M. granulatus* Pic (though offering little else of value) mention a stria on the elytra.

In addition to the 3 species described below I have seen 2 additional species; one (from Puerto Rico) clearly belongs to this genus, but the only specimen is in too poor a condition to describe, and the other (a single specimen from Mexico) exhibits certain differences that do not warrant its inclusion in *Neosothes* at this time.

Neosothes bicarinatus n. sp. (Figs. 1, 3)

General: Body 1.9 to 2.1 times as long as wide; pubescence very fine, with a silvery luster; reddish brown to dark brown, color not uniform throughout; elytra (except apex) and abdomen usually darkest, appendages lightest, yellowish to reddish brown, scutellum at center nearly orange; punctures of dorsal surface very fine, dense, those of elytra and at side of pronotum indistinctly of 2 sizes, both elytra and pronotum quite shiny.

Head: Eyes separated by 1.4 to 2.0 times their vertical diameter; antennae as given for genus; last segment of maxillary palpi a little over 2 times as long as wide, lateral margins rather sinuate, last segment of labial palpi nearly 2 times as long as wide.

Dorsal Surface: Pronotum at extreme side flat to somewhat concave; small punctures at side very fine and dense, indistinct larger punctures often with anterior margins raised and producing a finely granulate appearance; small punctures of elytra very fine, dense, larger punctures rather indistinct, sparser apically, imparting a faintly granulate appearance, these stronger than on pronotum.

Ventral Surface: Metasternum finely, densely punctate, appearing vaguely granulate, punctures indistinctly of 2 sizes, longitudinal groove at center with sides nearly flat, bordered each side at anterior 2/3rds by a carina continuous with that which delimits anterior, inflexed portion of metasternum, carinae of median metasternal groove gradually weaker posteriorly, metasternal groove separated from anterior inflexed portion by a fine, distinct carina, this not continuous with transverse carina of each side of metasternum, metasternum at center terminating apically between hind coxae into a forked process, tips of process not attaining posterior limit of coxae; 1st abdominal suture weak to nearly obliterated at center, more distinct at sides, other sutures distinct throughtout.

Length: 2.0–2.8 mm.

This species is described from 5 individuals taken at a light trap 25 miles west of La Paz, BAJA CALIFORNIA, by K. W. Radford and F. G. Werner. The holotype and 3 paratypes were collected on August 30, 1959; these are in the California Academy of Sciences collection. One paratype was collected on September 4, 1959, and is in the U. S. National Museum collection.

No reliable external characters were discovered for distinguishing the sexes. The variation in eye size may be a secondary sex character, for, in many anobiids, the males have larger eyes than do the females. The holotype is one of the specimens with large eyes.

The specific name refers to the carinae bordering the longitudinal metasternal groove.

Neosothes testaceus n. sp. (Fig. 2)

General: Body 1.6 to 2.0 times as long as wide; pubescence very fine, with a faintly silver luster; dull yellowish brown to dull reddish brown, appendages lighter, most body margins darker, especially sides of pronotum, punctures of dorsal surface very fine, dense, those of elytra and sides of pronotum very indistinctly of 2 sizes; both elytra and pronotum quite shiny.

Head: Eyes separated by 2.0 to 2.4 times their vertical diameter; antennae as given for genus; last segment of maxillary palpus elongate, pointed, widest near middle, nearly 3 times as long as wide; last segment of labial palpus elongate triangular, widest at apex, about 2 times as long as wide.

Dorsal Surface: Pronotum at extreme side flat or somewhat concave; large punctures at side of pronotum vague, anterior margins somewhat raised thus imparting a finely granulate appearance, larger elytral punctures as vague as large punctures of pronotum, anterior margins just perceptibly raised.

Ventral Surface: Metasternum finely, densely punctate, appearing finely granulate, punctures indistinctly of 2 sizes; longitudinal groove at center with side margins evenly rounded and not carinate, transverse carina separating median groove and inflexed portion of metasternum continuous to sides of metasternum, metasternum apically at center terminating between hind coxae in a forked process, tips of process nearly attaining posterior limit of hind coxae; 1st abdominal suture nearly obliterated at center, more distinct at sides, other sutures distinct throughout.

Length: 1.8 to 2.4 mm.

The holotype (in California Academy of Sciences collection) and 2 paratypes (1 in CAS, 1 in USNM) bear the following data: 22mi. N.W. of Penjamo, BAJA CALIFORNIA, August 29, 1959, light trap, K. W. Radford and F. G. Werner. The sex of the types is not known. The specimen with the largest eyes has been selected as the holotype.

The specific name is in reference to the yellowish brown color typical of this species.

Neosothes granulatus n. sp.

General: Body 2.0 times as long as wide; light reddish brown, elytral apex lighter, abdomen a little darker than remainder; punctures of pronotum and elytra fine and very dense, very indistinctly of 2 sizes; elytra moderately shiny, pronotum noticeably less shiny; pubescence very fine, with a faintly yellowish luster.

Head: Eyes separated by 1.7 times their vertical diameter; antennae as given for genus; last segment of maxillary palpus pointed, widest near middle, about 2 times as long as wide; last segment of labial palpus triangular, widest at apex, about 1.5 times as long as wide.

Dorsal Surface: Pronotum at extreme side flat; punctures at side of pronotum fine and very dense, rather strongly impressed, imparting a finely granulate appearance; punctures of elytra very strongly impressed and imparting a finely granulate appearance.

Ventral Surface: Metasternum finely, densely punctate, appearing finely granulate, punctures indistinctly of 2 sizes; longitudinal groove at center of metasternum bordered each side by a distinct carina, this continuous with transverse carina delimiting inflexed portion of metasternum, carinae of median groove a little weaker apically, distinct nearly to forked process of metasternum, tips of process nearly attaining posterior limit of hind coxae, transverse carina that limits median groove anteriorly not continuous with transverse carinae delimiting inflexed portion; 1st abdominal suture nearly obliterated at center, more distinct laterally, other sutures distinct throughout.

Length: 2.0 mm.

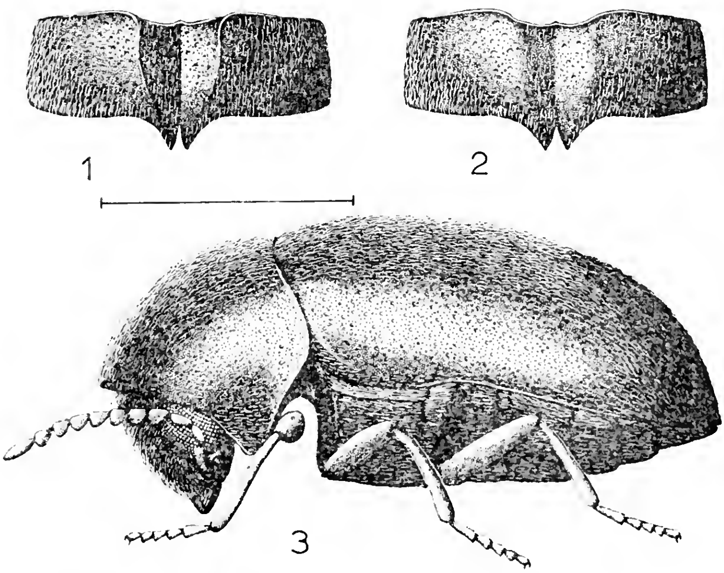
This species is described from a single individual of unknown sex (type number 68928 in USNM) with the following data: Caney, Cuba, VI–18–50, C.S.–688, 50–9728, *Mangifera indica*.

The specific name refers to the finely granulate appearance of the pronotum and elytra, the granulations being more distinct than in the other 2 species.

Key to the American Species of Neosothes

1. Median longitudinal groove of metasternum with lateral margins evenly rounded, not carinate (Fig. 2) .... **testaceus**, n. sp.
   Median longitudinal groove of metasternum with lateral margins carinate (Fig. 1) 2
2. Pronotum noticeably less shiny than elytra; longitudinal metasternal carinae distinct nearly to terminal metasternal process; Cuba .... **granulatus**, n. sp.
   Pronotum about as shiny as elytra; longitudinal metasternal carinae feeble to obsolete before terminal metasternal process; Baja California... **bicarinatus**, n. sp.

Thanks are due to H. B. Leech for the loan of specimens.



Neosothes. Fig. 1, Metasternum of *N. bicarinatus*, n. sp., anterior inflexed portion not shown. Fig. 2, Metasternum of *N. testaceus*, n. sp., anterior inflexed portion not shown. Fig. 3, Lateral view of *N. bicarinatus* n. sp. Line equals 1 mm.

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Insects from McConnell River, N.W.T.

WILLIAM W. JUDD, Department of Zoology, University of Western Ontario, London, Ontario

In 1964, Mrs. C. D. MacInnes, Department of Botany, University of Western Ontario, collected insects at the mouth of the McConnell River, 60° 50′N, 94° 25′W, emptying into Hudson Bay. They have been identified by the following taxonomists (ERI refers to the Entomological Research Institute, Department of Agriculture, Ottawa): C. P. Alexander, Amherst, Mass. (Tipulidae), G. E. Ball, University of Alberta, Edmonton (Carabidae), W. J. Brown, ERI (Silphidae, Dytiscidae, Curculionidae), J. G. Chillcott, ERI (Muscidae, Ephydridae, Empidae), R. C. Graves, Flint Community Junior College, Flint, Michigan (Cicindelidae), D. F. Hardwick, ERI (Noctuidae), G. Lewis, ERI (Satyridae, Pieridae, Olethreutidae), W. C. McGuffin, ERI (Geometridae), H. E. Milliron, ERI (Hymenoptera), E. G. Munroe, ERI (Pyralidae), L. L. Pechuman, Cornell University, Ithaca (Tabanidae), W. E. Ricker, Fisheries Research Board, Nanaimo, B. C. (Plecoptera), J. R. Vockeroth, ERI (Scatophagidae, Culicidae, Dolichopodidae), G. B. Wiggins, Royal Ontario Museum, Toronto (Tricoptera). The writer identified other butterflies with Klots (1951) and Calliphoridae with Hall (1947). All specimens are deposited in the Department of Zoology, University of Western Ontario, except some noted as "kept" in the institutions in which they were identified.

Plecoptera, Perlodidae

Arcynopteryx compacta McLachlan—3 ♂♂, 1 ♀, July 5. This is a typically Eurasian species but has been reported from Alaska and N.W.T. (Ricker, 1964).

Coleoptera

Carabidae

Amara (*Cyrtonotus*) *alpina* Paykull—3 beetles, June 10.
Pterostichus (*Lyperopherus*) *punctatissimus* Randall—1 beetle, July 5.
Pterostichus (*Steroccrus*) *haematopus* Dejean—1 beetle, July 5.

Reported previously from Labrador (Fall, 1919a) and N.W.T. (Lindroth, 1955).

Cicindelidae

Elaphrus (?*americanus* Dej.)—2 beetles, July 2. Dr. Graves reported (*in litt.*) that this species and *riparius* can be distinguished reliably only by study of male genitalia.

Dytiscidae

Agabus moestus (Curtis)—1 beetle, July 1.

Silphidae

Silpha lapponica Hbst.—2 beetles, June 21, 30. This species was also collected by the Canadian Arctic Expedition and occurs in Alaska and elsewhere in N.W.T. (Fall, 1919b).

Curculionidae

Lepyrus stefanssoni (Leng)—2 weevils (1 kept), July 5. This species was described from specimens collected by the Canadian Arctic Expedition in N.W.T. (Leng, 1919).
Lepyrus sp.—1 weevil, July 1.

TRICHOPTERA, Leptoceridae

Athripsodes nigronervosus Retzius—6 caddis flies (kept), July 12. Dr. Wiggins commented (*in litt.*) that this is primarily a species of Europe and Asia and that there are records from only two other localities in North America.

LEPIDOPTERA

Geometridae

Xanthorhoe baffinensis McD.—1 moth, July 5.
Hydria undulata L.—1 moth, July 5.
Rheumaptera hastata L.—1 ♂ (kept), July 15; 3 ♀♀, July 5.
Aspilates o. orciferaria Wlk.—2 moths, July 15.

Pyralidae

Orenaia coloradalis B. and McD.—1 moth kept), July 15.

Noctuidae

Peridroma saucia Hbn.—1 moth, July 15.

Olethreutidae

Olethreutes tessellana Pack.—1 moth, July 15.

Satyridae

Oeneis polixenes Fabr.—2 butterflies (1 kept), July 15.
Erebia rossii Curtis—6 butterflies (1 kept), July 5, 15.

Nymphalidae

Euptoicta claudia Cramer—1 butterfly, July 5.
Boloria frigga saga Staudinger—1 butterfly, July 15.
Boloria polaris Biosduval—7 butterflies, July 2, 5.

Lycaenidae

Plebeius aquilo Boisduval—1 butterfly, July 15.

Pieridae

Colias hecla Lefebre—1 butterfly, July 15.
Colias boothii Curtis—3 butterflies (1 kept), July 5.

Most of the moths and butterflies recorded were also collected by the Canadian Arctic Expedition (Gibson, 1920) and have been reported from localities in N.W.T. at the west of Hudson Bay (Ehrlich, 1958; Freeman, 1958). Klots (1951) reports that the range of *Euptoieta claudia* is "eastern United States, uncommon or rare north of Virginia, Illinois, and Minnesota." In looking for an explanation of the occurrence of this species so far north of its usual range, an inquiry was made of the Meteorological Service of Canada to see if a southerly flow of wind had occurred previous to the date of capture. Mr. J. R. H. Noble of that organization advised (*in litt.*) that "We have examined the Surface Weather Maps for the period June to July 5, 1964, and can no strong southerly flow over the eastern and central parts of North America." Thus the cause of the presence of this insect at McConnell River remains problematical, but it was most likely a stray from elsewhere.

DIPTERA

Tipulidae

Prionocera (near *sordida* (Loew)—1 female, July 1.
Tipula (*Vestiplex*) (near *arctica* Curtis)—1 female, July 15.

Dr. Alexander commented (*in litt.*) that only males can be identified to species.

Culicidae

Aedes nigripes (Zett.)—3 females, July 1, 12. Jenkins (1958) reports that this mosquito is characteristic of tundra and gives records of its occurrence along the west shore of Hudson Bay.

Dolichopodidae

Campsicnemus vanduzeei Cn.—1 male, June 7.
Hydrophorus innotatus Lw.—1 fly, June 9.
Hydrophorus sp.—1 fly, June 7.

Empidae

Rhamphomyia (Ctenempis) sp.—2 flies, July 12.

Tabanidae

Hybomitra frontalis (Walker)—3 horse flies (1 kept), July 12.

Ephydridae

Scatella stagnalis Fall.—1 female, June 7.
Scatella sibilans Hal.—1 female, June 9.

Scatophagidae

Scatophaga furcata (Say)—6 males, June 20.
Scatophaga intermedia Walk.—1 female, July 12.

Muscidae

Fucellia pictipennis Becker—3 females, June 7.
Lispe canadensis Snyder—1 male, June 7.
Bebryx chillcotti Huckett—1 male, July 12.

Huckett (1965) records these three species from N.W.T. *B. chillcotti* being described from specimens from that region.

Calliphoridae

Cynomyopsis cadaverina (R.-D.)—1 male, June 7; 4 females, June 7, 9. This bowfly has previously been recorded from as far north as Ungava Bay (Hall, 1947).

Hymenoptera, Apidae

Bombus sylvicola Kirby—2 bees, June 21, 30. This species was also collected by the Canadian Arctic Expedition in Alaska, Yukon and N.W.T. (Sladen, 1919).

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Nomenclature Notice

Possible use of plenary powers by the Commission is announced for the following names, listed with case number in parenthesis. ORTHOPTERA: (1761) Type species for *Patanga* Uvarov, 1923; neotypes for *Acridium assectator* Fischer von Waldheim, 1833, and *Gryllus succinctus* Linnaeus, 1763. COLEOPTERA: (1763) Type species for *Proteinus* Latreille, 1796. DIPTERA: (1764) Suppression of *Musca lateralis* Linnaeus, 1758. LEPIDOPTERA: (1768) Type species for *Thrix* Doherty, 1891. ARANEAE: (1770) Suppression of *Attus obscurus* Taczanowski, 1872. (1771) Type species for *Hypaeus* Simon, 1900.

Send comments with case number in duplicate to International Commission on Zoological Nomenclature, c/o British Museum (N.H.), Cromwell Road, London S. W. 7, England. (See *Bull. zool. Nomencl.* 23, pt. 5, 20 Dec. 1966.)

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Insects

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ENTOMOLOGICAL NEWS

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Eugene Pilate (1804–1890) *

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

An Ohio naturalist-entomologist who is not mentioned in Osborn's (1937, 1946) compendium is Dr. Eugene Pilate; and his son George, who published upon Ohio lepidoptera, is likewise omitted. Dr. Pilate led a long and exciting life. He was born in Tourcoing, France, on February 12, 1804. His education was started at Lille and completed at the University of Paris where he was granted the degree of Doctor of Medicine. Pilate was a supporter of Charles, and when Louis Phillipe was enthroned he was forced to flee for his life. In that year, 1833, he took refuge in England, the home of his wife, and in the same year the young couple sailed for America. The Pilates appear to have had the wanderlust. They settled in New York where the doctor practiced medicine for two years. After the stint in New York, the Pilates moved to Alabama where Mrs. Pilate established a girls' school while her husband practiced.

When Texas revolted against Mexico, Pilate hastened to join the revolutionists. He was appointed surgeon on General Houston's staff. After the establishment of the Republic of Texas the doctor settled in Galveston. He soon tired of civilized life and traveled westward into the new country where he became a trader and physician to the Indians. In 1852 the family revisited France, possibly to settle the affairs of Louis Pilate (1816–1852)—a younger brother?—an outstanding French entomologist. Two of Eugene Pilate's sons then remained in France but his youngest, George, returned with the family to

* This study is an outcome of N.S.F. Grant GS-969.

settle in Opelousa, Louisiana. Once again settled and in practice, Dr. Pilate set about writing and illustrating a natural history of Louisiana. This master work was all but completed when the Civil War broke out. During hositilities a raiding party set fire to the Pilate home and destroyed the extensive collections, library and manuscripts it contained. When peace returned to the land, Pilate could not face the misery that had descended upon his beloved South. He moved to Dayton, Ohio. in 1866 and took up residence at 14 Wilkerson Street.

Once settled in the new environment Dr. Pilate turned his spare time to studying the natural history of the area, particularly the birds and insects. Now 62 years old, he felt too old to start any major project. Instead he divided his time between the practice of medicine and surgery, and teaching and encouraging George and his friends in the art of natural history. It was this latter that brought him in touch with Herman Strecker, of Reading, Pennsylvania, as a supplier of natural history materials. The Pilates gathered a fine collection of birds and insects from the vicinity of Dayton. The remains of this is to be found in the Dayton Museum of Natural History. George Pilate published a "List of the Lepidoptera taken in and around Dayton, O." in *Papilio* for May 1872 (2: 65–71) in which he enumerated 463 species of which 72 are butterflies and the rest moths.

Sometime in the 1880's George left Dayton and returned to Opelousa. There he lived until the early 1890's. He returned to Dayton and as late as 1897 resided at 127 Commercial Street.

The Pilate correspondence with Strecker extended from 1873 to 1883, during which time about 125 letters accumulated in Strecker's files. In the late 1890's George Pilate added a few when Strecker re-opened the correspondence and tried to purchase Eugene Pilate's collection. By that time it had been given to the Dayton Public Library from whence at a later date it was transferred to the Museum. These letters have been the primary source for the above information. They are now being studied at the Museum along with the material from the Pilate collection.

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An article in "The History of the Montgomery County Medical Society," pp. 34–35, sent me by Mr. G. R. Shields, Head of the Social Science Division, Dayton & Montgomery Public Library, for which I have no date of publication or author's name.

New Species of Erythroneura (Homoptera: Cicadellidae) *

LEON W. HEPNER, Mississippi State University

The species described here all belong to the *Eratoneura* subgenus or *maculata* group. In most of them the posterior point on the foot of the style is about as long or longer than the foot and they are related to *gemina* McAtee, *mirifica* Beamer, *arta* Beamer, *penesica* Beamer and *solita* Beamer. The principal diagnostic characters are seen in the lateral and posterior views of the shaft of the aedeagus, the length and shape of the pygofer hook, the shape of the foot of the style, the size of the black spot in the first apical cell, and the host plants. The drawings of the posterior views of the shaft of the aedeagus often show this part slightly tilted ventrally so as to depict the greatest length of the shaft.

Many named and unnamed species were reared in Mississippi and Tennessee during the years 1961 to 1964 and many were taken on host plants on collecting trips from 1961 to 1964. Other specimens were borrowed from the Illinois Natural History Survey and Florida State Plant Board collections.

In the drawings, the aedeagi and styles are double the magnification of the pygofers and pygofer hooks. Unless otherwise stated, all specimens were collected by the author and types will be deposited in the Illinois Natural History Survey collections.

* Supported by National Science Foundation Grant No. 23575.

Erythroneura douglasi new species (Fig. 1)

Length 2.6 mm; color pattern of elongate spots and black spot in first apical cell smaller than average. Shaft of aedeagus in lateral view long and narrow, in posterior view with very narrow lateral flanges; dorsal process about half length of shaft. Pygofer hook much longer than pygofer, in lateral view slightly curved and evenly broadened from apex to base; in dorsal view slightly sinuate, gradually broadened on basal half. Foot of style with short anterior point, posterior point curved, much longer than foot.

Holotype ♂, allotype ♀ and 4 ♂ and 7 ♀ paratypes reared at State College, Mississippi, in cage 496 on *Quercus marilandica,* blackjack oak, collected on 13 July, 1964, and 3 ♂ and 2 ♀ paratypes with the same data except collected on 16 June and 1 Aug., 1964.

This species differs from *gemina* in having a much smaller black spot in first apical cell, a much longer pygofer hook and a more strongly curved posterior point on foot of style. The host plant is evidently blackjack oak.

Erythroneura nigriquera new species (Fig. 2)

Length 2.6 mm; color pattern of narrowly connected large spots and with black spots in first apical cell smaller than average. Shaft of aedeagus in lateral view broader on basal half, in posterior view with very narrow lateral flanges; dorsal process more than half length of shaft. Pygofer hook slightly longer than pygofer, in lateral view evenly curved and gradually broadened from apex to base, sculptured on outer half; in dorsal view almost straight, broadened on basal third. Foot of style narrow, posterior point longer than foot, sculptured, curved.

Holotype ♂, allotype ♀ and 3 ♂ and 2 ♀ paratypes, reared on *Quercus nigra,* water oak, at State College, Mississippi, in cage 283, collected on 4 Aug., 1964 and 7 other pairs of paratypes with same data except collected on 8 July and 11 June, 1964. Additional paratypes consisting of 6 ♂ and 15 ♀ with same data as holotype except reared in cage 402 and collected

24 June, 1964, and 1 ♂, Quincy, Florida, 31 July, 1956, F. W. Mead, on *Quercus nigra.*

This species resembles *gemina* but with a longer pygofer hook and broader aedeagus shaft on basal half. The host plant is evidently *Quercus nigra.*

Erythroneura lyriquera new species (Fig. 3)

Length 2.8 mm; spotted, with black spot in first apical cell larger than average. Shaft of aedeagus in lateral view with narrow, roughened dorsal flange along most of posterior margin, in posterior view with narrow lateral flanges; dorsal process about half length of shaft. Pygofer hook about length of pygofer, narrow and only slightly curved in both views. Foot of style with distinct anterior point and with long, sculptured, sinuate posterior point longer than foot.

Holotype ♂, allotype ♀ and 12 ♂ and 19 ♀ paratypes, reared at State College, Mississippi, in cage 308 on *Quercus lyrata,* overcup oak, collected 2 July, 1964 and 7 pairs with same data except collected on 28 July and 6 Aug., 1964. Additional paratypes, 30 pairs, with data as above except reared in cages 311 and 312 in July and Aug., 1964.

This species resembles *gemina* but with larger spot in first apical cell, longer, sinuate posterior point on foot of style and roughened dorsal flange along most of posterior margin of shaft of aedeagus. The host plant is evidently *Quercus lyrata.*

Erythroneura reedi new species (Fig. 4)

Length 2.6 mm; spotted, with spot in first apical cell larger than average. Shaft of aedeagus in lateral view short, sinuate on posterior margin, broadest at base, in posterior view with narrow lateral flanges along most of shaft; dorsal process about half length of shaft. Pygofer hook about length of pygofer, almost straight in both views, sculptured on outer third. Foot of style with posterior point somewhat longer than foot, evenly curved for most its length, heel larger than most.

Holotype ♂, allotype ♀ and 15 ♂ and 7 ♀ paratypes reared at State College, Mississippi, in cage 463 on *Quercus falcata* var. *leucophyla,* cherry bark oak, and collected 19 July and 14 Aug., 1963 and 11 ♂ and 5 ♀ with the same data except reared in cage 266 and collected on 8 July, 1964.

This species differs from *gemina* in having a much shorter aedeagus shaft and from *gemoides* Ross in having shorter pygofer hooks and longer posterior point on foot of style.

Erythroneura nielsoni new species (Fig. 5)

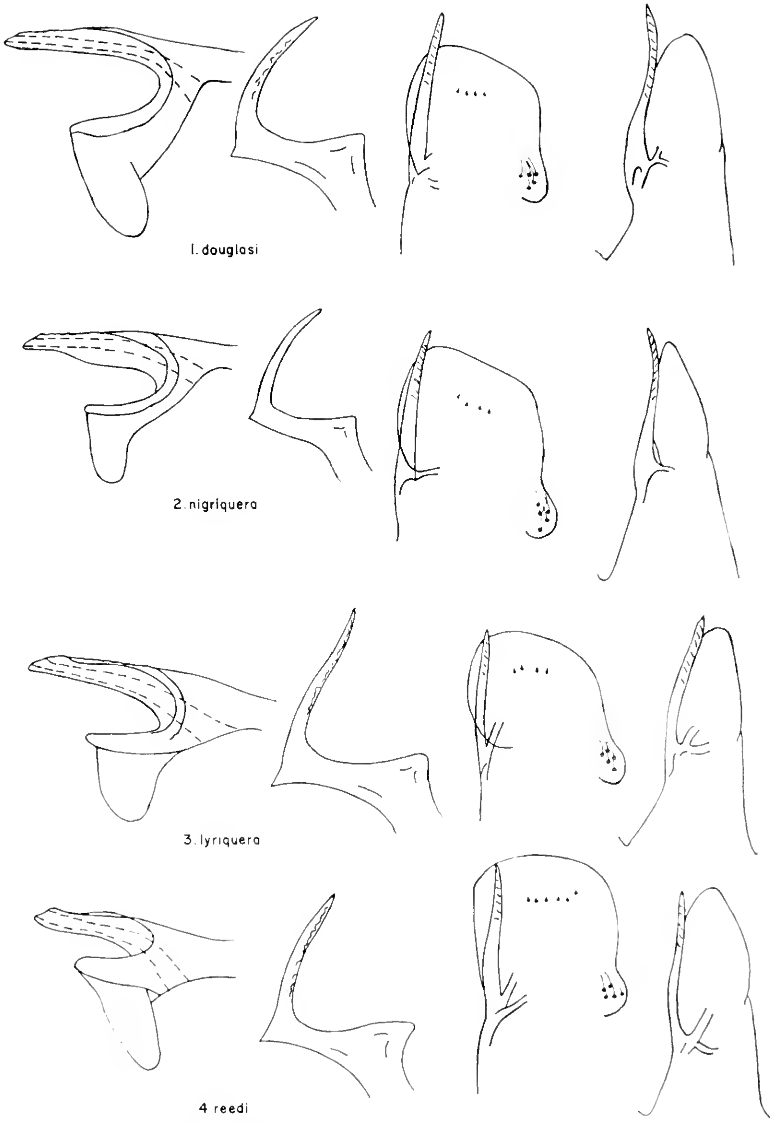
Length 3 mm; color pattern of large elongate spots and black spot in first apical cell larger than average. Shaft of aedeagus in lateral view long, broad and parallel margined, in dorsal view with lateral flanges distinct only at base; dorsal process short, spine-like, with short apodeme almost opposite base of shaft. Pygofer hook barely over half length of pygofer, broad, blade-like and slightly curved in lateral view, sinuate in dorsal view. Foot of style with long, slightly curved posterior point, foot quite narrow before large heel.

Holotype ♂, allotype ♀ and 14 ♂ and 18 ♀ paratypes reared at State College, Mississippi, in cage 214 on *Quercus lyrata,* overcup oak, collected on 19 Aug., 1964. One additional paratype, Cave-in-Rock, Illinois, 1 Sept., 1963, *Carya ovata,* shagbark hickory.

This species resembles *mirifica* but with larger black spot in first apical cell and with smaller lateral flanges. The host plant is evidently *Quercus lyrata.*

Erythroneura albiquera new species (Fig. 6)

Length 3 mm; color pattern of large spots and black spot in first apical cell smaller than average. Shaft of aedeagus in lateral view curved on anterior margin, broadest on basal half, in posterior view with medium lateral flanges; dorsal process about half length of shaft, apodeme subapical. Pygofer hook about length of pygofer, narrow in both views. Foot of style slender with narrow, sinuate posterior point almost twice length of foot and heel very large and broad.



FIGS. 1–4. *Erythroneura* species indicated, left to right: lateral view of aedeagus, foot of style, lateral view of pygofer and pygofer hook and dorsal view of pygofer and pygofer hook. (Aedeagus and foot of style 2 × magnification of pygofer and pygofer hook.)

Holotype ♂ and 7 ♂ paratypes, State College, Mississippi, 17 March, 1962. Additional ♂ paratypes as follows: State College, Mississippi, 1, 25 Jan., 1962, 1, 4 Mar., 1962, 1, 4 April, 1962, 1, 10 April, 1962, *Ilex decidua;* 1, Eupora, Mississippi, 9 July, 1961, *Quercus alba,* white oak.

Somewhat resembles *mirifica* but with longer posterior point on foot of style and longer pygofer hook, and differs from *igella* Ross and DeLong in having a shorter aedeagus shaft with larger lateral flanges. *Q. alba* may well be the host.

Erythroneura kirki new species (Fig. 7)

Length 3 mm; with slender markings and black spot in first apical cell average size. Shaft of aedeagus in lateral view short and broad with a distinct dorsal flange, in posterior view with lateral flanges only on basal half; dorsal process short. Pygofer hook much shorter than pygofer, slender, sinuate in both views. Foot of style with slender posterior point longer than foot.

Holotype ♂, State College, Mississippi, 6 Oct., 1961, *Quercus stellata,* post oak.

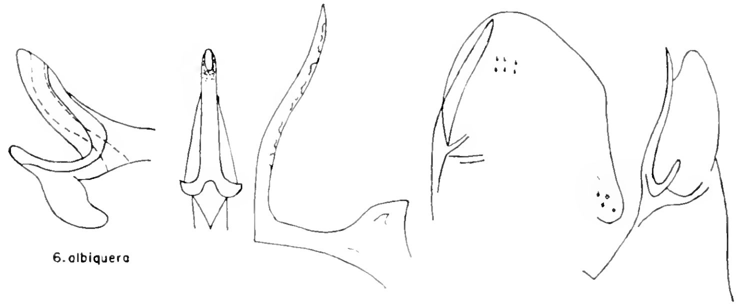
Resembles *parva* Beamer, but with broader aedeagus shaft in lateral view and with longer dorsal process on aedeagus. *Q. stellata* may be the host.

Erythroneura cavipierra new species (Fig. 8)

Length 2.8 mm; color pattern of large spots and black spot in first apical cell average size. Shaft of aedeagus in lateral view almost parallel margined, smooth, in posterior view rough on apical half with medium lateral flanges on basal half; dorsal process about one-third length of shaft. Pygofer hook short, almost straight in both views, broadest in lateral view. Foot of style long and slender, posterior point straight, almost as long as foot.

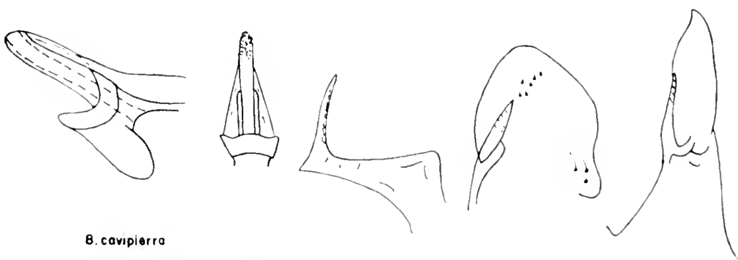
Holotype ♂ and 2 ♂ paratypes, Jefferson, Texas, 3 July, 1962, at light, and 2 other ♂ paratypes, same data except collected by Leon W. Hepner, Jr. One other ♂ paratype, Cave-in-Rock, Illinois, 1 Sept., 1963, *Quercus stellata,* post oak.

5 neilsoni



6. albiquera

7. kirki



8. cavipierra

FIGS. 5–8. *Erythroneura* species indicated, left to right: lateral view of aedeagus, posterior view of aedeagus, foot of style, lateral view of pygofer and pygofer hook and dorsal view of pygofer and pygofer hook. (Aedeagus and foot of style 2 × magnification of pygofer and pygofer hook.)

This species most nearly resembles *abjecta* Beamer but with dorsal process not spine-like, shorter pygofer hook and with narrower lateral flanges.

Erythroneura stannardi new species (Fig. 9)

Length 3 mm; color pattern and black spot in first apical cell average size. Shaft of aedeagus in lateral view short and broad with very large dorsal flange, in posterior view spiny and without lateral flanges; dorsal process very short. Pygofer hook in lateral view slightly longer than pygofer, bladelike, broadest on outer half, in dorsal view slightly sinuate, broadest on basal half. Foot of style short, heel large, posterior point much longer than foot.

Holotype ♂, allotype ♀ and one ♀ paratype reared at State College, MISSISSIPPI, in cage 604 and collected on 6 Sept., 1962. The ♀ parent was collected at Houston, Mississippi, on *Q. coccinea*, scarlet oak, and the offspring reared on *Q. palustris*, pin oak. Additional ♂ paratypes as follows: 2, Houston, Mississippi, 15 Oct., 1961, *Quercus coccinea;* 1, Iuka, Mississippi, 5 Aug., 1961, *Quercus rubrum*, northern red oak; 6, Siloam Springs, Brown Co., Illinois, 29 Apr., 1960, Ross and Cunningham; 4, Rushville, Illinois, 29 Apr., 1960, Ross and Cunningham; 2, Thornton, Illinois, 7 Sept., 1949, Ross and Stannard, 1, *Corylus americana* and 1, *Q. ellipsoidea;* 1, Rocky Branch, Illinois, 25 July, 1954, H. B. Cunningham; 1, Rocky Branch, Illinois, 13 May, 1949, Ross, Gloyd and Stannard.

The shaft of the aedeagus most nearly resembles *acantha*, but that species has no posterior point on foot of style. It may well utilize several of the red oaks as hosts.

Erythroneura rubrarta new species (Fig. 10)

Length 3 mm; with broad red band across middle of clavus extending through corium to costal plate and a second red band from apex of clavus to costal margin, black spot in first apical cell average size.

Shaft of aedeagus in lateral view long and narrow, apically "beaked," with large, thin dorsal flange, in posterior view with large membranous lateral flanges; dorsal process about half length of shaft. Pygofer hook longer than pygofer, roughened, doubly sinuate in lateral view, in dorsal view curved, broadest on basal half. Foot of style pointed obliquely outward, slender with broad, sculptured posterior point.

Holotype ♂, State College, MISSISSIPPI, 15 March, 1963.

This species most nearly resembles *arta* but with pygofer hook differing in shape and with red bands on wings. The host plant is unknown.

Erythroneura krameri new species (Fig. 11)

Length 3 mm; color pattern of broad markings and black spot in first apical cell very large. Shaft of aedeagus in lateral view almost parallel margined, roughened on posterior margin, in posterior view with narrow flanges toothed on apical half; dorsal process very short. Pygofer hook shorter than pygofer, slightly falcate in both views. Foot of style slender with curved posterior points almost length of foot.

Holotype ♂ and 1 ♂ paratype, State College, MISSISSIPPI, 11 Sept., 1963. Additional ♂ paratypes as follows: State College, Mississippi, 2, 29 March, 1963, *Ilex decidua,* 1, 24 May, 1963, *Carya tomentosa,* 1, 21 Aug., 1963, *C. tomentosa;* 1, Murray, Kentucky, 3 Sept., 1963, *Carya tomentosa;* 1, Lexington, Tennessee, 4 Sept., 1963, *Quercus phellos;* 1, Giant City State Park, Illinois, 14 Sept., 1954, Mills and Ross; 1, Cobden, Illinois, 8 Feb., 1957, Ross and Kramer.

This species is near *penesica* but has a thicker shaft of aedeagus with much wider lateral flanges. The host plant is evidently *Carya tomentosa*, mockernut hickory.

Erythroneura pamelae new species (Fig. 12)

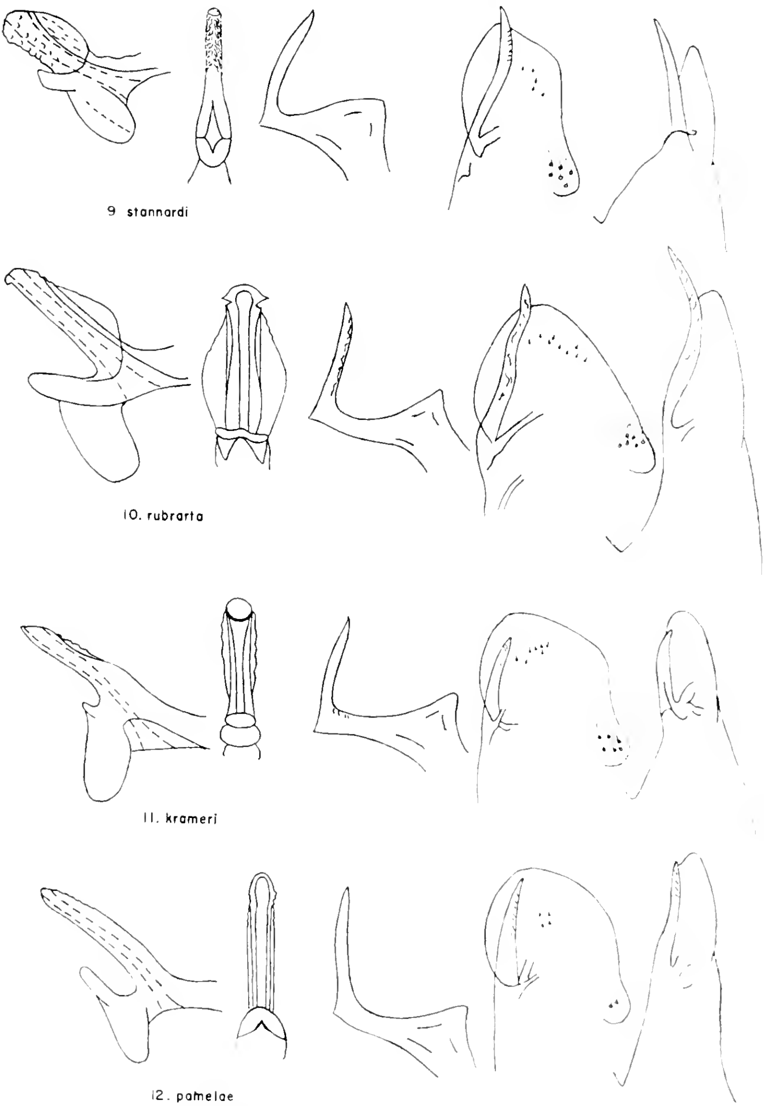
Length 3 mm; color pattern darkening posteriorly and black spot in first apical cell average size. Shaft of aedeagus in lateral view slender, almost parallel margined with narrow, roughened dorsal flange, in posterior view broad with narrow lateral flanges, irregularly margined on outer half; dorsal process almost half length of shaft, apodeme subapical. Pygofer hook about length of pygofer, evenly broadened from apex to base, slightly falcate in lateral view and slightly sinuate in dorsal view. Foot of style slender with broad posterior points about length of foot.

Holotype ♂, allotype ♀ and 28 ♂ and 32 ♀ paratypes reared at State College, MISSISSIPPI, in cage 263 on *Quercus falcata* var. *leucophyla*, cherry bark oak, collected on 8 July, 1964 and 4 ♂ and 2 ♀ with same data except collected on 10 June and 4 Aug., 1964, and 20 pairs with same data as above except reared in cage 421 and collected on 15 June, 9 July and 30 July, 1964. Other ♂ paratypes as follows: 1, Norris City, Illinois, 13 April, 1960, Ross and Cunningham; 1, Ava, Illinois, 30 June, 1953, Ross and Moore, *Fagus;* 1, Elizabethtown, Illinois, 2 Sept., 1963, *Q. falcata;* 1, Athens, Arkansas, 28 July, 1963, *Fagus;* 1, Timothy, Tennessee, 1 Sept., 1963, *Fagus;* 1, Etawah, Tennessee, 28 Aug., 1963, *Caryi tomentosa;* 1, Florida Caverns State Park, Florida, 7 Oct., 1960, F. W. Mead.

This species somewhat resembles *penesica* but with longer dorsal process and narrower lateral flanges on shaft of aedeagus. Although cherry bark oak is a definite host, the large number of specimens collected on beech suggests there are either two species involved or the species utilizes both hosts.

Erythroneura priniquera new species (Fig. 13)

Length 3 mm; faintly spotted and with black spot in first apical cell average size. Shaft of aedeagus in lateral view slender and with narrow dorsal flange, in dorsal view with broad lateral flanges from near apex to base; dorsal process about one-third length of shaft. Pygofer hook shorter than pygofer, broad and bladelike in lateral view, narrow in dorsal view. Foot of style long and slender, posterior point straight and slightly shorter than foot.



FIGS. 9–12. *Erythroneura* species indicated, left to right: lateral view of aedeagus, posterior view of aedeagus, foot of style, lateral view of pygofer and pygofer hook and dorsal view of pygofer and pygofer hook. (Aedeagus and foot of style 2 × magnification of pygofer and pygofer hook.)

Holotype ♂, allotype ♀ and one pair of paratypes reared at State College, Mississippi, in cage 63 on *Quercus prinus*, chestnut oak, collected on 8 July, 1962 and 20 ♀ paratypes with same data as above except reared in cage 68 and collected on several dates in 1962. The female parents of the above types were collected near Bruce, Mississippi, from chestnut oak and the specimens were reared from seedlings grown from acorns from the same area.

This species somewhat resembles *arta* but with straight, short pygofer hook and different lateral flanges on shaft of aedeagus.

Erythroneura natchezensis new species (Fig. 14)

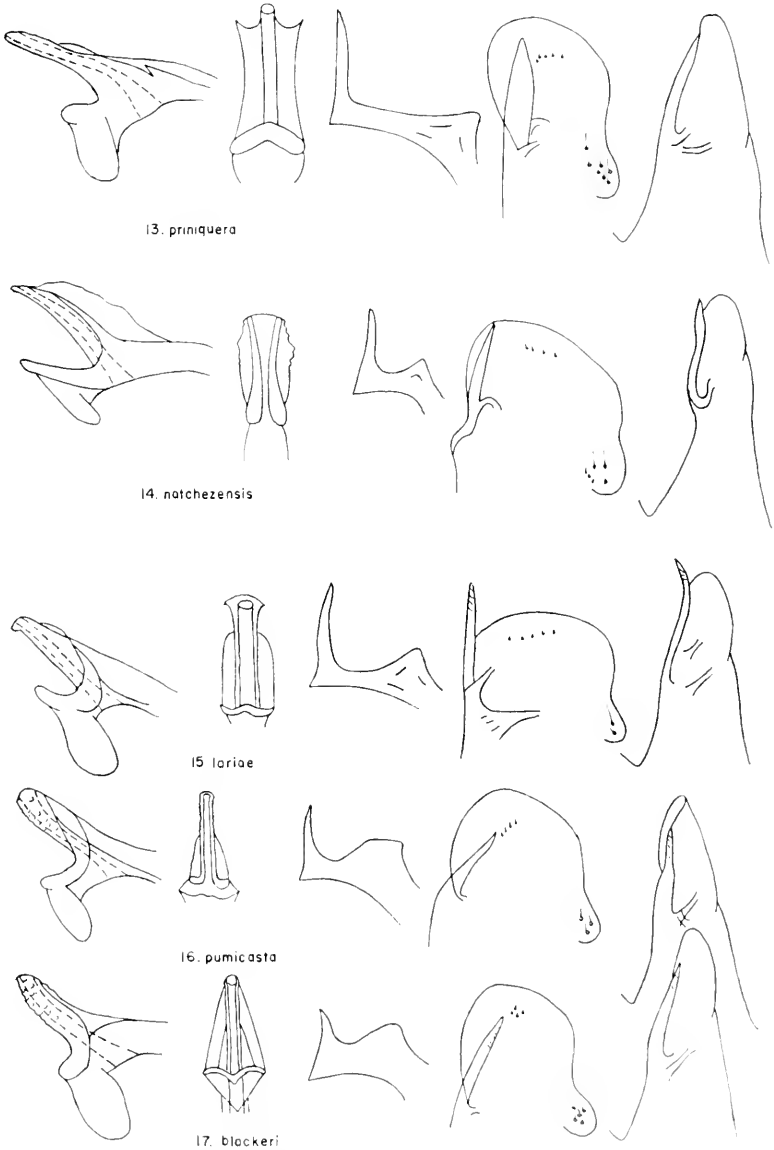
Length 3 mm; wing pattern of connected spots and black spot in first apical cell average size. Shaft of aedeagus in lateral view narrow and with large membranous dorsal flange, in posterior view with large lateral flanges; dorsal process more than half length of shaft. Pygofer hook about length of pygofer, almost straight in both views. Foot of style with toe directed laterally, posterior points longer than foot, sculptured, directed medially so as to meet on the mid line.

Holotype ♂ and one ♂ paratype, Anderson Lake State Park, Fulton Co., Illinois, 8 Sept., 1954, H. B. Cunningham. One other ♂ paratype, Lexington, Tennessee, 4 Sept., 1963, *Corylus americana*.

This species differs from *arta* in having an almost straight pygofer hook, more slender shaft of aedeagus and more extensive dorsal flange.

Erythroneura loriae new species (Fig. 15)

Length 2.6 mm; with an unmarked cream wing color and black spot in first apical cell small. Shaft of aedeagus in lateral view slender with distinct dorsal flange, in posterior view with large lateral flanges; dorsal process about two-fifths length of shaft. Pygofer hook slightly longer than pygofer, almost straight in lateral view, curved in dorsal view. Foot of style slender with posterior point about length of foot, slightly curved.



FIGS. 13–17. *Erythroneura* species indicated, left to right: lateral view of aedeagus, posterior view of aedeagus, foot of style, lateral view of pygofer and pygofer hook and dorsal view of pygofer and pygofer hook. (Aedeagus and foot of style 2 × magnification of pygofer and pygofer hook.)

Holotype ♂, Ratcliff, TEXAS, 21 June, 1962.

This species somewhat resembles *arta* but with straight pygofer hook and smooth lateral flanges.

Erythroneura pumicasta new species (Fig. 16)

Length 2.6 mm; color pattern of indistinct spots and with black spot in first apical cell average size. Shaft of aedeagus in lateral view short with distinct dorsal flange, in posterior view with lateral flanges on basal half; dorsal process about half length of shaft. Pygofer hook short, slightly sinuate and broadened basally in both views. Foot of style short, with large heel, foot directed obliquely laterally, and posterior points obliquely medially; posterior point about three-fourths length of foot.

Holotype ♂, Gainesville, FLORIDA, 6 June, 1963, *Castanea pumila,* chinquapin and one ♂ paratype, Carthage, Mississippi, 25 June, 1962, *Castanea pumila.*

The aedeagus shaft of the specimen from Mississippi is much broader and has a shorter dorsal process, but in other respects it agrees with the holotype.

Erythroneura blockeri new species (Fig. 17)

Length 2.9 mm; color pattern of elongate spots and black spot in first apical cell larger than average. Shaft of aedeagus in lateral view rough, curved, with distinct posterior flange, in posterior view with large lateral flanges from apex to base; dorsal process about two-fifths length of shaft. Pygofer hook shorter than pygofer, almost straight in both views, sculptured on outer half. Foot of style short, heel large, posterior point triangular, directed obliquely mesally.

Holotype ♂, allotype ♀ and three pairs of paratypes reared at State College, MISSISSIPPI, in cage 1496 on *Quercus nigra,* water oak, collected 8 July, 1964, and three pairs with the same data, except collected on 4 Aug., 1964. Additional paratypes reared on *Q. nigra* at State College, Mississippi, as follows: 7 ♂ and 4 ♀ in cage 282 and 4 pairs in cage 1474.

This species somewhat resembles *solita* but without spine like dorsal process and larger lateral flanges and differs from *knullae* in having a longer dorsal process.

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Trichoptera from Israel

OLIVER S. FLINT, JR., Smithsonian Institution, Washington, D. C.

Recently a small collection of Trichoptera from Israel was received for identification. Attempting to name these specimens, I immediately became aware of the paucity of caddisfly records from Israel. Herein are presented those few published records which were found, together with the data from the present collection and the description of a new species.

All the records are from the Jordan Valley in the extreme northeast of Israel. Deganya A is near the Jordan River at the outlet from the Sea of Galilee about 209 meters below sea level.

Shaar-Hagolan and Kare-Deshe are in the near vicinity, and Lake Huleh is about 25 miles upstream.

Pseudoneureclipsis palmonii, n.sp.

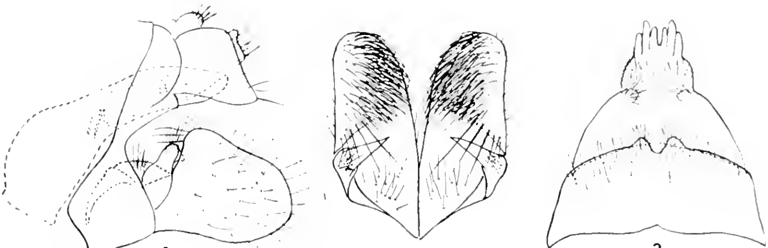
This genus was previously known only from southeast Asia and adjacent islands and southern Africa. The species is closely related to the African *P. truncata* Kimmins and *P. mlangensis* Mosely. From these it differs in the more rounded claspers with a less projecting lateral process, and a differently shaped cercus.

Adult: Length of forewing, 4–5 mm. Color uniformly brown, appendages somewhat paler; wings covered uniformly with dark, reddish-brown hairs. Venation typical of genus; R_{2+3} branched well before wing margin. Male genitalia (Fig. 1–2): Ninth segment narrow laterally, widened ventrally. Cercus quadrate, posteroventral angle prolonged; mesad to cercus an elongate, rectangular plate; dorsad a median hirsute lobe. Clasper with a dome-like basomesal portion bearing a few setae dorsally; laterally a finger-like appressed process whose tip is developed into a long mesally-directed point; apical lobe rounded in lateral aspect, bearing on inner surface a dense pad of basally directed setae. Aedeagus tubular bearing an internal complex of sclerites near apex. Female genitalia (Fig. 3): eighth sternum with posterior margin bearing a pair of short, submesal process. Ceri absent. Tenth segment with three pairs of finger-like appendages. Spermatheca present, but too lightly sclerotized to distinguish structure.

Holotype male, allotype female: ISRAEL, Denganya A, 9 September 1964, Y. Palmoni. USNM type 69024. Paratypes: Same locality, but 6 July 1964; 2 ♀; 7 October 1964, 1 ♀. Shaar-Hagolan, 5 June 1942, 1 ♀. Kare-Deshe, 19 November 1963, 1 ♀.

Ecnomus gedrosicus Schmid

A single male of this species, originally described from Iran, is recorded by Botosaneanu (1963) from Lake Huleh.



Pseudoneureclipsis palmonii, n. sp.: 1, male genitalia, lateral. 2, claspers of male, dorsal. 3, female genitalia, ventral.

Ecnomus galilaeus Tjeder

The species Botosaneanu records from Lake Huleh as *E. kunensis* Barnard, is unquestionably the same as this one described by Tjeder (1946b). Whether *galilaeus* is a synonym of *kunensis* is another matter. The illustrations of Botosaneanu and Tjeder show a long clasper which widens gradually toward the base. However, Barnard's original figures (1934) and Kimmins' later figures (1957) show that the clasper of *kunensis* is shorter, and suddenly widened before the base. Until the types are compared and the question finally settled, it seems best to consider that there are two closely related species distinguished by the shape of the clasper.

Botosaneanu also records larvae of this genus from Lake Huleh.

Psychomyia pusilla Fabricius

Recorded by Botosaneanu from Lake Huleh, additional specimens are here recorded from: Deganya A, 19 April 1965, 1 ♂ 1 ♀, and 31 March 1965, 1 ♀. The species is widespread over Europe and the Middle East.

Hydropsyche jordanensis Tjeder

This species, originally described from the Jordan Valley (Tjeder, 1946, a, b), has been discovered in Roumania recently.

Hydropsyche exocellata Dufour

This species which is widespread but apparently scarce over most of Europe is recorded from the Jordan Valley by Tjeder (1956 a, b).

In addition to the males recorded below, the collection also contains 9 females which may be this or the preceding species: Deganya A, 1 March 1965, 1 ♂; 12 February 1965, 1 ♂.

Orthotrichia tetensii Kolbe

Botosaneanu records a male of this eurasian species from Lake Huleh.

Orthotrichia moselyi Tjeder

The species is known only from the holotype described by Tjeder (1956b) from Deganya A.

Hydroptila species

Larvae of this genus are recorded from Huleh by Botosaneanu.

Oxyethira species

Botosaneanu records larvae of this genus from Lake Huleh.

Triaenodes internus capitatus Martynov

A single male of this subspecies is recorded from the Jordan Valley (Tjeded 1946a). The subspecies was described from southern Persia.

Triaendoes reuteri McLachlan

Several males and a female of this eurasian species are recorded from Lake Huleh by Botosaneanu. He also records larvae of the genus from the same locality.

Athripsodes species

There is a single female, apparently of this genus, from Deganya A, 19 April 1965, which I cannot determine to species. Botosaneanu records the larvae of a leptocerid which may well be a species of *Athripsodes*, and Tjeder (1946b) mentions that he has females of two unidentified species of Leptoceridae.

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Macdonaldium fungi, a New Genus and Species of the Feather-Winged and Smallest known beetles (Coleoptera: Ptiliidae) from East Como, Quebec

Mohammad Abdullah,[1] and Abida Abdullah, Department of Entomology, Macdonald College of McGill University, P.Q., Canada

The ptiliids or the feather-winged beetles are the smallest of all the Coleoptera, ranging from 0.25 to 1 mm, and are poorly known, being currently studied by very few specialists. An interesting historical account of the North American ptiliids is given by Barber (1924) who opens his paper with the statement

[1] Postdoctorate Fellow of the National Research Council of Canada.

"Seventy years ago a Russian travelling in the United States collected a colony of microscopic beetles in a fungus in Georgia and no coleopterist appears to have found the species since" and goes on to revise the American Nanosellinae. No systematic study has been made of the Canadian Ptiliidae although some of the genera occurring in the Lake Superior region (*e.g.*, *Pteryx* Matthews, *Ptenidium* Erichson, *Ptinellodes* Matthews and *Ptinella* Motschulsky) may also extend to Canada, and *Actidium* Matthews is known from British Columbia as well as California and Texas. The present record, however, appears to be the first of an endemic genus of the Canadian Ptiliidae from the Province of Quebec.

The description of the Ptiliidae given by Arnett (1963: 349) applies to our material except as follows: lacinia apically pointed and slightly curved; middle coxae contiguous; and hind coxae with femoral plates developed throughout. These characters should be incorporated into the definition of the family.

Our material keys out to the genus *Ptinellodes* Matthews, both in Matthews (1884: 114) and Arnett (1963: 350), to which it is certainly most closely allied. However, our genus (*vide infra*) differs from *Ptinellodes* as follows:

Head small, narrower than the elytra; eyes present in both sexes; pronotum without tubercles; lateral borders of the elytra arcuate (Fig. 3); five abdominal segments exposed dorsally; pygidium with three acute teeth, one on apex and two laterally (Figs. 6, 9) .... **Macdonaldium,** new genus

Head large, wider than the elytra; eyes absent in the male; pronotum with minute tubercles; lateral borders of the elytra nearly straight; four abdominal segments exposed dorsally; pygidium with two acute teeth, one on each side........... .... **Ptinellodes** Matthews

MACDONALDIUM, new genus

Diagnosis. A combination of the characters mentioned in the key (*vide supra*) should serve to distinguish this genus from others in the Acratrichini.

Shape. Oval.

Head. Transverse, less than twice wider than long, widest across eyes, narrower than pronotum and elytra; clypeo-labral suture prominent, slightly produced anteriorly in middle; gular sutures approximate, not extending to posterior end. Eye entire, round, small, projecting, finely faceted. Antenna nearly twice as long as head; eleven-segmented; filiform but apical three segments slightly swollen, forming a loose club. Labrum large, rounded at apex. Mandible pointed, needle-like at apex. Maxilla with lacinia pointed, slightly curved at apex; maxillary palp four-segmented, segment three largest, segment four narrowest, needle-like. Tentorial bridge (or corpotentorium) with anterior tentorial arm (or pretentorium) M-shaped.

Thorax. Pronotum (Fig. 1) widest at base, nearly half as long as wide; produced above and below at apex and base respectively on each side; procoxae oval, short, contiguous, with trochantins exposed; prosternal apophyses slender, nearly as long as procoxa; sternopleural sutures oblique resulting in large hypomera and narrow prosternite. Middle coxae (Fig. 2) contiguous, their cavities closed by sterna. Metasternum nearly half as long as wide; met-endosternite characteristic, arms long, slender, widely separated, arising from inner angle of hind coxae where fused in a narrow, reduced body, without stalk; metacoxae widely separated, separated by little less than width of coxa, with prominent femoral plates. Scutellum (Fig. 3) sharply tapering at apex, triangular. Wing (Fig. 4) feather-like, with venation extremely reduced, scarcely visible, an upper (? fused Sc + R) with a pterostigma and a lower (? anal vein or its remnant) with characteristic flecks feebly apparent. Elytra truncate, leaving five abdominal segments exposed, without epipleural folds; each with sutural margin straight, lateral margin curved, apex roundly truncate, nearly twice as long as wide. Legs with femora large, in hind legs sparsely spinous; tibiae moderately, sparsely spinous; tarsi slender, apical (*i.e.*, third) tarsal segments much longer than preceding two segments combined.

Abdomen. Six visible sternites; last visible sternite emarginate in male (Fig. 5), entire in female (Fig. 8); pygidium in both sexes slightly longer than preceding two tergites, with three short teeth, one apical, two lateral (Figs. 6, 9). Aedeagus extremely reduced, hard to distinguish (Fig. 7). Female reproductive system as in Fig. 9, ovipositor not distinct.

Type of the genus: *M. fungi,* new species.

To the memory of Sir William Macdonald, the founder of Macdonald College, this genus of beetles is humbly dedicated.

Macdonaldium fungi, new species (Figs. 1–9)

Holotype. Male (our number 686), CANADA, QUEBEC, East Como, October 16, 1965, from fungus (Dr. & Mrs. M. Abdullah), in the Lyman Entomological Museum at Macdonald College.

Color. Dark brown to fuscous; antennae, palpi, tarsi light brown.

Vestiture. Uniformly, sparsely pubescent.

Punctures. Fine, sparse.

Head. Antenna with first two segments large, first longest, second nearly as long as eleventh; segments three to eight narrow; segments nine to eleven progressively enlarged.

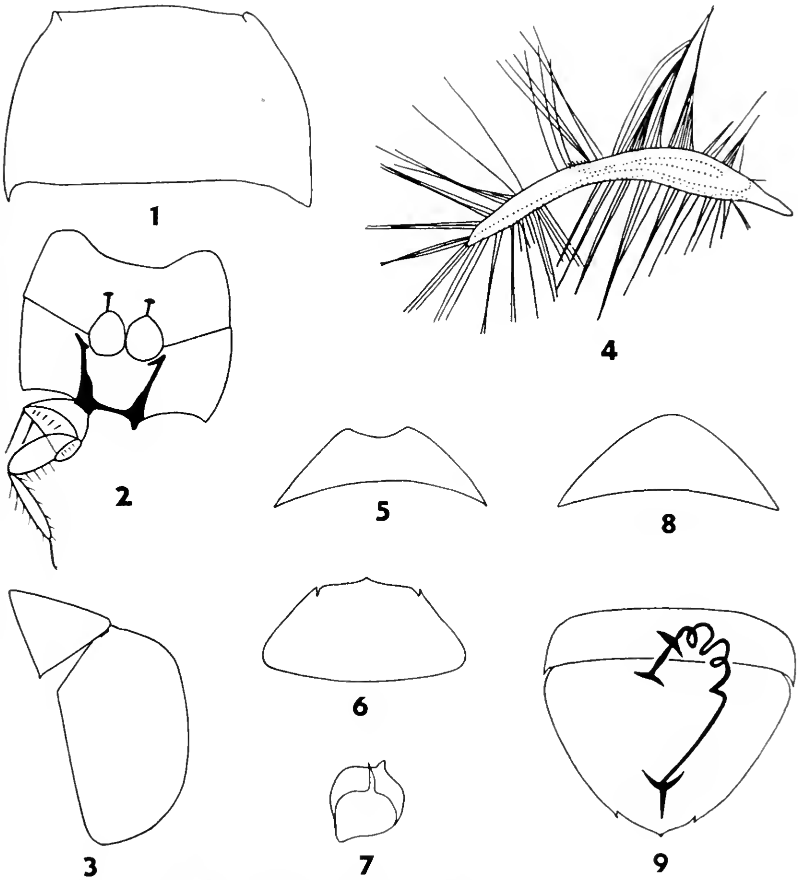
Abdomen. Sixth visible sternite emarginate at apex (Fig. 5).

Total length 1 mm.

Allotype. Female (our number 687), CANADA, QUEBEC, East Como, October 16, 1965, from fungus (Dr. & Mrs. M. Abdullah), in the Lyman Museum. Differs from the holotype in the structure of the sixth visible sternite which is entire at apex (Fig. 8) apart from the reproductive organs (Fig. 9).

The sexes could be easily separated as the last visible abdominal sternite is entire in the female and emarginate in the male.

The immature stages of *Macdonaldium* remain to be discovered but if the association of truncate elytra in the adult with the fan-like fringe of the galea in the larva is a monophyletic character in the Acratrichini, one would expect that the larva of *M. fungi* should possess the fringe. It should be mentioned that similar fringes occur in certain Anistomidae (or



FIGS. 1–7. *Macdonaldium fungi,* new species, holotype, male: 1, pronotum, dorsal view; 2, portion of meso- and metathorax (showing the endosternites and right hind leg) ventral view; 3, scutelum and right elytron, dorsal view; 4, hind wing (long hairs artificially broken and curled or combined at places, actually projecting straight and feather-like); 5, last visible abdominal sternite; 6, pygidium; 7, ninth abdominal segment including the minute aedeagus, hardly visible at 1,600 times magnification.

FIGS. 8–9. *M. fungi,* new species, allotype, female: 8, last visible abdominal sternite; 9, last two abdominal tergites with reproductive organs.

Leiodidae) (*vide* Böving & Craighead, 1931: Pl. 11, Fig. F) and that Crowson's (1955: 36) suggestion of a correlation of these fringes at the apex of the maxillary mala with the habit of feeding on conidia or spores seems plausible. It is difficult to decide whether the truncate elytra (Fig. 3) are a primitive feature of the Ptiliidae (or in fact of the superfamily Staphylinoidea) or a derivative one. If the closest affinity of the Ptiliidae is with the Anisotomidae where the elytra are entire, it is conceivable that the truncate elytra and the loss of the fringes are both derivative characters of the Ptiliidae. This hypothesis, however, rests on the supposed derivation of the Ptiliidae from the Anisotomidae or its ancestors for which more evidence is needed.

The met-endosternite (Fig. 2) prompts comparison with the Sphaeriidae (*vide* Crowson, 1955, Fig. 23) and the Histeridae (*vide* Crowson, 1955, Fig. 22) but the details are different and so are many other important characters. We, therefore, do not suggest any direct relationships to these families.

It is fairly certain that the feather-like wings (Fig. 4) of the Ptiliidae are adaptations to extremely minute size and would seem to be useful in dispersal by air in these daytime flyers. (For the periodicity of flight in the Ptiliidae and other insects a reference may be made to an excellent paper by Lewis & Taylor, 1965). Another features in the Coleoptera which seems to be linked with small size is the reduction of the maxillary lobes to one as in the Ptiliidae, Corylophidae, Nitidulidae and many Myxophaga.

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Books

INSECT PESTS OF FARM, GARDEN, AND ORCHARD. By **Ralph Howard Davidson** and the late **Leonard Marion Peairs.** Sixth ed. John Wiley & Sons, New York, 1966. Pp. ix, 675, 587 figs. $17.50.

Only the real old timers will recall the first edition by E. D. Sanderson, 1912, which was so well received that new editions came regularly, with L. M. Peairs as coauthor and later author. The book is now too well known to require discussion except to say that it continues to earn our respect for its concise yet lucid presentation, and that it has been updated as regards control measures, and that for each topic it always gives the latest references, many for 1966.

In 1912, Dr. Sanderson estimated that the insect damage in our country would total about $1\frac{1}{4}$ billions of dollars annually; the present edition estimates 5 billions, plus another for insecticides, plus an unknown amount for labor. Thus the costs of feeding our pests increases even as do other costs—the first edition of this book was listed at $3.00.—R. G. S.

INSECTS AND HYGIENE. The biology and control of insect pests of medical and domestic importance. By **James R. Busvine,** 2nd ed. Methuen & Co., Ltd., London. Barnes & Noble, Inc., New York, 1966. Pp. xi, 467. $18.00.

Although written for use in Britain, most of this treatise is equally useful in North America. Its broad approach is immediately evident in the introduction and in the chapters on anatomy, physiology, development, ecology and populations. For each species there is always a wealth of detailed data on life history and bionomics.—R. G. S.

Insects

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ENTOMOLOGICAL NEWS

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Factors Affecting Wing Length and Emergence in the Winter Stonefly Capnia nana.[1]

Alan V. Nebeker[2] and Arden R. Gaufin[3]

Brachyptery was found to occur in several Rocky Mountain species of *Capnia* (Plecoptera, Capniidae), especially in the southern regions at the higher altitudes. *Capnia nana* was found to exhibit all degrees of wing development from fully longwinged to almost completely wingless and because of this was investigated further in an attempt to determine some of the factors which might influence this phenomenon.

Capnia nana Claassen (Figs. 1–5) is a small dark stonefly inhabiting cold springs and mountain streams and lakes of the Rocky Mountains and the Pacific Northwest. The adults emerge during the cold winter months from November through May. Emergence at higher altitudes may be delayed several months however (Fig. 6). The earlier emergence in November and December has been found to occur only in springs which maintain a temperature higher than that of nearby streams during the winter.

This species exhibits a wide variation in the length of the wings with corresponding variation in habitat occupied. The wing length varies from that in almost wingless (apterous)

[1] This investigation supported, in part, by National Science Foundation grant No. G-20703, and Division of Water Pollution Control, U.S.P.H.S. Grant No. WP54.

[2] National Water Quality Laboratory, 2215 East 5th Street, Duluth, Minn.

[3] University of Utah, Salt Lake City, Utah.

specimens living in cold spring areas of Utah to the long-winged (macropterous) forms along the Pacific coast. Six different wing lengths are apparent and when males and females are considered together as a population twelve different combinations (populations) are found to occur.

Four thousand three hundred specimens were collected and examined from British Columbia, Oregon, Montana, Idaho, and Utah. This is the largest collection of this species known and is considered sufficient for this type of study. All populations of this species are believed to be one species, but two subspecies, based upon genitalia as well as wings, are recognized. The purpose here is to consider the wing conditions in relation to known and possible factors which might affect the overall wing lengths. Altitude can now be shown to have a direct correlation, though perhaps not a direct influence. Water temperature is also a factor as certain populations in northern Utah are restricted to cold water springs having little temperature variation.

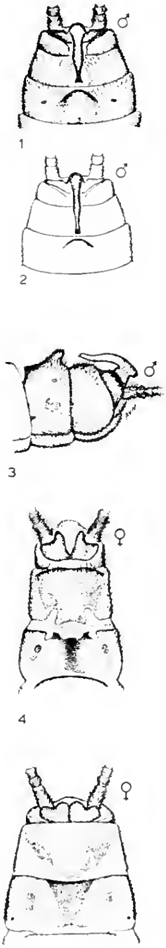
Other factors such as latitude show a correlation. Latitude has a direct relationship to the length of the periods of daylight and darkness, which has been shown to influence growth rates and development in the stonefly *Capnia bifrons* (Khoo, 1964). Latitude as such is also correlated with wing length in that the areas of low elevation are in western Canada and the areas of high elevation occur in the southern Rockies of the United States.

Table 1 lists the types of wing length found in *Capnia nana*.

TABLE 1. Types of wing length exhibited by *Capnia nana*

A. Almost-apterous—0.5 mm.
B. Micropterous—1.5 mm.
C. Micropterous-brachypterous—3.0 mm.
D. Brachypterous—4.0 mm.
E. Brachypterous-longwinged—5.0 mm.
F. Longwinged—6.0 mm.

As can be seen there are six definite types of wing development ranging from almost apterous (0.5 mm) to the fully



Figs. 1-5: Capnia nana genitalia

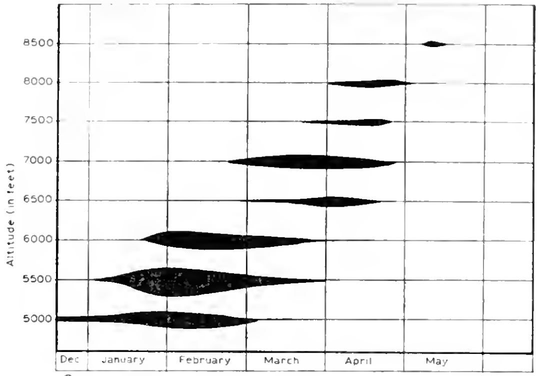


Fig. 6. The effects of altitude on the seasonal distribution of Capnia nana

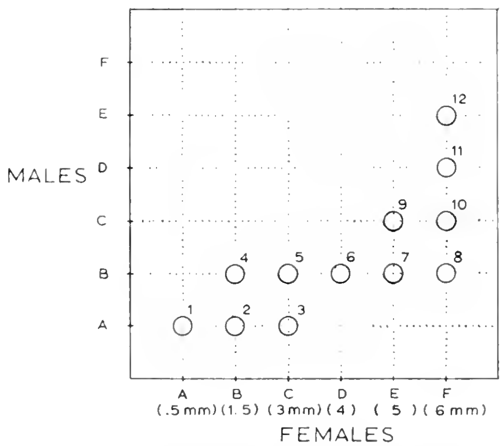


Fig 7. Scatter diagram illustrating various wing length combinations of males and females. The circles numbered 1 to 12 represent the populations(♂+♀) described in Table II and III

winged condition (6.0 mm). The measurements are average figures and are set up for simplicity in associating the different wing lengths. Figure 7 is a scatter diagram used to associate the males and females within each population. From this it can be seen that the female never has shorter wings than the associated male. Its wings may be of the same length, but usually they are one or more degrees longer than those of the male.

Table 2 shows the various combinations of males and females as determined from the scatter diagram (Fig. 7) and using the terminology outlined on Table 1.

TABLE 2. Types of wing length in *Capnia nana* populations showing various combinations of males and females found in the western United States

Population*	1.	Male almost-apterous—A. Female almost-apterous—A.
Population*	2.	Male almost-apterous—A. Female micropterous—B.
Population*	3.	Male almost-apterous—A. Female micropterous-brachypterous—C.
Population*	4.	Male micropterous—B. Female micropterous—B.
Population*	5.	Male micropterous—B. Female micropterous-brachypterous—C.
Population*	6.	Male micropterous—B. Female brachypterous—D.
Population*	7.	Male micropterous—B. Female brachypterous-longwinged—E.
Population*	8.	Male micropterous—B. Female longwinged—F.
Population*	9.	Male micropterous-brachypterous—C. Female brachypterous-longwinged—E.
Population*	10.	Male micropterous-brachypterous—C. Female longwinged—F.
Population*	11.	Male brachypterous—D. Female longwinged—F.
Population*	12.	Male brachypterous-longwinged—E. Female longwinged—F.

* These twelve populations are shown and their distribution plotted on Map 1.

Almost-apterous males occur with almost-apterous females in a few cold springs in Logan Canyon, Cache Co., Utah, as shown in Table 3. Almost-apterous males are also found with microp-

TABLE 3. Elevations at which various populations of *Capnia nana* are found in the Western United States

	Elevation (ft.)	Typical Locality
Population 1. (A A)*:	5 000–7,000	Cold Springs, Cache Co., Utah
Population 2. (A B):	5,000–7,000	Cold Springs, Cache Co., Utah
Population 3. (A C):	5,000–7,000	Logan River, Cache Co., Utah
Population 4. (B B):	5,000–7,000	Logan River, Cache Co., Utah
Population 5. (B C):	7,000–7,500	Trout Creek. Wasatch Co., Utah
Population 6. (B D):	5,000–7,000	Wasatch Mts., Salt Lake Co., Utah
Population 7. (B E):	5,000–7,000	Wasatch Mts., Salt Lake Co., Utah
Population 8. (B F):	5,000–7,000	Mt. streams of Northern Utah
Population 9. (C E):	4,500–6,500	Bozeman area, Gallatin Co., Montana
Population 10. (C F):	2,000–4,000	Spring Creek, Baker Co., Oregon
Population 11. (D F):	3,000–4,000	River Valleys of Western Montana
Population 12. (E F):	0–3,000	Coastal British Columbia

* (A A) = (A = almost-apterous male) (A = almost-apterous female).

terous and micropterous-brachypterous females in the Logan River, Utah. Micropterous males are widespread in northern Utah and are found with females exhibiting micropterous, micropterous-brachypterous, brachypterous, brachypterous-longwinged, and longwinged wing types. Micropterous males are not found north of the Snake River area of Idaho, which has formed a barrier to many species of stoneflies, possibly indicating long isolation from northern, lower altitude forms.

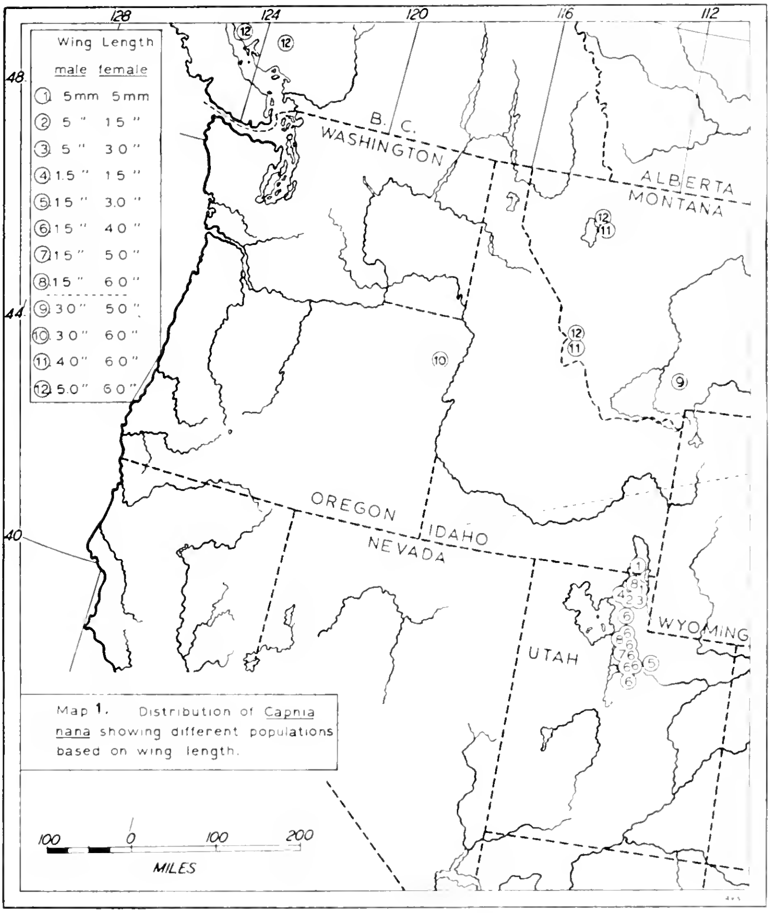
The micropterous-brachypterous males are associated with brachypterous-longwinged females in south central Montana, and with longwinged females at lower elevations in eastern Oregon, giving a comparison of different female wing lengths only at the same latitude, but different elevation. No longwinged males have been found within the species. Brachypterous males with longwinged females are found in several areas of Montana west of the Continental Divide. This is an area of rather low river valleys with a climate similar to that nearer the Pacific areas of western Washington. Brachypterous-longwinged males are the only type [found] along the lower coastal areas, and are found up to about three thousand feet in western Montana. They are associated only with longwinged females.

Map 1 shows the areas and distribution of the various populations of this species.

The effect of altitude is not apparent within a single stream even though there may be a difference of four thousand feet. The wing length of specimens collected throughout the length of Big Cottonwood Creek, Salt Lake Co., Utah, did not show any reduction at the higher altitudes of the canyon as one would expect if altitude had a direct and immediate influence. The effect of altitude appears to be a long range factor, gradually altering populations within a certain range of altitude, over a fairly wide geographical range, and over a long period of time, probably altering one to many genetic factors within populations.

The work of Khoo (1964) with Hynes in England has shown a correlation of emergence with photoperiod. Laboratory work has shown that *Capnia bifrons* responds to a lengthening photoperiod, and development of adult characters in the nymph is initiated. In conjunction with this development he showed that low temperatures retarded nymphal growth even though the lengthening photoperiod initiated development of adult characters. These two factors worked to produce abnormally small, inviable adult characters within the nymphal skin, including the lack of the development of normal long wings, indicating a possibility that brachyptery of wing-polymorphic species, i.e., *Capnia nana,* may be a result of factors such as the interaction of temperature and photoperiod; the longer photoperiod causing the adult characters to appear; the cold water preventing their complete development. The longer photoperiod in winter in the southern Rockies, along with the colder temperatures found at the higher altitudes, may explain the high amounts of brachyptery in the species of stoneflies in the high southern Rocky Mountains.

However, adults of almost-apterous *C. nana* have been collected in cold springs in Logan Canyon in November and December before the days begin to lengthen indicating that the increasing photoperiod lengths are not a factor here. The short days which probably stimulate the development of nymphal growth (Khoo, 1964) may also be the factor which stimulates



Map 1. Distribution of *Capnia nana* showing different populations based on wing length.

the continuation of development to adult. A factor which must be considered in the specialized spring habitat is that the water temperatures are comparatively warm in the winter time. The normal creek temperatures range near 35° F, while the spring temperatures are near 45° F. This warmer temperature might be sufficient to produce the earlier emergence in the springs, with the concomitant shorter wings because of the shorter growth period. Further studies under controlled conditions such as moving young individuals to other situations, or changing temperature or day-length in small areas of a pool will be necessary to help decide what factors may be responsible for the differences.

Conclusion

Emergence of adults can be shown to be directly affected by altitude and water temperature as there is a delay of several months at higher altitudes and at lower temperatures. However, the various environmental factors discussed above have not shown a direct and immediate influence on the wing development of individuals. The factors may account for minor variations in wing length, and probably did in the past, but it has become apparent from this study that the populations exhibiting different wing lengths are probably genetically different and that this is the factor which largely determines wing size at the present time.

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Symposium on Crop Losses

The Food and Agriculture Organization of the United Nations is organizing a "Symposium on Crop Losses—Evaluation of field losses caused by pests and diseases and factors affecting epidemics and outbreaks." The meeting will be held in FAO, Rome, Italy, from 2 to 6 October 1967. Requests for tentative agenda and inquiries should be addressed to Dr. L. Chiarappa, Crop Protection Branch, FAO, Viale delle Terme di Caracalla, Rome, Italy.

Notes on Mexican and Southwestern U.S. Bethylidae (Hymenoptera): Part II, Epyrinae[1]

Howard E. Evans, Museum of Comparative Zoology, Harvard University, Cambridge, Mass.

Rhabdepyris (Trichotepyris) cubiceps new species

Holotype.—♀, Mexico: Sinaloa: Mazatlan, 6 August 1964 (W. R. M. Mason) [CNC].

Description of female type.—Length 4.5 mm; LFW 3.1 mm. Head and thorax black, rather dull; abdomen shining black, apical two segments suffused with pale ferruginous; mandibles dusky ferruginous, antennae also of this color except flagellum light brown beneath; coxae black, legs otherwise light ferruginous except hind femora with a black spot near the base; wings subhyaline, fore wing with an elongate brownish cloud just below the radial vein. Mandibles broad, probably 5-toothed though in fact so badly worn that this is uncertain; clypeus obtusely angulate, with an arching median ridge, protruding only a short distance beyond the antennal insertions. Head unusually long and thick, WH 0.90 × LH, thickness of head about 0.60 × LH; vertex, in full frontal view, weakly concave medially. Antennal scrobes not margined; eyes strongly hairy, removed from vertex crest by about 0.6 their own height; WF 1.12 × HE; ocelli in a compact triangle opposite eye tops, far below vertex crest, OOL 1.25 × WOT. First four antennal segments in a ratio of about 35:9:8:12, segments three and eleven each about 1.3 × as long as thick. Front rather dull, with strong surface sculpturing and rather coarse punctures; vertex strongly alutaceous but not notably punctate. Pronotal disc rather abruptly sloping anteriorly and laterally, but not at all carinate; posterior margin not paralleled by a punctate groove; surface strongly alutaceous and with an abundance of

[1] Research supported by the National Science Foundation, Grant GB1544. The first paper in this series was published in Entomological News, 78: 13–23 (1967). See also Psyche, 72: 265–278 (1966).

small punctures; pronotal disc slightly longer medially than mesoscutum, the latter wholly alutaceous but more weakly punctate; notauli thin, divergent anteriorly; scutellar furrow weakly arched, weakly expanded at each end. Propodeal disc 1.3 × as wide as long, with seven discal carinae, sides with fine, radiating striae; side-pieces with strong longitudinal striae. Mesopleurum alutaceous, rather dull; lower fovea broadly open above, bearing some rather coarse punctures. Front femora not much swollen, measuring 2.25 × as long as wide.

Allotype.—♂, same data as type [CNC].

Description of male allotype.—Length 5.0 mm; LFW 3.5 mm. Black; mandibles black except dull ferruginous apically and along upper margin; scape black, flagellum very dark brown, somewhat lighter beneath; coxae black, femora black except front pair light brown on apical third, middle pair light brown at base and apex; legs otherwise testaceous; wings subhyaline. Mandibles 5-toothed; clypeus angulate, with an arching median carina; antennal scrobes not at all carinate. First four antennal segments in a ratio of about 26:7:4:20, segment four about 2.2 × as long as thick, segment eleven about 2.7 × as long as thick. WH/LH = 1.0; WF 1.1 × HE; OOL and WOT subequal. Front dull, strongly alutaceous, punctures shallow and inconspicuous. Pronotal disc slightly more shining and more evidently punctate than the front, its posterior margin paralleled by a weak depression. Features of mesonotum and propodeum as described for female, the propodeal disc measuring 1.3 × as wide as long, as in that sex, the transverse striae obsolete behind. Lower mesopleural fovea open above on the middle half, without the strong punctures found in the female.

Remarks.—The male and female have so many features in common that there seems little doubt that they represent the two sexes of one species. This is a striking and unusual species, especially with respect to the head of the female. It is a member of the *megacephalus* group; the female runs to *angusticeps* Evans in my 1965 key, although the front femora are much less robust. However, the female *angusticeps* has a much more shining front and narrower vertex, a more elongate propodeum, and many other differences. The male runs to couplet 7 in my key, but it differs from *amabilis* Fouts in its much larger size and different pronotal sculpturing, from *texanus* Evans in its more nearly circular head and much more coarsely sculptured head and thoracic dorsum.

Rhabdepyris (Trichotepyris) apache Evans, 1965

As I pointed out in Psyche, 72: 269, this species appears to be widely distributed and not uncommon in western Mexico, having been recorded from Sonora, Sinaloa, Jalisco, and the Tres Marias Islands. R. C. Bechtel and E. I. Schlinger collected no less than 40 ♂♂ of this species at and near Acapuneta, NAYARIT, 4 May 1953 [CIS]. I have also seen three more specimens from SINALOA: 1 ♂, 13 mi. N of Elota, 14 Aug. 1960 (Arnaud and Ross) [CAS]; and 2 ♂♂, Mazatlan, 6 Aug. 1964 (W. R. M. Mason) [CNC].

Rhabdepyris (Trichotepyris) werneri Evans, 1965

This species was described from three specimens from Arizona. It can now be recorded from CHIHUAHUA: 1 ♂, Santa Clara Canyon, 5 mi. W Parrita, 21 June 1956 (J. W. MacSwain) [CIS].

Rhabdepyris (Chlorepyris) quinquelineatus Keiffer, 1906

This poorly known species can now be recorded from OAXACA: 1 ♂, Temascal, 30 June 1964 (A. G. Raske) [CIS]. It has previously been recorded from Veracruz, Yucatan, El Salvador, and Nicaragua.

Anisepyris speciosus new species

Holotype.—♀, EL SALVADOR: Quezaltepeque, 500 meters, 19 June 1963 (D. Q. Cavagnaro and M. E. Irwin) [CAS].

Description of female type.—Length 4.5 mm; LFW 3.3 mm. Head and thorax black, the front and thoracic dorsum with weak, dark, olive-green reflections; propodeum black; abdomen piceous, shining, the apical fourth suffused with dull ferruginous; mandibles rufo-testaceous, antennae also of this color except flagellum strongly infuscated on upper surface beyond the basal two segments; coxae and femora black, hind tibiae somewhat infuscated, legs otherwise bright rufo-testaceous. Wings lightly tinged with luteous, fore wings with two large brown bands, one occupying the outer 0.6 of the median and submedian cells, the other crossing the wing at the radial vein. Mandibles moderately broad, with five large, subequal teeth; clypeus broadly rounded except angulate medially, at the end of the high, arching median carina. Antennal scrobes and insertions not at all margined above by carinae. First four antennal segments in a ratio of about 40:12:10:13, segments three and eleven both very slightly longer than thick. WH 0.96 × LH; vertex passing nearly straight across a considerable distance above eye tops; front broad, WF 1.47 × HE; ocelli in a small triangle, front angle less than a right angle, OOL 1.6 × WOT. Front alutaceous, rather weakly shining, uniformly covered with small punctures which are separated by 1–2 × their own diameters. Pronotal disc also alutaceous and covered with small punctures, margined by carinae anteriorly and laterally and its posterior margin paralleled by a punctate groove. Mesoscutum transversely depressed, weakly punctate on the posterior half, the notauli strong on the posterior two thirds; scutellar groove arching backward and broadened at each end. Propodeal disc measuring 1.25 × as wide as long, with seven discal carinae, sublaterals also well developed, the disc otherwise strongly transversely striate; posterior foveae strong; declivity transversely striate, more strongly so below; side-pieces finely striolate. Mesopleura strongly alutaceous, weakly punctate, the lower fovea well defined except its upper margin indistinct on the middle third. Front femora not much swollen, measuring 2.4 × as long as wide; middle tibiae spinose above for most of their length.

Remarks.—This striking and unusual species is known from a single specimen. The spinose middle tibiae would seem to place it in the *occidentalis* species-group, but the lack of scrobal carinae, propodeal sculpturing, banded wings, and other features tend to suggest that it is an aberrant member of the *proteus* group. Other members of the *proteus* group possessing banded wings are all smaller and more slender species.

Epyris connexus new species

Allotype.—♀, ARIZONA: Madera Canyon, Santa Rita Mts., 30 July 1955 (F. X. Williams) [CAS].

Description of female allotype.—Length 5.3 mm; LFW 3.4 mm. Black, apical abdominal segment brownish; mandibles light castaneous; scape black except paler on apical fifth; flagellum dull castaneous, upper surface fuscous; coxae black; femora black except outer third of fore femora rufo-castaneous like remainder of legs; wings hyaline, veins light brown, setulae rather pale. Mandibles slender, bidentate, the inner tooth broad and sloping into the inner margin; clypeus short, very broadly subangulate. Head unusually broad for this genus, WH 1.08 × LH; antennae arising well below bottoms of eyes; vertex passing straight across a distance above eye tops equal to about 0.6 × HE; eyes with only very short, inconspicuous hairs. First four antennal segments in a ratio of about 31:8:8:10, segment three not longer than thick, segment eleven 1.2 × as long as thick. Front broad, WF 1.6 × HE; ocelli in a very broad, flat triangle, the posterior ocelli removed from the vertex crest by less than their own diameters; OOL 1.15 × WOT. Front weakly alutaceous, moderately shining, wholly covered with small punctures which are separated by little more than their own diameters. Pronotal disc moderately shining and closely punctate like the front, along the midline about 1.6 × as long as mesoscutum, the latter covered with minute punctures and with strong, complete notauli. Scutellar pits elliptical, longer than wide, separated by 4 × their own greatest diameter, the two pits connected by a weak, shallow groove very close to the anterior margin of the scutellum. Propodeal disc 1.5 × as wide as long, the median carina strong and complete, the median U-shaped area bordered laterally by two other strong carinae which extend about 0.7 the length of the disc; U-shaped area reticulate, most of the ridges primarily longitudinal; sides of disc shining and with only very weak surface sculpturing; declivity shining and weakly sculptured except for the median carina; side-pieces finely striolate. Mesopleurum moderately shining, with a few small punctures, with a V-shaped ridge, the upper arm of which passes across the top of the pit. Front femora incrassate, measuring 1.9 × as long as wide; middle tibiae strongly spinose; claws dentate.

Holotype.—♂, ARIZONA: SW Research Station, 5 mi. W Portal, 5,400 feet, 11 Sept. 1959 (H. E. Evans; visiting poplar honeydew) [MCZ].

Description of male type.—Length 4.4 mm; LFW 2.9 mm. Black; mandibles testaceous, black at extreme base; scape fuscous, flagellum bright ferruginous; coxae black, middle and hind femora fuscous, front femora ferruginous except somewhat infuscated basally and above; legs otherwise rufo-testaceous; wings hyaline, with light brown veins, the setulae pale, giving the wings a somewhat whitish bloom. Mandibles bidentate; clypeus broadly subangulate; eyes bare; scrobes not margined. First four antennal segments in a ratio of about 9:2:6:6, segment three about 1.3 × as long as thick, segment eleven about 1.5 × as long as thick. WH 1.1 × LH; WF 1.2 × HE, the eyes strongly convergent below; vertex passing nearly straight across, the ocelli in a very broad, flat triangle, the posterior ocelli very close to the vertex crest; OOL only 0.9 WOT. Front alutaceous, rather weakly shining, wholly covered with small, shallow punctures which are separated by 1–2 × their own diameters. Thoracic dorsum also closely and finely punctate, moderately alutaceous; median length of pronotal disc subequal to that of mesoscutum; scutellar pits as described for female. Propodeal disc very short, 1.7 × as wide as long, its median U-shaped area strongly reticulate, bordered on each side by a strong carina on the anterior half; sides of disc finely, transversely striolate; side-pieces longitudinally striolate. Mesopleurum somewhat shining, obscurely punctate, the upper arm of the V-shaped ridge passing across the top of the pit, as in the female. Front femora somewhat incrassate, measuring 2.1 × as long as wide; middle tibiae with many small spines above; claws dentate. Abdomen stout, fusiform.

Paratypes.—ARIZONA: 6 ♂♂, same data as type except five of them collected on 9 September 1959 [MCZ, AMNH, CU]; 1 ♂, Santa Rita Mts., 12 July 1950 (P. P. Cook; on Phoradendron on oak) [KU].

Variation.—The males vary considerably in size (LFW 2.1–2.9 mm) but show no important variation in sculpture or color except that in some specimens the front femora are wholly fuscous. The propodeal disc varies from 1.6 to 1.9 × as wide as long, and there is minor variation in the sculpturing of the median area.

Remarks.—This is an unusual species, and the broad head and weakly connected scutellar pits suggest that it is somewhat annectant with *Rhabdepyris.*

Epyris tabascoensis new species

Holotype.—♂, Mexico: Tabasco: Teapa, January (H. H. Smith) [BMNH].

Description of male type.—Length 5.0 mm; LFW 2.7 mm. Head and thorax black; abdomen dark brown, shining; mandibles testaceous; antennae testaceous except scape somewhat infuscated, flagellum rather strongly infuscated on apical half; coxae, femora, and hind tibiae dark brown, legs otherwise testaceous; wings subhyaline, veins and stigma brown. Mandibles bidentate; clypeus with an angular median lobe and fairly prominent, though not protruding, lateral lobes; scrobes not margined and eyes not hairy. First four antennal segments in a ratio of about 10:5:4:7, segment three about as long as thick, segment eleven about 1.6 × as long as thick. Head only slightly longer than wide, WH 0.97 × LH; eyes convergent below, WF only about 0.9 × HE; front angle of ocellar triangle less than a right angle, OOL and WOT about equal. Front alutaceous, moderately shining, with small, crowded punctures below and larger although shallow, more widely spaced punctures above. Thoracic dorsum alutaceous, with shallow, rather inconspicuous punctures; median length of pronotal disc about twice that of mesoscutum; notauli wide, complete; scutellar pits large, longer than wide, separated by about their own greatest diameter. Propodeal disc elongate, only 1.1 × as wide as long, with remarkably coarse sculpturing: there are three complete discal carinae, the more lateral ones broad and flat-topped, plus strong sublaterals and laterals; between these seven carinae there are strong, irregular transverse ridges; declivity transversely striolate, with a median carina; side-pieces with coarse reticulations overlying an alutaceous background. Mesopleurum alutaceous, somewhat shining, with a rather large pit, the upper arm of the V-shaped ridge crossing above the pit. Middle tibiae somewhat spinose above; claws strongly dentate. Abdomen robust, fusiform.

Remarks.—This species is known from a single specimen, but this specimen is unique in so many features that it is useful to have a name for it in the initial stages of my current studies of the genus *Epyris*. Similar propodeal sculpturing occurs in a few South American species, but these appear otherwise unrelated to *tabascoensis*.

Alphabetical List of Abbreviations Used in Text

Structures

DAO:	diameter of anterior ocellus
HE:	height of eye (maximum, lateral view)
LFW:	length of fore wing
LH:	length of head (apical margin of clypeus to median vertex crest)
OOL:	ocello-ocular line (minimum distance from eye to lateral ocellus)
WF:	width of front (measured at its minimum point)
WH:	width of head (maximum, including eyes)
WOT:	width of ocellar triangle (including lateral ocelli)

Institutions

AMNH:	American Museum of Natural History, New York
BMNH:	British Museum (Natural History), London
BPBM:	B. P. Bishop Museum, Honolulu, Hawaii
CAS:	California Academy of Sciences, San Francisco
CDAS:	California Dept. of Agriculture, Sacramento
CIS:	California Insect Survey, Berkeley
CNC:	Canadian National Collection, Ottawa
CU:	Cornell University, Ithaca, N. Y.
KU:	Kansas University, Lawrence
MCZ:	Museum of Comparative Zoology, Cambridge, Mass.
UA:	University of Arizona, Tucson
UCD:	University of California, Davis
USNM:	United States National Museum, Washington, D. C.

Identification of Hexagenia bilineata and H. limbata Nymphs[1]

Vijayalakshmi K. Gooch,[2]
Iowa State University, Ames, Iowa

Several thousand *Hexagenia* naiads were collected from Pool 19 of the Mississippi River (above Keokuk, Iowa) from 1957–63 (Fremling, 1960; Carlson, 1963; Wenke, 1965). Subimagoes and imagoes were readily identified as *H. bilineata* and *H. limbata,* but difficulty was encountered in separating the nymphs. Differences in the shape of the frontal process, described in keys by Burks (1953) and Hamilton (1959), were not consistent in these populations. Intermediate forms were abundant. Pigment patterns described by Speith (1941) were of little help with the alcohol-preserved specimens.

Differences in the tarsal claws (Figs. 1 and 2) gave good separation of the nymphs over 16 mm in length (tip of frontal process to end of last abdominal segment). Claws were also swollen on some *H. bilineata* naiads under 16 mm but this length seemed the smallest that could be used with confidence. Burks (1953) mentions the midtarsal claw of *H. bilineata* nymphs as being thick near tip but does not describe the claws of *H. limbata.*

Maximum length of *H. bilineata* female nymphs was 34 mm and of males, 30 mm, compared to 30 mm and 28 mm for *H. limbata* females and males. The caudal filament is about the same length as the cerci in male *H. limbata* nymphs but is shorter in male *H. bilineata* nymphs, as pointed out by Fremling (1960). In addition, at equal lengths, male *H. bilineata* nymphs had larger eyes than male *H. limbata.*

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[2] Present address: 1424 Union Dr., Davis, Calif. 95616.

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FIG. 1. (Upper). Tarsal claws of *Hexagenia bilineata* nymph, from front to hind legs (right to left).

FIG. 2. (Lower). Tarsal claws of *Hexagenia limbata* nymph, from front to hind legs.

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A New Species of Carabodes from Jamaica (Acari: Cryptostigmata)*

Tyler A. Woolley, Department of Zoology,
Colorado State University

When Sellnick and Forsslund (1953) published their paper on Swedish species of *Carabodes*, they reviewed rather extensively the characters of the genus and the taxonomy of several species. Since that time a number of species have been described.

In a series of oribatid mites sent to the writer for identification was an unusual species of the genus. After checking the literature it was determined as a new species and is described below.

Carabodes jamaicaensis, n. sp. (Figs. 1, 2)

Diagnosis: With characters of the genus, but distinctly different from other known species in the presence of a finely spined, clavate sensillus, and heavy, spined, clavate prodorsal and notogastral setae. The sensillus is similar to *C. labrynthicus*

* Research supported by NSF Grant GB 3872.

(Michael,1879) Sellnick and Forsslund, 1953, but is larger and more globose. The prodorsal and notogastral hairs constitute the most strikingly distinct features of the new species.

Description: Color yellowish-brown; rostrum rounded, rostral hairs setiform, slightly longer than lamellar hairs, incurved, inserted ventrally, posterior to apex of rostrum; lamellae as broad as in other species of genus, with rounded depressions in surface, pits larger than those in integument of prodorsum; lamellar hairs clavate, beset with tiny spines, inserted in medial anterior corner of lamella; translamella absent; interlamellar hairs similar in size and shape to lamellar hairs, inserted medial to lamellae about equidistant from the rostrum and dorsosejugal suture; pseudostigmata directed laterally, behind pedotecta I, and posterolateral corner of prodorsum; sensillus short, strongly clavate, dark black, head covered with tiny spines, pedicel short, glabrous.

Hysterosoma truncate anteriorly, broadly rounded posteriorly, dorsosejugal suture nearly straight transversely, with roughened edge; humeral processes short, squarish, with dimpled surfaces; ten pairs of notogastral setae, each seta clavate, slightly curved, beset with tiny spines; surface of notogaster tuberculous (Fig. 1).

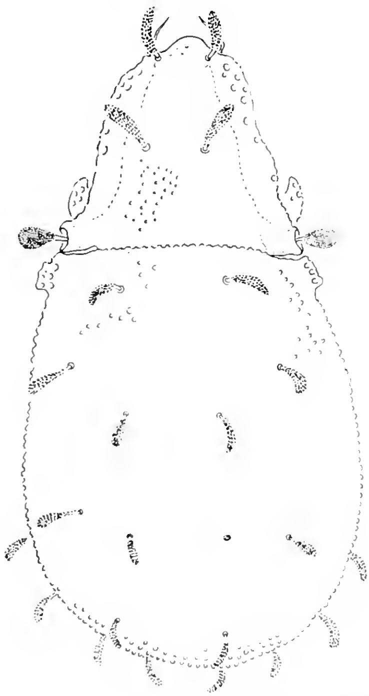
Camerostome oval in general outline, truncate posteriorly, infracapitulum as seen in figure 2; curved anterior distal margin of lamellae attached somewhat ventrally, posterior to insertion of rostral hairs (Figs. 1, 2); ventral setae as in figure 2; genital aperture square, each genital cover with four setae inserted near medial margin; g:1, g:2 in anterior half of cover, g:3, g:4 in posterior half of cover; aggenital setae posterolaterad of genital opening, closer to genital aperture than to anal; anal opening also square, larger than genital; covers pitted, with two anal setae, inserted near medial margins of covers; three pairs of adanal setae; ada:3 adjacent to anterolateral corner of anal opening, ada:2 at posterolateral corner, ada:1 mediad of ada:2, but closer to corner than to medial edge of anal cover; fissure *iad* not visible.

Length: 450 μ, prodorsum 150 μ, hysterosoma 300 μ; width: 222 μ.

Legs monodactylous; all femora are keeled, but the keels of femora III, IV are more prominent.

Two specimens (a male and a female) were collected on unknown wood cuttings from Jamaica, at Miami, 3-20-60 by C. Stegmaier (Lot 60-7480). The type specimen is a female and will be deposited in the U. S. National Museum.

Discussion: Comparisons of *Carabodes jamaicaensis*, n. sp., with other species in my possession and described in the literature disclosed that it is new and quite distinctive. The finely



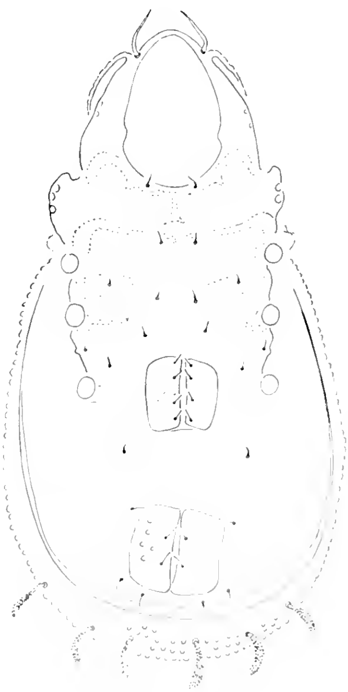


FIG. 1. *Carabodes jamaicaensis*, n. sp., from the dorsal aspect, legs omitted.

FIG. 2. *Carabodes jamaicaensis*, n. sp., from the ventral aspect, legs omitted; position of ovipositor indicated.

spined, clavate sensillus, and the heavy prodorsal and notogastral hairs are most noticeable. It is thus different from any of the species of Europe and Africa, except for the similarity of the sensillus to *C. labrynthicus* (Michael, 1879) Sellnick and Forsslund, 1953. In some general aspects it resembles *C. verricatus* Tragardh, 1931, from Juan Fernandez Island, but differs in the large clavate sensillus and the heavy, clavate, spined dorsal hairs; it differs from *C. falcatus* Jacot, 1937, and the Polynesion *C. granosus* Sellnick, 1959, and *C. imperfecta* Sellnick, 1959, again in the type of sensillus and dorsal hairs. In Jacot's *C. falcatus* from the United States, the dorsal hairs are described as clavate, translucent and appressed, but he figured only the scabrate sensillus; other features indicated in the description establish the difference. *C. jamaicaensis,* n. sp., differs from Hammer's species (*Carabodes sp.* Hammer, 1958) in the type of sculpturing of the integument and the heavy spined sensillus. The new species varies in the same way from representatives of the genus described from Japan, *C. bellus* Aoki, 1959, which has heavy, ribbed dorsal hairs, and *C. rimosus* Aoki, 1959, which has much smaller clavate, spined notogastral setae and a less rugose prodorsum.

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The Fungus-Growing Ant, Trachymyrmex jamaicensis, on Bimini Island, Bahamas (Hymenoptera: Formicidae)

NEAL A. WEBER, Swarthmore College,
Swarthmore, Pennsylvania

The fungus-growing ant, *Trachymyrmex jamaicensis* E. André is the most widely ranging attine in the West Indies other than the yeast-culturer, *Cyphomyrmex rimosus* Spinola. It is found from the Bahamas through the Greater Antilles to at least as far southeast as St. Vincent in the Lesser Antilles. It has also been taken on the coast of Florida at Dania near Miami. Several forms have been described from Cuba, Haiti and Antigua. Outlines of the worker and female heads and the characteristic fungus aggregate of inflated hyphae or a staphyla appeared in Weber 1966.

A July 1959 trip was made to Bimini for the purpose of examining the nest and securing fungus cultures. Of the two islands comprising Bimini, the triangular North Island was circumnavigated in a brief and unsuccessful search for the species. It was found on the more compact South Island only in the northwestern portion (Lat. 25° 43′ N., Long. 79° 18′ W.) in a *Coccothrinax argentea* (Lodd) Sarg. and scrub community.

The external indication of the nests was a largely circular crater of 35–60 cm across and with an eccentric entrance 9–13 mm in diameter. A 35 cm crater on 3 July was 50 mm high at its highest point. The highest side of the circular crater resembles the semi-circular crater of *T. septentrionalis* McCook which also commonly nests in sand and is found some 50 miles distant on the Florida coast. The latter, however, may have reached Florida along the Gulf of Mexico coast from Mexico.

Under the 35 cm crater were eight chambers extending to a depth of 60 cm. The most shallow was empty and 2.7 cm down. It may have been the original one formed by the female and her first brood. The next three chambers were at depths of 15 cm

(6 cm in diameter), 42 cm (4.5 by 6.5 cm) and 51 cm (6 cm high by 10 cm wide). Three of the chambers were well filled with gardens. They were in the form of friable lamallae suspended from rootlets.

Another nest had four chambers at depths of 13 to 70 cm. It contained on 6 July alate males and females and brood, of which the eggs were 0.35 by 0.51 mm to 0.38 by 0.61 mm.

Temperatures at the sites of these two nests seemed so high for attines that they were taken (in the manner of Weber 1959) with a set of calibrated thermometers. The humidity was excessively high and there were hordes of mosquitos to add to the discomfort of excavating.

Temperature relations of the two nests, A at 9:10–10:00 A.M., July 3, and B at 9:35–10:03 A.M., July 6, respectively, were as follows in degrees Celsius:

	Nest A	Nest B
Surface of sand in the shade	36.2	32.2
Surface of sand in the sun, to	37.7	37.1
Depth 10 cm	28.7	26.9
Depth 20 cm	29.8	27.3
Depth 30 cm	30.0	28.1
Depth 40 cm	29.8	28.0
Depth 50 cm	29.6	27.9
Depth 60 cm	29.9	
Depth 70 cm		30.0
Height 100 cm in shade	31.3	31.2
Height 100 cm in sun on thermometer	37.3	32.1

Several cool days with rain followed July 3 and were responsible for the drop in sub-surface temperatures between the 3d and 6th since the two nests were similarly situated. These temperatures are higher than those under tropical rain forest and generally higher than those associated with sand nests of *septentrionalis* in Florida in June and July.

Because of the high temperatures the ants foraged for substrate at night or early in the morning, ceasing when the sun shone on the nest. When disturbed the ants became motionless or, if close to the crater opening, quickly ran down it. The largest and darkest workers tended to be those out foraging or bringing up sand. The smallest and palest were those in the fungus gardens.

The fungus gardens were highly friable and consisted of yellowish flower stamens, woody particles, green dicot leaf sections and possibly insect feces. The mycelium was typical of other *Trachymyrmex* species and of higher attines in general (Weber 1966). Cultures were made to Sabouraud's dextrose agar for further study.

The brood was heavily coated with the mycelium as is typical of attines. All stages were present in the July nests. Callow workers had much paler ferruginous thoraces, pedicel, and appendages than the head and gaster. Those walking about in the gardens retained this pattern. The last parts of the trunk to darken were the propodeum and pedicel.

Mites were sparsely present in the nest and resembled pale brown 'mud turtles.' The garden fragments used as inocula in agar tubes developed an abundant nematode fauna in a week while the growing ant fungus was still normal. A small, gray, slender lizard 12 cm long with diamond-shaped marking dorsally seized several alate females and workers when a nest was being excavated and masticated them with some difficulty. In the soil about the fungus chambers were tunnels of the small, yellow ant, *Brachymyrmex heeri* Forel. The Florida *T. septentrionalis* workers and females immediately accepted and ate the *jamaicensis* fungus. In an observation nest of the Florida species, a Bimini garden fragment was incorporated into the other garden, thus showing the close relationships of the fungi of the two species.

Acknowledgments. The use of the Lerner Marine Laboratory of the American Museum of Natural History on Bimini and of the Archbold Biological Station in Florida facilitated these studies, as did a Swarthmore Faculty Research grant. The assistance of Cornelius Jeffery Weber was appreciated.

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The Systematic Position of Melanactes and Pseudomelanactes (Coleoptera, Elateridae)

Ross H. Arnett Jr.[1]

A study of *Pseudomelanactes agrypnoides* (Van Dyke, 1932) enables me to furnish a modification of my key to the genera of the Elateridae of the United States (Arnett, 1962), to include the monobasic genus *Pseudomelanactes* Mathieu, 1961, and to make a few observations on the systematic position of *Melanactes* and *Pseudomelanactes*. Three specimens of *P. agrypnoides* were taken at Peña Blanca Canyon, Pajarito Mountains, Santa Cruz County, Arizona, August 7, 15, and 17, 1964 by R. H. Arnett, Jr. and E. R. Van Tassell. They are deposited in the Purdue University Entomology Research Collection.

The systematic position of *Melanactes*.—This genus is retained as a separate subfamily, Melanactinae, even those Dr. Mathieu in 1961 included it in the Pyrophorinae, Denticollini (=Lepturoidini), because of certain resemblances of the adults to those of *Denticollis* spp. Although admitting some dissatisfaction with this association, he was influenced, no doubt, by the vogue at that time of ignoring the very important character of setae at the base of the tarsal claws. For some reason. workers stopped using this character for the Pyrophorinae. It was not included in Bradley (1930), or in a manuscript key widely circulated by M. C. Lane. It was used again by Crowson (1960) and by myself. The absence of these setae, therefore, definitely removes *Melanactes* spp. from the Pyrophorinae. There is no evidence against having this genus remain in a separate subfamily, Melanactinae. A study of several exotic genera, as was done by Mathieu, indicates that the genus does not stand alone in this subfamily, but the matter merits further study.

[1] Professor of Entomology, Purdue University, Lafayette, Indiana. Approved by the Agriculture Experiment Station, Purdue University, as Journal Paper no. 2990.

The systematic position of *Pseudomelanactes*.—Due to the presence of the setae at the base of the tarsal claws, it is easy to see that the genus *Pseudomelanactes* belongs to the Pyrophorinae. This character is present even though it was not mentioned in the original description of the genus and of the species, both authors either overlooking this feature, or deeming it unimportant. The characters place it near Conoderini, but it is sufficiently distinct from this group of genera to be placed as the type of a separate tribe, the Pseudomelanactini, NEW TRIBE. This tribe may be briefly characterized as being pyrophorine; mandibles directed downward; antennae eleven-segmented, the second segment small, slightly longer than wide, approximately one-half the length of the third; frontal ridge incomplete at middle; tarsal segments narrow, without lobes; claws simple. Type species of the genus: *Melanactes agrypnoides* Van Dyke, monobasic.

Key changes.—The following changes should be made in my key to the genera (Arnett, 1962, p. 501):

18(16). Tarsi with fourth segment as narrow as third (Pseudomelanactini) .... **Pseudomelanactes**
Tarsi with fourth segment broadened beneath (Conoderini) 18a
18a(18). Pronotal punctation all of one size............ 19
Pronotal punctation of two distinct sizes........ .... **Heteroderes**
19(18a). Tarsi with fourth segment distinctly lobed beneath............................ **Conoderes**
Tarsi with fourth segment without ventral lobe but more or less strongly cordate.. **Aeolus**

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Insects.

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Theodore Pergande (1840–1916)

Marion R. Smith and Arnold Mallis

An Early Federal Entomologist

Arnold Mallis, Gulf Research and Development Co.

Theodore Pergande was a prominent name in the annals of American entomology at the beginning of this century, yet you would never know it. If there is an obituary of him worthy of the name, I have yet to see it. Fortunately, Pergande has not been neglected by all entomologists, and with the help of Howard, Osborn, and Mrs. Comstock we will try to whip together something worthy of him.

L. O. Howard first began to work with C. V. Riley in the U.S.D.A. in 1878 and he writes (1933) that Riley "greeted me with sufficient cordiality, and introduced me to his only other assistant, Theodore Pergande, a little German of forty, with a heavy brown beard, who spoke fluent but rather ungrammatical English, and who had charge of the rearing of insects and the making of notes."

When Professor and Mrs. J. H. Comstock came to Washington in 1879, Howard and Pergande were there to greet them and work with them in the U. S. Department of Agriculture. Mrs. Comstock (1953) recalls Theodore Pergande as a "small, delicate-featured, bearded German with a gentle manner and lovable character. He was about thirty-nine years old and had come to America before the Civil War [?]. A rich man in the town where he was born in Germany had wanted him to become a Catholic, marry his daughter, and go into business with him.

Pergande told me that he would have liked the partnership with the man but that he could not stand either the church or the daughter, so he came to America."

Howard (1933) writes, "He was a man of slight education, who had been a mechanic in Germany and who had come to this country just at the outbreak of the Civil War. . . . He landed in New York with no English and very little money. He did not know where to go. He found his way to Grand Central Station, fell into line at the ticket office and noticed that the man ahead of him bought a ticket for Syracuse. The word Syracuse sounded familiar, so he, too, bought a ticket to that point. He arrived in Syracuse early in the evening, wandered about the streets, homesick for the German tongue, and presently found himself before a chapel where he heard German spoken by the people passing in. So he, also, entered the church. Behold! he was back in the religious atmosphere. He spoke (in German, of course) to the young man who sat next to him, found him agreeable and went home to spend the night with him at his boarding-house. The young man had no job, and when, on the next morning, while walking together through the streets, they saw a recruiting station, they both volunteered, adding their names to the first three hundred thousand recruited for the war. So, by the irony of fate, twenty-four hours after he landed, he found himself back in both the religious and warlike atmospheres.

"At the end of the first three months, the enlistment having expired, Pergande's new-found friend went back to New York, but the immigrant, with characteristic perseverance stuck to the army for the full four years of fighting. At the end of the war he was discharged at St. Louis, and having no other trade, went into the big gun works there. He had always been an amateur entomologist, collecting butterflies and beetles and such things, and on one of his Sunday afternoon collecting rambles he met Otto Lugger, then Riley's assistant. Lugger was about to resign and recommended his friend for the job. So Pergande stayed with Riley, and came with him from Missouri to Washington in 1878, where he remained until the time of his death in the early 1900's."

Mrs. Comstock tells us (1953) that after the Civil War "he married a pleasant, thrifty little German woman who took good care of her husband and their daughter. He was a tireless worker, faithful to his task and to his fellow workers; he wrote an exquisitely fine hand, as legible as print. His notes on the insects he studied were of the greatest value because of their accuracy and careful descriptions. He was ambitious to write in perfect English, so he began studying Shakespeare. Mr. Comstock and Leland Howard had many a secret chuckle over notes on some minute insect, written in true Shakespearian diction. Pergande had discovered the male form, never before observed of a scale insect. When Dr. A. S. Packard of Brown University visited our offices, he remarked, 'You are fortunate to have so many of these rare insects.' Pergande answered with a smile, 'Fortunate? No, not fortunate! We hoont for them.' Pergande was not fitted for independent scientific work, but his knowledge of insects was great, and as an observer in a scientific laboratory he was invaluable. He could mount the most minute insects to perfection; his slender hands could manipulate, with exquisite precision, the wings of the smallest Tineid moth. He loved his work and loved to discover new things. When my mother wished him a long life, he answered: 'Jes, jes, I hope so too, dare are so many tings to find out and I hope I live to fine dem.' "

Howard continues in the above vein and enlarges on his abilities by noting that he was "not too careful about his personal appearance, but a positive genius in his work on the life history of insects. He was invaluable to Riley and invaluable to the entomological service at Washington. For many years he kept the main insectary notes of the service; and the great bulk of the life history work published in the many entomological publications of the Department for many years was based upon his careful notes and observations."

It was Pergande who in the summer of 1886 showed that the plum tree was an alternate host for the hop-plant louse and this led to spraying of the aphids on the plums and freeing of the hop plants from this destructive pest. He also worked out the life history of the destructive clover-seed midge and many other economic pests. He was an outstanding authority on the Aphididae and also did a good deal of work on scale insects and thrips. Osborn notes that Pergande was "a very exact and keen observer and a great deal of his time was devoted to the preparation of material used in the preparation of papers by others, so that his published papers do not represent in any degree the results of his research on insects." In time he began greatly to resent Riley's use of his work without any accreditation.

As he grew older he became somewhat cantankerous and difficult to get along with, and Howard writes of his last years: "Pergande had many friends and admirers who estimated him at his true worth. No one who worked with him will ever forget him. He received little public credit for his work, but his very few published papers show his great knowledge and keen ability. He had a delightful sense of humor, and told fascinating stories of his experiences. He had strong likes and dislikes as to persons, and was very outspoken. His mind began to fail toward the end, and he had a number of curious hallucinations."

Pergande died in Washington, D. C., on March 23, 1916, a man who contributed a great deal to the growth of entomology but rarely received recognition for these contributions. How many more deserving men like him have faded from the scene unsung and unheralded?

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Theodore Pergande—Early Student of Ants

Marion R. Smith, U. S. D. A. Entomology Research Division, Retired

It is not generally known that Theodore Pergande played an unusually important role in the founding of North American myrmecology and that he should therefore be given full credit for this. I am sure he little realized when he was carrying out his ant studies that his work would eventually form the basis for the cornerstone of North American myrmecology. One naturally wonders not only why he became interested in ants but also at what period he actually began serious work on them. I might have been able to answer these and many other questions pertaining to Pergande had I known him personally. He died in March 1916 and unfortunately I did not come to Washington, D. C., to work in the Truck Crop Insect Investigations, Bureau of Entomology, U. S. Department of Agriculture until the fall of 1917.

At this late date (1966) we will probably never know why Pergande became interested in ants but at least we can hazard a guess as to the approximate date he began work on them. I believe Pergande started work on ants as an avocation after he came to Washington, D. C., in the seventies, and he maintained a deep interest in them until his death although his greatest period of activity appears to have been from the seventies until the early years of nineteen hundred. When Pergande embarked on the work North American myrmecology was in an incipient and chaotic state. Most of the ants that had been described (and there were very few of them) were described by Europeans (Fabricius, Latreille, DeGeer, Roger, Smith, Mayr, et cetera) and the types were in European museums. Even the descriptions were in European journals. Our native workers (Say, Haldeman, Cresson, Fitch, Walsh, and others) were not primarily interested in ants but described them only incidentally.

Only one native worker, S. B. Buckley, a geologist by profession had made a rather serious and extensive attempt to describe 67 North American ants, largely from Texas, Washington, D. C., New York, Connecticut, and other localities. Not only did his work prove to be a complete fiasco but to add to the difficulties his types were lost. To date, only 10 species bear Buckley's name and these are recognized largely by Buckley's descriptions of their habits and habitats rather than by their entirely inadequate technical descriptions.

For an excellent and detailed account of the chronology of the development of North American myrmecology the reader is referred to W. S. Creighton, 1950.

The only comprehensive publication available to Pergande in the early period of his work was the section giving keys to families and genera and also a list of the described species in Cresson, 1887. Pergande's personal collecting of ants appears to have been limited to only those localities in the vicinity of Washington, D. C., as attested by such labels as old Georgetown, banks of Potomac River, Ivy City, Bladensburg Road, Corcoran Hill, Rosslyn, Va., et cetera. Like other myrmecologists, however, he also acquired specimens from special friends or by other incidental means.

Two of his friends who contributed a large number of specimens were Father P. J. Schmitt and Titus Ulke. The former sent him specimens from such localities as Beatty, Pa., Belmont, N. C., and localities in Florida and Colorado. The ants from Ulke were collected by him in the vicinity of Hill City, S. Dak., while Ulke was engaged in mining investigations. For a more detailed account see Smith, 1950.

Realizing the utter hopelessness of the North American situation where there were no colleagues to aid him, a lack of types and other authentic material with which to compare his specimens and inadequate library facilities Pergande naturally turned his attention to Europe where he had lived the early part of his life and was familiar with specialists on various groups of insects including ants. The men whose help he especially sought were Gustav Mayr of Austria, Carlo Emery of Italy, and Auguste Forel of Switzerland, three of the most noted myrmecologists of the World. This relationship resulted in these men not only identifying many of Pergande's North American ants but also in their describing many new North American species. Realizing Pergande's general interest in ants they made it a custom to send him authentically determined specimens of their own species as well as those of other authors. These specimens came from not only Europe but diverse regions of the World and quite often represented newly described species or species of new genera.

It so happened, probably not by accident, that Pergande chose to send Emery the bulk of his North American species for determination. Pergande made it a habit to split or divide his series of specimens of a given species so that Emery received part of the individuals and Pergande retained the remainder. If Emery reported the specimens to be a new species and described them, Pergande would label his individuals for example, thus, "*Formica ulkei* Emery, new sp., types." According to present day procedures, however, such a practice was incorrect for two reasons; first, the specimens retained by Pergande were not used by Emery in describing the species (although it cannot be denied they came from the original nest series) and were therefore not types, and second, if types, they should have been called cotypes since Emery did not describe the species from a single specimen or holotype but based his description on characters common to a number of individuals.

Regardless, though, of these facts there are many ants in the Pergande collection that are unusually valuable because they belong to original nest series from which species were described. The ants sent Emery by Pergande resulted in two rather large and comprehensive publications by Emery on North American ants in 1893 and 1895. For the first time there thus appeared two large, authentic and comprehensive publications that described and discussed ants from various localities but especially from the United States. It should be mentioned here, however, that a previous publication on our ants by Mayr had appeared in Vienna in 1886.

Many of the ants described by Emery were from Washington, D. C., and Hill City, South Dakota, or their vicinities and it is more than likely that these two localities have more species described from them than any other localities in the United States. According to Creighton, *loc. cit. supra,* by 1900 Emery had described approximately 108 of our forms. Although Pergande's determination labels were written in a very neat and legible handwriting his personal collection lacks a great deal of uniformity and preciseness. Quite often vital information such as specific locality, date, or collector's name is missing from pinned individuals of numerous series. One frequently finds a series of individuals of the same species for example, labeled thus, "Nebraska, 1888, No. 110."

It was a common custom for Pergande to label series with certain assigned numbers regardless of the completeness of the other data. Undoubtedly he must have had notebooks pertaining to his ant collection which gave not only the correct number of each series but all other data as well. I am indebted to the late Mr. H. S. Barber, a former coleopterist in the Bureau of Entomology, for some pertinent information concerning Pergande and his ant collection. He knew Pergande for many years and was well qualified to speak concerning him. He told me that contrary to popular belief the collection of ants was Pergande's personal one and that he kept it in his home. At his death it was given by his family through the Bureau of Entomology to the National Museum; unfortunately, however, the family did not recognize the value of his notebooks and destroyed them.

The destruction of the notebooks was one of the most calamitous things that could have happened to Pergande's ant collection. Many myrmecologists including myself have found ourselves stalemated on numerous occasions as we have sought definite information on certain specimens or series of Pergande's ants. Wishing to check further into the acquisition of the ant collection by the U. S. National Museum I requested the proper authorities there to kindly check their records for such information as to when acquired, from whom, size of collection, and details concerning number of species and also number of types. They reported that the collection was acquired by the museum in September 1916 as a gift from Miss Laura

Pergande (Pergande's daughter) through Dr. L. O. Howard, Chief, Bureau of Entomology, U. S. Department of Agriculture. The collection was recorded by them as an "exceedingly valuable" one but no data were given as to size, total number of specimens and species, or total number of types.

In 1899, Forel visited the United States. He especially visited Washington, D. C., to renew his acquaintance with Pergande. The two collected ants together along the banks of the Potomac River where they found some unusually interesting species. Forel also visited Boston as well as North Carolina. In the latter state he collected ants in such localities as Faisons, Goldsboro, Morganton, and the Black Mountains around Asheville. His visit to this country resulted in a publication by him in 1901, in which he discussed and described many ants he had collected on the trip.

It is surprising that although Pergande collected and studied ants for forty years or more he published less than half a dozen articles on them and amazingly these were not on the ants of the United States proper (with which he should have been most familiar) but with ants of such distant localities as Lower California (Mex.), Mexico, and Alaska. His papers on ants, in chronological order, were:

1894 (1893). On a collection of Formicidae from Lower California and Sonora, Mexico. Proc. Calif. Acad. Sci. ser. 2, 4: 23–36.

1893 (1893). Formicidae of Lower California, Mexico. *Op. cit.* 4: 161–165.

1896. Mexico Formicidae. *Op. cit.* 5: 858–896.

1900. Papers from the Harriman Alaska Expedition XVII. Entomological results (11): Formicidae. Proc. Wash. Acad. Sci. 2: 519–521.

1904. Formicidae of the Expedition. Harriman Alaska Expedition 9, Ins. pt. 2: 113–117. (Pp. 115–117 reprinted from Proc. Wash. Acad. Sci. 2: 519–521.)

In these Pergande described and discussed numerous species. His descriptions for that period were entirely adequate and fully demonstrated his aptitude for the work. One of the high points was his description of *Ceratopheidole*, a new subgenus of *Pheidole* which is still recognized as a valid taxon. However, a large number of Pergande's species have gradually fallen into synonymy. Of the ants which he described that are native to the United States or else occur here, there are now perhaps less than a half-dozen valid species.

In 1900, the distinguished scholar, Dr. W. M. Wheeler, joined Pergande in the field of myrmecology and continued in the field until his death in 1937. The bulk of his work on North American ants was carried out between 1900 and 1917 when he described approximately 270 forms and revised many genera. In his work with North American ants he was in constant correspondence with Pergande who furnished him numerous specimens for study as well as very pertinent notes on their history, and biology.

In summarizing Pergande's contribution to myrmecology I would say that it was not Pergande's taxonomic work on ants or his wide knowledge of them that perhaps distinguished him most but his excellence in collecting and assembling specimens as well as knowing who were the best authorities to aid him in their determination. His aid to Wheeler must have been indispensable. Pergande deserves exceptional praise for his fine collection which was without doubt the earliest, largest, and most authentic ant collection in North America and which later became the nucleus for the present ant collection in the United States National Museum.

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New Neotropical Sarcophagidae in the Vienna Museum (Diptera)

H. Rodney Dodge, Washington State University, Pullman, Washington

The following four specimens received from the Vienna Museum (Naturhistorisches Museum, Burgring 7, Wien, Austria) are of interest because they appear to represent four new species. They are of historical interest because they bear Brauer and von Bergenstamm's "det. B.B." labels and one, at least, is credited to Schiner. To the best of my knowledge their names have never been published or even cited in the literature. The types have been returned to Vienna.

Boetia fuscipenis, new species (Figs. E, F)

Length 12 mm. Differs from the genotype, *B. curiosa,* in the reduced ventralia and the shorter apical hood of the penis. The absence of anterior ACR separates this species from *B. covai,* known only from a female from Venezuela.

Male.—Front 0.14 of head width; frontal rows of 13–15 bristles, widely divergent in lower 5 pair; frontal vitta with sides parallel to the lunule; ocellar and outer vertical bristles not differentiated; antennae black, segment 3 is 2 × segment 2; arista short plumose, nearly bare; vibrissae at oral margin; facial ridge setuled halfway to lunule; cheek 0.20 of head height; occiput black haired; palpi black.

Thorax subshining, black, grey pollinose, faintly trivittate; scutellum with a faint, shallow depression. Chaetotaxy: acrostichals 0:1, weak; dorsocentrals 3:3; intraalars 1:2; supraalars 2:3; humerals 3; notopleurals 4; postalar declivity bare; scutellars 4 marginal (2 strong), 0 apical, 1 discal; propleuron bare; prosternum apparently bare; sternopleurals 3, not in a row; hypopleurals 11; beret bare; infrasquamals few. Wing subhyaline, slightly brown along the costal margin and about the anterior crossvein; vein 3 (only) setuled 0.33 to crossvein;

vein 4 acutely bent; costal spine nil; costal sections 20/35/18/52/17/5; basicosta white; epaulet black; squama entirely brown on lower lobe, the upper lobe translucent. Legs black, ordinary, the hind tibia with villosity, mid tibia with a comb-like row of 15 small bristles; hind coxae with a row of minute setules behind.

Abdomen black, shining, devoid of pollen; 3rd tergum without median marginals; sterna 1–4 with erect setae; sternum 5 deeply cleft, with 2 finger-shaped lobes, strongly setose, on sides of the cleft. Genital segments red, shining, the first black at base and with a marginal row of 10 stout bristles. Forceps widely separated, the tips narrower and parallel; in side view the forceps are straight and sharp, moderately haired at base. Claspers unequal, the posterior slender, hooked at apex, the anterior stouter, with a patch of setules on its back. Penis 2-segmented, brown, with a blackish band at its middle, ventralia much reduced; apical cowl much shorter than in *curiosa*.

Holotype, male: "Kaol. (or Kad.) VENEZUELA, 1857" and "*fuscipenis* det. B.B."

Chlorosarcophaga bicolor, new species (Fig. D)

Length 13.5 mm. Differs from *Chlorosarcophaga cognata* (Walker) by its metallic color and much shorter anterior clasper, from *C. cochliomyia* by the red genital segments and in details of the penis.

Male.—Front 0.23 of head width; frontal rows 7–8, diverging in anterior 1–2 pairs; frontal vitta about a third of front, the sides parallel, not widening at lunule; ocellar and outer vertical bristles differentiated; parafrontofacial yellow, without setules or hairs; antennae black, segment 3 is 2.6 × antennal segment 2; arista plumose on basal 0.5, upper rays in a single row; vibrissae at oral margin, span twice the width of parafacial; cheek black-haired, 0.23 of head height; posterior orbits yellow; occiput black haired, a few yellow hairs below the neck. Palpi black, slender throughout.

Thorax dark metallic blue with grey pollen, trivittate. Chaetotaxy: acrostichals 0:1, weak; dorsocentrals 3:3; intraalars 1:2; supraalars 3:3; humerals 3; notopleurals 4; postalar declivity bare; scutellars 3–4 marginals (2 strong), no apical, 1 discal; propleuron bare; sternopleurals 3, not in line; hypopleurals 9, beret bare; infrasquamals present. Legs black, the hind tibia brown; tibia non-villose; mid femur with 2 A, 1 AV and ventral villosity; comb absent; mid tibia without AV bristle; hind coxa setuled behind; hind trochanter with a patch of stubby bristles. Wing subhyaline, veins brown, vein 3 setuled half way to crossvein; vein 4 acutely angled; costal spine absent; costal sections broken; basicosta white; epaulet black; squama white with white fringe.

Abdomen dark metallic blue with thin grey pollen; third tergum with marginal row; sternum 5 deeply cleft; genital segments red, shining, the first with interrupted marginal row of 7 weak bristles; claspers subequal in size; penis 2-segmented, the club moderate sized, with well developed ventralia.

Holotype, male: "Lindig, 1864, VENEZUELA" and "*bicolor* Schiner, det. B.B." The specimen has been repinned on a pin of smaller diameter.

Emdenimyia xanthophorina, new species (Fig. C)

Length 9.7 mm. A species close to *E. biseriata* Dodge, also from Venezuela. It resembles *biseriata* in the coloration of the fourth tergum but differs by the large thorn or spur on the anterior clasper.

Male.—Front 0.15 of head width; frontal rows of 12–13 bristles, widely diverging in the anterior 3 pairs; frontal vitta slightly widening at the lunule; ocellar bristle developed; outer vertical not differentiated; parafrontofacial golden yellow, bare; antennae black, segment 3 is 2.4 × segm. 2; arista plumose on basal 0.75, the upper rays in a single row; vibrissae at oral margin; facial ridge bristled 0.80 to lunule; cheek yellow and grey, 0.17 of head height. The point of attachment of head to body seems to be unusually low; posterior orbits golden; occiput black haired, a few white hairs below the neck. Palpi black, subclavate.

Thorax black with yellow pollen, broadly trivittate. Chaetotaxy: acrostichals 0:1; dorsocentrals 2:2, the posterior in a row for 3, the middle bristle missing; intraalars 1:2; supraalars 1:3; humerals 3; notopleurals 4; postalar declivity setuled; scutellars 2 marginal, no apical, 1 discal; propleuron and prosternum setuled; sternopleurals 3, not in line; hypopleurals 8; beret setuled; infrasquamals few. Legs black, the middle and hind tibia villose; mid femur without comb; mid tibia without AV bristle; hind coxae sparsely setuled behind; hind trochanter with a patch of stubby bristles. Wing elongate, subhyaline, the veins brown, vein 3 setuled half way to crossvein; vein 4 bent at right angle; costal spine nil, costal sections 20/33/22/46/20/4; basicosta white; epaulet black; squama white, the lower lobe with vague median cloud, the fringe hairs yellow at the fold.

Abdomen black, strongly dusted with yellow pollen, weakly tessellated; tergum 4 all yellow except for a shining T-shaped area; tergum 3 without median marginal bristle; sterna 2–4 with thin, recumbent hairs; sternum 5 deeply cleft, the arms of the cleft simple; genital segments black with yellow pollen, the first with a marginal row of 10 weak bristles. Forceps contiguous to tips, straight and sharp; anterior clasper two-thirds as long as penis, with a huge recurved thorn on back edge near base; penis with the usual prickly area apically.

Holotype male: "Kad. Venez. 827" and "*xanthophor.* det. B.B.," returned to Vienna.

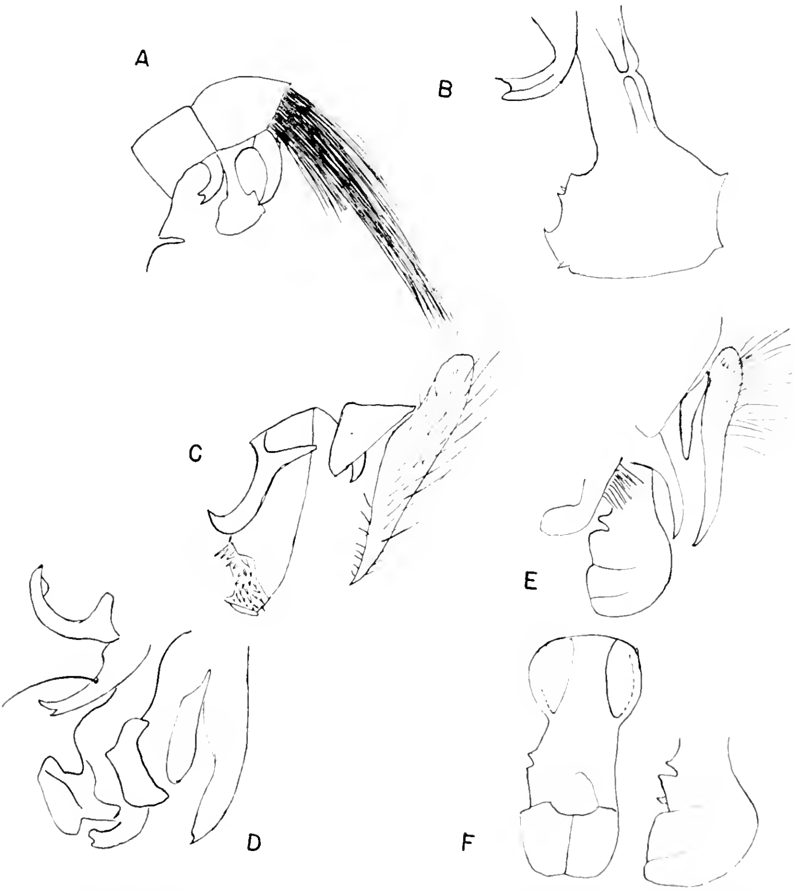
Winthemiola new genus

This genus is based on *Winthemiola calceata* new species, a species with an extraordinarily well developed beard of long villous hairs on the basal half of the forceps. Otherwise in external anatomy much like *Boettcheria*—even possessing a patch of stubby bristles on the hind trochanters. The genitalia are unlike *Boettcheria.* The other characters of this genus are elucidated in the description of *calceata,* which see.

Winthemiola calceata, new species (Figs. A, B)

Length 14 mm.

Male.—Front 0.165 of head width; frontal rows of 13–15 bristles, widely divergent in the anterior 4–5 pairs; frontal vitta dull black, widening to the lunule; ocellar and outer vertical



A. *Winthemiola calceata,* lateral view of genital segments. B. *Winthemiola calceata,* penis and anterior clasper. C. *Emdenimyia xanthophorina,* lateral view of genitalia. D. *Chlorosarcophaga bicolor,* lateral view of genitalia. E. *Boctia fuscipenis,* lateral view of genitalia. F. *Boctia fuscipenis,* penis in tilted posterior and lateral views.

bristles not differentiated; parafrontofacial silvery grey, with an irregular row of setules becoming hair-like below; antennae brown, segment 3 darker and 2 × segment 2; arista plumose on basal 0.67, the upper rays in a single row; vibrissae near oral margin, span 1.7 × width of parafacial; vibrissal axis nearly as long as antennal axis; cheek black-haired, 0.24 of head height; occiput with 4 rows of black hairs; palpi brown, subclavate.

Thorax black with grey pollen, trivittate. Chaetotaxy: acrostichals none; dorsocentrals 3:3; intraalars 1:2; supraalars 2:3; humerals 3; notopleurals 4; postalar declivity strongly haired; scutellars 2 marginal, 1 apical, 1 discal; propleuron bare; prosternum nearly bare; metasternum pilose; sternopleurals 3, in line; hypopleurals 12; beret setuled; infrasquamals present. Wing subhyaline, veins brown, vein 3 setuled 0.5 to crossvein; costal spine absent; costal sections 20/33/22/46/15/6; basicosta yellowish brown; epaulet black; squama white with a brown cloud, the fringe hairs brown at the fold, the long hairs continuing nearly to the outer posterior corner of the lower lobe. Legs black, the trochanters, knees, and tibia brown; mid femur with 5 A, 4–5 AV (followed by a row of closely set small bristles) 5 P and a comb of 12–14 bristles, the basal half with numerous PV villous hairs; mid tibia with long AD and AV bristles; hind femur with AD and A rows, a single subapical AV bristle and numerous villose hairs. Hind coxae setuled posteriorly; hind trochanter with a patch of stubby bristles.

Abdomen black, with thick grey pollen faintly tessellated, in posterior view with a median dorsal line; third tergum with no median marginal; sterna 3–4 with minute, prostrate hairs in contrast to the erect setae of sterna 1–2; sternum 5 broadly cleft, with a strong, erect tooth on each side near the middle. Genital segments shining, red, the first black basally and with a marginal row of 12 bristles. Forceps widely separated, curved to sharp points, on base with an extremely large brush of fine, villous hairs; claspers subequal, the posterior with a moderate hair, the anterior bifid at apex. Penis unsegmented, apically enlarged and inflated, the ventralia slightly developed.

Holotype male: "BRASILIA, Coll. Winthem" and "*calceata*, det. B.B.," returned to Vienna. One paratype, San Bartotoma, Lima, Peru, 15–III–28, in U. S. National Museum.

The Genus Oligotrophus Latreille (Diptera: Cecidomyiidae) in North America and a New Species Injurious to Betula papyrifera Marsh

RAYMOND J. GAGNÉ, Entomology Research Division, Agr. Res. Div., U. S. Department of Agriculture, Washington, D. C.

The genus *Oligotrophus* may be distinguished from all other genera of North American Oligotophini by the following combination of characters: palpus three-segmented, claws simple, R_5 reaching costa beyond the apex of the wing, and the ovipositor long or short but not cultriform. Following is a key to the six species of *Oligotrophus* known to occur in North America.

Key to species of *Oligotrophus* in North America

1. Third palpal segment at least 1.5 times as long as second...2
   Third palpal segment shorter than or equal to second......5
2. Third palpal segment 2.5 times as long as second; ovipositor protrusible, long, without lateral lamellae; female only; host unknown................**vernalis** Felt
   Third palpal segment less than twice the length of second...3

3. First palpal segment at least 1.5 times the length of second; male, distimere without medial projections; female, tip of ovipositor with long, numerous, distally recurved setae; reared from apical branchlet galls on *Juniperus mexicana* Streng..... **pattersoni** White
   First palpal segment slightly longer to shorter than second; genitalia different from above.................. 4
4. Male, flagellomeres with stems about 0.5 length of node, nodes globular; female, ovipositor simple, rounded, without lateral lamellae; reared from seed galls on *Betula* spp................. **betulae** (Winnertz)
   Male, flagellomeres parallel-sided with stems shorter than 0.2 length of node; female, ovipositor with lateral lamellae; causes damage to buds of Betula papyrifera Marsh.................... **papyriferae** n. sp.
5. Palpus without spiniform setae, second segment no wider than third; causes leaf galls on *Salix humilis* Marsh............................... **salicifolius** Felt
   Palpus with spiniform setae, second segment wider than third; reared from apical branchlet galls on *Juniper utahensis* (Englem.) Lemmon, *J. ashei* Buckz. (*Sabina sabinoides*), and several varieties of *J. virginiana* L........................ **betheli** Felt

Felt (1918) erected the genus *Alassomyia* on the basis of one female specimen with supposedly toothed claws but otherwise with the characters of *Oligotrophus*. Upon examination of the type-species, I find the claws to be simple and therefore consider *Alassomyia* a synonym of *Oligotrophus*. *A. juniperi* Felt, the only included species, is a new junior synonym of *O. betheli* Felt.

I consider *Semudobia* Kieffer another subjective synonym of *Oligotrophus* which Kieffer (1913) erected for *O. betulae* (Winnertz) because of the median projection of the basimeres of the males. *Oligotrophus* is a fairly diverse genus and, if one could justify splitting it on the basis of differences in the genitalia alone, one could erect a new genus for each of the five other North American species. At present, *Oligotrophus* is a convenient, subjective grouping. When more species are known, it may aid in identification and in demonstrating relationships to erect new genera.

Mayetiola inquilinus (Felt), new combination, is herein transferred from *Oligotrophus* because it possesses a four-segmented palpus, though reported by Felt (1915) as three-segmented. *O. vernalis* Felt may also belong to *Mayetiola*. Only one whole palpus remains on the one specimen, and its long third segment may be a fusion of a normally four-segmented palpus. For the time being, however, it is retained in *Oligotrophus*.

O. apicis Appleby & Neiswander and *Mayetiola sabinae* (Felt), as well as *Alassomyia juniperi* Felt discussed above, are new junior synonyms of *O. betheli* Felt. The interparameral organs, "structure A" of Appleby and Neiswander (1965), thought to be absent from the male genitalia of *O. betheli* are not, and any difference in the structure of the distimeres of the two species is the result of their position on the slide mount. The holotype and only specimen of *M. sabinae* was mounted in such a way that the number of palpal segments was not visible. After remounting the type, it was obvious that this species is the same as *O. betheli*.

Lectotypes are here designated for the following Felt species: *O. salicifolius*. Lectotype: ♂; Karner, N. Y.; April, 1910; a2017. Paralectotypes: (all from Karner, N. Y.; a2017) 1 ♂, Mar. 31, 1910; 1 ♀, 2 pupal exuviae, 2 larvae, April 1, 1910; 1 ♀, April 2, 1910; 1 ♀, April 6, 1910.

O. betheli. Lectotype: ♀; McCoy, Colo.; Bethel; July 1, 1912; a2303. Paralectotypes: 2 ♀♀, 2 pupae (1 ♂, 1 ♀) and 2 pupal exuviae, all with same information as lectotype; 1 ♀, same locality and type number; June 25, 1912; *Juniperus utahensis*.

The above lectotypes and paralectotypes are on temporary loan to the U. S. National Museum from the N. Y. State Museum in Albany.

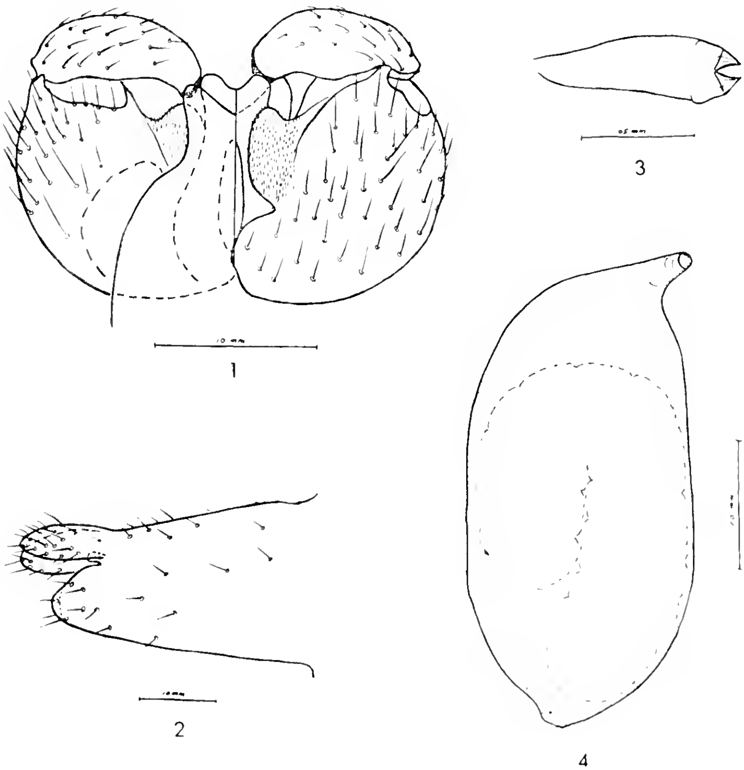
Dr. Louis F. Wilson of the North Central Forest Experiment Station and Mr. Murray Hanna of the Michigan Department of Agriculture in Lansing, Mich., collected and reared specimens of the new species described below and kindly submitted them to me for description. This species is of some economic importance because the larvae bore within and kill the affected buds of paper birch, *Betula papyrifera*. In the fall the larva makes an exit hole, usually near the base of the bud, and drops to the duff where it forms a cocoon in which it apparently overwinters before pupating in the spring.

Oligotrophus papyriferae, n. sp.

Adults. Wing length: male, 2.63–2.73 mm; female, 2.42–2.94 mm. Flagellomeres: 12; parallel-sided with short, distal stems except terminal one which is tapered distally; one circimfilum on proximal third of nodes and two on distal half, though they may be variously interconnected vertically, especially the distal pair; roughly two whorls of setae, one proximad to basal circumfilum, the other between the two distal circimfila. Third flagellomere of male: total length, 0.100–0.105 mm; width, 0.038–0.045 (figures may be high due to slight compression under cover slip on slide mount); length of distal stem, 0.010–0.015. Third flagellomere of female: total length, 0.070–0.085; width, 0.040–0.043; length of distal stem, 0.035–0.055. Palpus: length first segment, 0.035–0.060 mm; second, 0.035–0.055; third, 0.085–0.100; proportions about 1:1:2. Frontoclypeal setae, 3–8 (avg. of 9 observations, 6); subalar sclerite setae, 7–17 (avg. 9); scutellar setae 4–16 (avg. 8). Length of tarsal segments: I, 0.100–0.120 mm. (avg. of 9 observations, 0.108); II, 0.335–0.425 (0.377); III 0.165–0.235 (0.193); IV, 0.105–0.140 (0.126); V, 0.085–1.115 (0.102). Claws evenly curved. Empodium discoid, about 0.028 in diameter, 0.008 in thickness, approximately as long as claws. Pulvilli about 0.015 mm long. Male terminalia (Fig. 1): basimeres stout with medial projections clothed with thick, short hair; tenth tergum bifid; tenth sternum bifid with projections rounded; aedeagus short. Female terminalia (Fig. 2): short, 0.225–0.265 mm in length, approximately one-eighth length of abdomen; lateral lamellae present.

Last-instar larvae. Length 2.1–3.0 mm. All papillae apparently without setae and for that reason difficult to detect. Visible are four lateral groups each with three papillae, on the ventral surface of the three thoracic segments, four fore ventral papillae on the abdominal segments and four terminal papillae slightly raised on short humps. Rounded, smooth verrucae cover the integument except on the smooth intersegmental membranes and on the midventer of all segments where verrucae are slightly pointed. Sternal spatula (Fig. 3) bifid, weakly developed, the two points turning in slightly toward each other.

Cocoons (Fig. 4), 2.75–3.35 mm in length. Formed in duff after larva has escaped from bud. Hyaline, brittle, cylindrical, posterior end broadly rounded, anetrior end tapered and open



O. papyriferae n. sp. Fig. 1. Male terminalia: left half, dorsal view; right half, ventral. Fig. 2. Female terminalia. Fig. 3. Sternal spatula of larva. Fig. 4. Cocoon with larva curled up within (diagrammatic).

at the end to form a small chimney. Position of the larva sometimes straight with head toward chimney but more often in a bent-double position, ventral side out.

Pupae. Unknown.

Material examined. Holotype: "♂; 66 12230; from buds of *Betula papyrifera,* Sanilac Co., MICH.; M. Hanna Coll.; reared in lab, 4–20–1966; U.S.N.M. Type No. 69070." Paratypes: 5 males, 10 females, all with same data as holotype; 3 larvae: "ex cocoons, nr Port Sanilac, Mich., 10–25–1965"; 5 larvae: "ex birch buds, Fort Sanilac, Mich., 10–81965; L. W. Wilson & M. Hanna." Other material: 27 cocoons with larvae from Port Sanilac, Mich., 10–25–1965. Four paratypes (2 males, 2 females) deposited in Michigan State University, East Lansing, Mich. All other material deposited in the U. S. National Museum.

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Three New Reared Braconidae (Hymenoptera)

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

Names have been requested for the three new species of Braconidae described here in order that they may be available for use in papers dealing with the ecology and biology of these forms.

Orgilus indagator, new species

This form is structurally most similar to *O. cuneatus* (Provancher) but it is considerably larger, the ovipositor sheath is relatively shorter and the legs and abdomen are darker.

Female.—Length about 3.2 mm. Head a little wider than thorax, in dorsal view 1.7 times as broad as long; face very slightly wider than eye height and very finely shagreened though shiny; malar space about 0.4 as long as eye height; longest segment of maxillary palpus about as long as malar space; temples receding from eye margins, smooth and polished, and at mid-eye point about 0.75 as wide as eyes; cheeks finely shagreened; vertex weakly alutaceous; ocellocular line about twice as long as diameter of an ocellus; antennae of available specimens 30- or 31-segmented, a few of the preapical segments not distinctly longer than broad.

Mesoscutum faintly alutaceous and with extremely shallow setiferous punctures which are indistinct posteriorly and are most distinct anteriorly on the middle lobe; notauli sharply impressed, foveolate, meeting only slightly before posterior margin of mesoscutum; scutellar sulcus very large and deep and finely foveolate; propodeum closely rugulose, with prominent stubs of several carinae arising from the posterior margin and setting off five impressed areas that are open anteriorly; side of pronotum rugulose except below the impression where it is finely granulose or shagreened and mat; mesopleuron smooth and polished, the longitudinal furrow slightly curved and foveolate; metapleuron rugose posteriorly, granulose and rather mat anteriorly. Hind coxa 0.6 as long as hind femur, minutely granulose and not strongly shiny; hind femur more than four times as long as broad; inner calcarium of hind tibia fully half as long as metatarsus; tarsal claws simple. Radial cell on wing margin hardly as long as stigma; second abscissa of radius on a line with intercubitus; stub of third abscissa of cubitus a little longer than second abscissa, which is about half as long as the recurrent vein; nervulus slightly postfurcal; lower abscissa of basella much longer than nervellus, half as long as mediella, and more than half as long as maximum width of the hind wing; radiellan cell at widest point at least as wide as cubitellan cell at narrowest.

Abdomen a little narrower than thorax; first tergite a little longer than broad at apex, closely rugulose, the dorsal keels indistinct; second tergite as long as broad at base, finely rugulose except narrowly along posterior margin where it is smooth and polished; suturiform articulation sharply impressed; third tergite sculptured like the second, though somewhat more weakly, and more broadly smooth along posterior margin; fourth tergite sometimes weakly punctate or shagreened in part; ovipositor sheath about as long as abdomen.

Black; antennal flagellum brownish yellow except on apical third where it is darkened; scape pale below, dark above; palpi pale; tegulae yellowish; wings hyaline or nearly basally, a little infumated on apical half; legs yellowish brown, the hind coxae more or less darkened; hind femora darkened apically, especially above and inwardly; hind tibiae apically and hind tarsi blackish; abdomen black, sometimes with faint reddish spots in the apical lateral angles of the first and second tergites.

Male.—Antennae of available specimens 31- to 33-segmented, with even the shortest segments much longer than broad; palpi darkened; legs more extensively darkened than in the female.

Holotype.—U. S. National Museum No. 69367.

Described from 9 females (one the holotype) and 9 males (one the allotype), all reared from larvae of *Trichotaphe levisella* Fyles at Eaglenest, MINNESOTA, in July, 1964, and August, 1965, by W. V. Balduf.

Oncophanes pusillus, new species

This is most similar to *O. americanus* (Weed) but it is smaller, and the thorax, except the anterior part of the prothorax, is entirely black; in *americanus* the thorax is more or less reddish testaceous, sometimes entirely so, and the sternum, at least, is never darkened. In addition, there are differences in sculpture and in the areolation of the propodeum.

Female.—Length barely 2 mm. Head as seen from above slightly wider than thorax and less than twice as wide as long, smooth and polished; temples about three-fourths as wide as eyes; malar space a little shorter than minimum width of temple; ocelli small, the distance between the lateral ocelli about twice the diameter of one of them; ocellocular line much longer than base of ocellar triangle; antennae filiform, very slender, 21- to 23-segmented in the specimens available, the segments successively shorter but even the apical segments twice as long as broad.

Mesoscutum smooth and shining; notauli finely impressed and meeting at posterior margin of scutum; a few short longitudinal striae in the area where the notauli meet; scutum very sparsely hairy, especially on the lateral lobes, which are almost bare; scutellar sulcus deep and long, more than half as long as scutellum, a little roughened and with a median longitudinal septum; scutellum slightly convex, a little longer than broad, smooth; metanotum nearly as long as scutellum, finely rugulose; propodeum rugulose but shiny and without conspicuous hairs; areola of propodeum sharply defined, pentagonal, strongly petiolate, the petiole nearly half as long as the areola; the large basal lateral areas smooth basally; side of pronotum smooth above, foveolate in the furrow; mesopleuron smooth and shiny except for a small rugose area in the basal angle and a finely foveolate, straight longitudinal furrow below; metapleuron entirely strongly rugose. Wing venation essentially as in *americanus,* although usually mediella is a little shorter, being normally not distinctly longer than basal abscissa of basella.

Abdomen usually about as wide as thorax, and about as long; first tergite as long as broad at apex, longitudinally striate, the striae minutely punctate or granulose; the fused second and third tergites about as long as wide at widest point, finely longitudinally striate, the striae finely granular, those on the second tergite nearly parallel, those on the third tergite somewhat finer and usually diverging more or less. Ovipositor sheath about as long as the fused second and third tergites.

Head black; antennae piceous, the scape and pedicel paler; palpi pale; thorax black except anterior part of prothorax which is testaceous; wings hyaline, stigma and veins very pale brown; legs, including all coxae, yellow; second and third tergites ranging in color from dark brown to brownish yellow; the first tergite and the apical tergites darker.

Holotype.—U. S. National Museum No. 69368.

Described from 9 females (one the holotype) reared by W. V. Balduf at Eaglenest, Minnesota, July 6, 1964, from the gelechiid *Trichotaphe levisella* Fyles. The National Museum collection also contains several specimens of both sexes (not included in the type series) that were collected in August and September, 1959, in Florence County, Wisconsin, by R. L. Giese. In the males of this series the antennae are 19- to 21-segmented.

Bracon cuscutae, new species

This seems not to be closely related to any described species of *Bracon*. The combination of a smooth and polished frons, rather thin head, antennae with few and unusually long flagellar segments, longitudinally striate second and third tergites, and comparatively long ovipositor, appears to set it off as a very distinct and easily recognizable form.

Female.—Length around 2 mm. Head in dorsal view a little more than twice as broad as long, entirely smooth and polished; eyes large; temples rather strongly receding, less than half as wide as eyes; malar space about as long as pedicel of antenna; antennae 19- to 21-segmented in the available specimens, all flagellar segments at least twice as long as broad.

Thorax compact; mesoscutum smooth and polished; notauli not, or only very faintly, indicated; surface of scutum without hairs except for a very few in the lines where the notauli would be if they were present; scutellar furrow rather fine, with 8 or 10 small foveolae; scutellum nearly flat, smooth and polished; propodeum smooth and polished laterally; a well developed stub of a median longitudinal carina arising from the posterior margin of propodeum and extending forward, sometimes nearly to the middle, and each side of this carina a little weak sculpture; pleura smooth and polished. Radius arising from slightly before middle of stigma; first abscissa of radius about as long as width of stigma and half, or nearly half, as long as second abscissa; third abscissa going almost to apex of wing and a little more than twice as long as second abscissa; section of cubitus between recurrent and first intercubitus not more than half as long as first abscissa of radius. Legs slender.

Abdomen about as long as thorax; first tergite smooth medially, finely rugulose laterally and at the posterior margin; second tergite about three times as broad as long, its posterior margin straight, most of its surface finely longitudinally striate; sutiriform articulation well impressed and strongly foveolate; third tergite nearly as long as second and similarly, though more finely, striate, smooth laterally; fourth and following tergites smooth and polished, the fourth sometimes with a little indistinct sculpture; ovipositor sheath as long as abdomen and propodeum combined.

Testaceous; head black, the face often yellowish brown except for a blackish median spot; scape yellowish, pedicel and flagellum of antenna piceous to black; wings weakly infumated, stigma and veins brown; legs yellow, the hind tibiae darkened except basally and the hind tarsi with first and fifth segments dark, the intermediate ones paler.

Male.—Essentially like the female but a little smaller and more slender. Antennae of the available specimens 16- to 21-segmented.

Described from 9 females (one the holotype) and 10 males (one the allotype) reared by D. M. Anderson at Washington, D. C. from *Smicronyx* sp., apparently *S. tychiodes* LeConte, in dodder during 1964, most of them, including the holotype, in August, others in September and November; and 1 female from *Smicronyx tychiodes,* Washington, D. C., July 24, 1879. This last specimen had been labeled by Ashmead with a manuscript name but was never described.

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ENTOMOLOGICAL NEWS

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A New Species of Tuckerella (Acarina: Tuckerellidae) from Nevada[1]

Clive D. Jorgensen[2]

Tuckerellidae contains only one genus (*Tuckerella*) Womersley with four species and none which are certain to be native to North America, although *ornata* and *pavoniformis* have been collected occasionally (Baker and Pritchard, 1953) in Florida and California. Only adult females were described until Miller (1964) described males, females, nymphs, and larvae for *flabellifera* from Tasmania. Miller also corrected the sex determination of the specimen Womersley (1957) used to describe *spechtae*. It was a male rather than a female. Thus, females are known for *ornata, pavoniformis,* and *flabellifera;* males for *flabellifera* and *spechtae*; and immature stages for *flabellifera.*

This paper will describe females, males, and nymphs of a new species collected from *Coleogyne ramosissima, Atriplex canescens,* and *Atriplex confertifolia* at the U. S. Atomic Energy Commission Nevada Test Site. As near as can be determined, this is the only species known to be a native of North America. A revised key to the adults of all *Tuckerella* is also included.

[1] This study (No. COO-1336-3) was supported, in part, by U. S. Atomic Energy Commission grant AT(11-1)-1336 to Brigham Young University, Provo, Utah.

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

Key to the known species of *Tuckerella*

1. Last four palmate setae on dorsal hysterosoma equal or subequal in size 2
   Last four palmate setae on dorsal hysterosoma with lateral pair larger than medial pair 4
2. Five pairs of flagellate caudal setae .... **ornata** (Tucker)
   Seven pairs of flagellate caudal setae 3
3. Flagellate setae all equal length, dorsal opisthosomal setae subequal .... **coleogynis** sp. nov.
   Flagellate setae not all equal (third pair from lateral margin shorter), dorsal opisthosomal setae not equal .... **spechtae** Womersley
4. Five pairs of flagellate caudal setae ... **flabellifera** Miller
   Six pairs of flagellate caudal setae .... **pavoniformis** (Ewing)

Tuckerella coleogynis sp. nov.

Female (Fig. 1)—Body semi-oval, sometimes truncate posteriorly; divided with sutures between propodosoma, metapodosoma, and opisthosoma; dorsal integument reticulate with striations within depressions. Two eyes on each side. Four pairs of palmate propodosomal setae, the fourth (posterolateral) being largest and flared out posteriorly. Four pairs of palmate dorsal metapodosomal setae and three pairs of laterals. Seven pairs of palmate dorsal opisthosomal setae (three pairs on anterior margin, four pairs on posterior) and four pairs of laterals. All dorsal opisthosomal setae subequal. Seven pairs of flagellate caudal setae, longer than body, ciliated on proximal end only; one pair of medio-caudal foliaceous setae; all caudal setae arising from tubercles arranged in straight row. Palpus five segmented, the fifth developed into a distinct thumb with stout terminal sensory setae and four additional setae, claw well developed. Legs short and stout with two well developed claws and pulvillus; tenant hairs from base of claws and pulvillus; tarsus I with two sensory rods, the distal rod about twice the length of the proximal; tibia I and tarsus II each with one sensory rod; palmate setae on dorsal surface of legs, some being replaced by foliaceous setae on leg IV. Eight pairs of setae in genito-anal region.

Male (Fig. 2)—Similar to female except dorsal palmate setae on opisthosoma tend to be more pointed and the lateral palmate setae more truncate; single pair of medio-caudal foliaceous setae rather small. Palpus five segmented with distinct

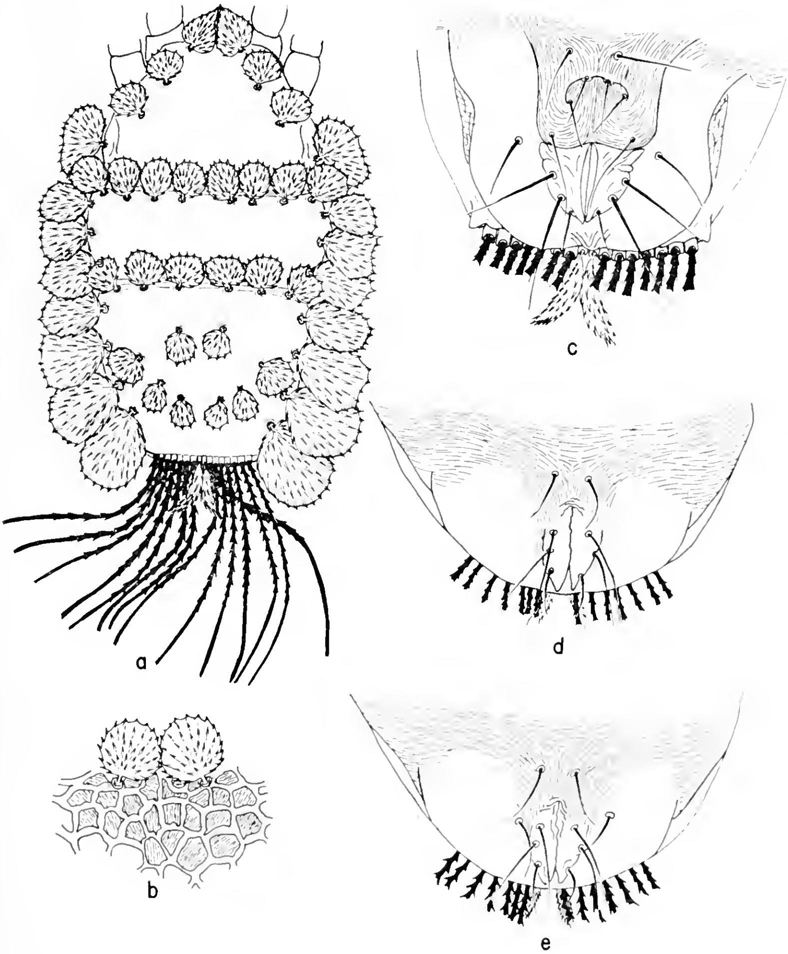

Fig. 1. *Tuckerella colcogynis*: (a) dorsal aspect of the female, (b) texture of the dorsum, (c) ventral opisthosoma of the female, (d) ventral opisthosoma of the protonymph, and (e) ventral opisthosoma of the deutonymph. Flagellate caudal setae are not complete.

thumb and claw, thumb with one stout terminal sensory setae and three additional setae. Tarsus I with two sensory rods subequal in size. Tibia I with a very small sensory rod, tarsus II, III, and IV each with a sensory rod approximately the same size as that on tarsus I. Six pairs of setae in genito-anal region. Aedeagus is short, stout, and curved slightly dorsally.

Protonymph (Fig. 1d)—Dorsal palmate setae similar to those of female. Dorso-lateral setae of propodosoma oval, but all others somewhat lanceolate. Seven pairs of flagellate caudal setae and one pair of medio-caudal foliaceous setae. One sensory rod on tarsus I and II, rod on tarsus I slightly longer than rod on tarsus II. Four pairs of setae in genito-anal region.

Deutonymph (Fig. 1e)—Dorsal palmate setae similar to those of protonymph except dorso-laterals are slightly broader. Two sensory rods on tarsus I, the proximal about one-third as long as the distal. One sensory rod on tarsus II. Five pairs of setae in the genito-anal region.

Tritonymph (Fig. 2b)—Dorsal palmate setae similar to those of the female, except dorso-laterals are somewhat more lanceolate. Caudal setae similar to those of female. Sensory rods on legs similar to those of the deutonymph. Six pairs of setae in the genito-anal region.

Holotype (female) and *Allotype* (male)—the holotype was collected from *Coleogyne ramosissima* at the U. S. Atomic Energy Commission Nevada Test Site, Nye County, NEVADA, September 12, 1960. The allotype was collected from debris at the base of *C. ramosissima* on July 10, 1961. These specimens are deposited in the author's collection at Brigham Young University, Provo, Utah.

Paratypes—Three protonymphs, one deutonymph, 31 tritonymphs, 22 females, and 16 males were collected from the Nevada Test Site. All males, all protonymphs, all deutonymphs, 29 tritonymphs, and one female were collected from debris at the base of *C. ramosissima* on July 10, 1961. The females were collected from foliage and debris during winter, spring, and summer. They were collected from *Atriplex confertifolia,* and *Atriplex canescens* in addition to *C. ramosissima.* These speci-

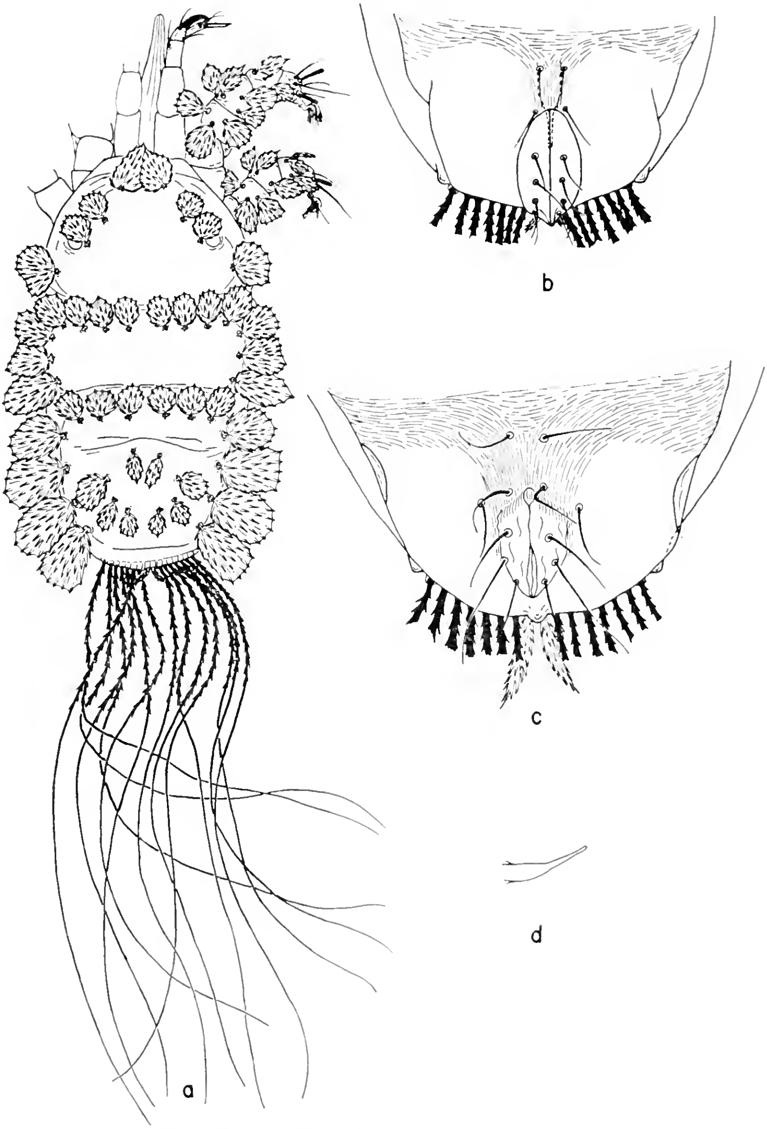

FIG. 2. *Tuckerella coleogynis*: (a) dorsal aspect of the male, (b) ventral opisthosoma of the male, (c) ventral opisthosoma of the tritonymph, and (d) lateral aspect of the aedeagus. Flagellate caudal setae are not complete in 2 (b) and (c).

mens are deposited with the author at Brigham Young University, Provo, Utah.

Diagnosis

Tuckerella coleogynis is most closely related to *T. spechtae*, but differs in the following characteristics: *coleogynis* has all flagellate caudal setae about equal in length and all dorsal opisthosomal setae are subequal; *spechtae* males have the third pair of flagellate caudal setae much shorter than the remainder, and the last four dorsal opisthosomal setae plus the lateral pair on the anterior margin much smaller than the remainder. All immature stages in the life cycle of females can easily be distinguished from the other species by the number (seven) of caudal flagellate setae.

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Nomenclature Notice

Possible use of plenary powers by the Commission is announced for the following, the case number being in parenthesis: Hymenoptera: (1689) grant of availability for certain "section" names of de Saussure. Diplopoda: (1785) Validation of emendation to **Polyxenus** of **Pollyxenus** Latreille, 1802–1803. Send comments, with case number, in duplicate to International Commission on Zoological Nomenclature, c/o British Museum (N.H.), Cromwell Road, London S.W. 7, England. (See *Bull. zool. Nomencl.* 24, pt. 1.)

Cold Hardiness in Overwintering Juvenile Grasshoppers [1]

GORDON ALEXANDER, Department of Biology,
University of Colorado

Most species of grasshoppers in cold or temperate regions pass the winter in the egg stage, but a few species overwinter as intermediate juvenile instars. While the embryonic stages are known to be tolerant of very low temperatures (Uvarov, 1966) apparently no studies of cold-hardiness in overwintering nymphs have been reported. The present paper summarizes observations on the extent and nature of such cold-hardiness.

Species with overwintering nymphs hatch in late summer, molt two or three times before the first freezing temperatures, and are usually in the third or fourth instar before the first severe cold spell. They complete their molts during the following spring, when increasing photoperiod seems as much a factor in stimulating molting as is increasing temperature (Halliburton and Alexander, 1964).

In the region around Boulder, Colorado, at least five species of Acrididae have this type of life cycle. One of these, *Psoloessa delicatula* (Scudder), is quite rare. Another, *Chortophaga viridifasciata* (DeGeer), is restricted to grassy areas below 7,000 feet in altitude and is only locally common. The other three, *Eritettix simplex* (Scudder), *Arphia conspersa* Scudder, and *Xanthippus corallipes* (Haldeman) are all relatively abundant and rather widely distributed. These three, hereafter referred to only by generic names, occur on the plains and up to various altitudes in the Front Range of the Rocky Mountains—*Eritettix* to 9,000 feet, *Arphia* to above 10,000 feet, and *Xanthippus* to timber line and above (11,000 feet). This report deals primarily with cold-hardiness in these three, last named species, with only an incidental observation on the other two.

One might assume that these overwintering nymphs are dor-

[1] This study was made possible by N.S.F. Grant G-5507 and a grant in aid from the Council on Research and Creative Work, University of Colorado, both here gratefully acknowledged.

mant ("hibernating") during the entire winter, but this is not the case. The young grasshoppers are periodically active, during mild weather, even when such weather follows cold periods of − 18° C (0° Fahr.) or lower. *Active* nymphs of the three commonest species have been collected near Boulder in every winter month. While undoubtedly protected by snow cover at times, they are exposed to extreme cold at other times—during periods of dry cold weather in which ground vegetation and soil surface are at temperatures far below 0° C—and these nymphs are most abundant on south facing slopes, where snow does not persist.

It is obvious that these juvenile grasshoppers are much more tolerant of low temperatures than are adult grasshoppers of typical summer species. A few individual adults survive until after the first "hard" freeze, but they soon disappear; they do not have the cold-hardiness of overwintering juveniles.

A simple, recently performed experiment illustrates this basic difference. This account serves, at the same time, to describe a particularly significant experiment in a series with similar results: On November 7, 1966, when the air temperature was about 15.5° C (60° Fahr.), late surviving adults of four summer species and juveniles of four overwintering species were collected on the dry, southeast slope of a grassy mesa (elevation 5,800 feet) near Boulder. (This was the last of several warm days following a cold period in which the air temperature had dropped to about − 6.6° C (20° Fahr.)). The adults were: *Hypochlora alba* (Dodge) (1 female); *Melanoplus keeleri luridus* (Dodge) (2 males, 3 females); *Phoetaliotes nebrascensis* (Thomas) (1 male, 1 female); and *Encoptolophus sordidus costalis* (Scudder) (1 female). The juveniles were: *Arphia conspersa* (4 fourth instar, 16 fifth instar); *Eritettix simplex* (11, all fourth instar); *Chortophaga viridifasciata* (1 fourth instar); and *Psoloessa delicatula* (1 third instar). These were all placed, the same day, in a low temperature cabinet (see details below) with its minimum temperature − 7.5° C for approximately 24 hours. All survived, adults as well as juveniles. The temperature was then lowered to − 12.5° and the experiment repeated with the same animals (Nov. 8–9). This time the adults were all killed but all nymphs survived. Next, the temperature was lowered to − 15.5° and the juveniles were exposed 48 hours (Nov. 9–11). Five juvenile *Arphia* succumbed (four in the fourth instar and one fifth) but all other nymphs (28) survived. Finally, the survivors were exposed 48 hours to − 17.5° (Nov. 13–14). This time only four specimens died (all *Eritettix*).

According to Salt (1961), this low-temperature tolerance may be due to (1) avoidance of freezing by depression of the freezing point and the supercooling temperature or (2) ability to survive freezing or, of course, (3) a combination of these.

My study was designed to determine which alternative provides cold-hardiness in overwintering juvenile grasshoppers. It involved an analysis of survival at various low temperatures and for different periods of time, but it also included the monitoring of internal temperatures during numerous experiments. Only by measuring internal temperatures during cooling is it possible to determine supercooling limits and freezing points. Such monitoring has also demonstrated the fact that reduction in supercooling and freezing temperatures is not significantly greater in overwintering nymphs than in adults of summer species. The nymphs do survive freezing.

Monitoring internal temperatures has also demonstrated the fact that short exposures to low temperatures are not significant. Exposure must be for nearly an hour for the internal temperature of even a juvenile grasshopper to reach a low ambient temperature. The possible significance of rate of cooling in relation to tissue damage has frequently been emphasized. The present study, however, is an interpretation of an ecological situation. The rapid rates of cooling achieved by the cryobiologist, with cells and unicellular organisms (Doebbler and Cowley, 1964), do not correspond with rates limited by the slower heat exchange of organisms as large as grasshoppers.

The low temperatures used were achieved in a Cole-Parmer Low Temperature Cabinet, No. 3840. This is large (6 cu. ft.), so it is not surprising that the temperature fluctuates—about

3° C in the bottom of the cabinet—between a high, when the thermostat turns on, and a low, reached a few minutes after the compressor shuts off. The warming trend is slow, however, so low temperatures persist a long time. Since the lowest temperatures are of most significance in these studies I have indicated the temperature for a given experiment as the lowest of a given range. The range of fluctuation was reduced to about 1° in numerous experiments by using an insulated box inside the cabinet, but yielded no significant difference in results.

Temperatures were monitored with a Yellow Springs multiple-jack Tele-Thermometer, No. 44TZ. We measured ambient (cabinet) temperatures with a Yellow Springs General Purpose thermistor probe, No. 401, adjacent to the specimens; and we followed internal temperatures in an individual grasshopper with a Yellow Springs probe, No. 514. This is a 22-gauge, stainless steel, hypodermic needle in which a thermistor bead is mounted about an eighth inch back of the tip. (Only *Arphia* and *Xanthippus* juveniles could be used; *Eritettix* is too small.) These probes of this type were individually calibrated, and readings made with them were corrected accordingly.

The hypodermic was inserted through the left tympanic membrane and pushed diagonally into the head capsule along the left side so that the thermistor unit came to lie in the thorax to the left of the crop. The specimen was somewhat immobilized by being pushed headfirst into a vial only slightly larger and longer than itself. The pressure of the needle kept it from backing out. In some cases, undoubtedly, damage to the specimen resulted from unsuccessful use of the technique, but this was not inherent in the method; many individuals so treated survived long afterward.

All specimens in an experiment (that with the probe and, often, many others being tested at the same time) were placed in the cabinet simultaneously. Internal temperatures were read at one minute intervals. The temperature dropped rapidly to the supercooling temperature, then rose suddenly to the freezing point, remained constant during the freezing process, then slowly dropped to the ambient temperature (Fig. 1).

My studies were begun in the fall of 1964. During the winter of 1964–1965, Mrs. Elizabeth W. Frank, an N.S.F. Fellow, carried out experiments in cooperation with me, her observations appearing in her Master's thesis (Frank, 1965). She determined supercooling and freezing temperatures of *Arphia* and *Xanthippus* nymphs, and carried out experiments to test survival at low temperatures on these and *Eritettix*. The lowest supercooling (and freezing) temperatures she found were − 9.4° C (freezing at − 2.2°) and − 9.2° (freezing at − 3.2°) in *Xanthippus,* and − 9.2° (freezing at − 2.9°) in Arphia. Of 16 specimens no others supercooled below − 7.4°. Her survival tests were of short duration, but one, her longest, is of special interest: Only one *Eritettix* of a group

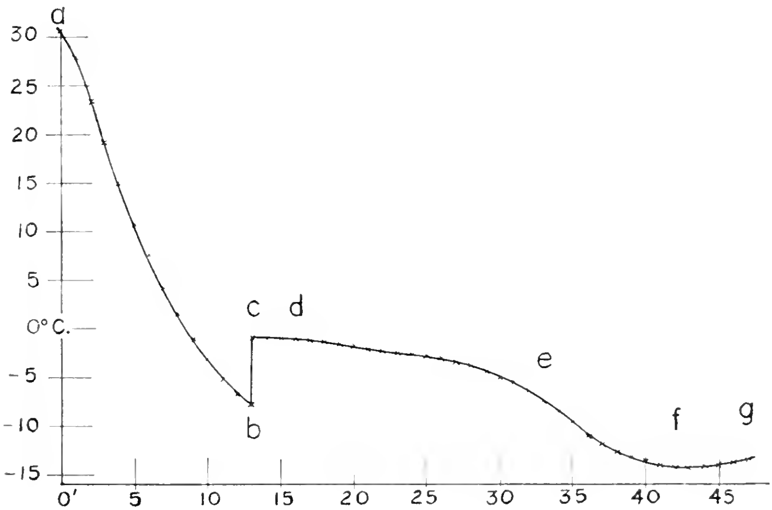

Fig. 1. Internal temperature of a fifth instar *Arphia conspersa* nymph exposed to a temperature of approximately − 15° C. Vertical axis, temperature C; horizontal axis, time in minutes. Explanation of letters: a, placed in cabinet; b, supercooled temperature (− 7.8°); c, freezing point (− 1.0°); d, end of freezing period; e, reaches supercooled temperature a second time; f, reaches ambient temperature (begins to follow temperature cycle of low temperature cabinet); g, removed from cabinet. This specimen, as well as other nymphs of *Arphia, Xanthippus,* and *Eritettix* in the same experiment, survived.

of three juvenile *Arphia* and seven juvenile *Eritettix* failed to survive an eight hour exposure to − 19° C. Of particular note in her thesis is the demonstration by her husband, Dr. William Frank, by infrared spectrum analysis, of the probable presence of glycerol in fluid obtained from *Arphia* and *Eritettix* juveniles.

During the winter of 1965–1966, with the assistance of Mrs. Judith Bodenham, I performed over 60 additional experiments along the same line. Most of these were carried out on laboratory reared specimens, juveniles and adults, of several species that normally overwinter in the egg stage, but 21 dealt with the three common species of overwintering juveniles. The design and execution of these experiments were influenced by the earlier ones; they were aimed at determining whether nymphs survive through depression of supercooling and freezing temperatures or by tolerance of freezing. As previously stated, nymphs do survive freezing. Glycerol is probably present but not in sufficient quantity to depress the freezing and supercooling points significantly. It may, however, be an important factor in preventing injury during freezing (Salt, 1961; Doebbler and Cowley, 1964).

Many of my experiments involved long exposures at low temperatures, types of tests not previously run but illustrated by the larger adult *Xanthippus* is less than half as rapid. (These are not rapid rates by physiological standards but are more rapid experiment already described. Eleven involved exposures of one to five days to temperatures below supercooling levels. Internal temperatures were not measured in these because shorter experiments, with internal monitoring, provided us with information on the rate of cooling, the time required to reach the supercooling point and to complete freezing, and the time required for a frozen grasshopper then to be cooled to the ambient temperature of the cabinet. Figure 1 shows that the rate of cooling to supercooling, when a rather small grasshopper is exposed to an ambient temperature a few degrees below its supercooling point, is nearly 3° C per minute. The rate of cooling of the much than most "natural" rates.) The ambient temperature (about 6° below supercooling) was reached by the *Arphia* nymph 30 minutes after onset of freezing. An adult *Xanthippus* reaches such an ambient temperature about 45 minutes after onset of freezing. Thus, laboratory exposure to low temperature should be at least 60 to 90 minutes; otherwise one cannot be sure that the temperature of the specimen has dropped to that of its surroundings.

Experiments with adults of summer species show no significant differences in supercooling and freezing temperatures between them and overwintering juveniles. The difference is in ability to tolerate freezing. A few examples: Adult female *Arphia pseudonietana* (Thomas), field collected, supercooled Sept. 6, 1964, to − 8.8° C (freezing at − 1.8°), exposed to − 11° for 25 minutes after completion of freezing, no recovery; adult female *Melanoplus bivittatus* (Say), laboratory reared, supercooled Oct. 25, 1965, to − 7.5° (freezing at − 1.0°), exposed to − 14° for 10 minutes after completion of freezing, showed some breathing movements but died same day; adult male *Melanoplus femur-rubrum* (DeGeer), laboratory reared, supercooled Dec. 11, 1965 to − 7.0° (freezing at − 0.8°), exposed to − 15° for 20 minutes after completion of freezing, no recovery.

In contrast are numerous cases of survival of overwintering nymphs exposed to such temperatures not merely for a few minutes but for several days. An experiment demonstrating such survival has already been described. Four experiments involved exposures of five days each. Juvenile *Arphia* and *Xanthippus* completely recovered after five days at − 16° C, and 4 of 8 *Eritettix* juveniles survived five days at − 14°.

Such survival, to be ecologically adaptive, must of course occur repeatedly, during each period above freezing that has followed very low temperatures. Several individual specimens have illustrated this adaptation. A juvenile *Arphia* collected Oct. 28, 1965, was monitored with an internal probe on Nov. 8. It supercooled to − 8.0° C, froze at − 1.5°, and was removed to room temperature as soon as frozen. On Nov. 20–21 it survived over 50 hours at − 11.5°. It survived 24 hours exposure to − 15° on Nov. 24–25, and, after an interval at room temperature, survived five days (Dec. 12–17) at − 14°. A similar sequence can be described for a *Xanthippus* juvenile, which was exposed 20 hours (Nov. 8) at − 15.5°, was frozen briefly Nov. 13, and subsequently survived exposure five days (Nov. 17–22) at − 12.5°.

One can be assured, by following internal temperature changes, that he is dealing with ice formation; but familiar evidence for freezing comes, too, from visual examination of frozen grasshoppers. A frozen grasshopper, whether an overwintering juvenile or a nonwintering adult, is stiff and brittle when taken from the freezing cabinet. It can be broken into parts between the fingers—the abdomen into several parts, for example. Each such break extends all the way through, the gut breaking across at the same level as the integument. When a frozen grasshopper is struck with a hammer the integument breaks primarily (though not exclusively) along existing sutures, and internal organs tend to break across. If a frozen grasshopper, thus broken or crushed, is placed quickly under a dissecting microscope one can watch the thawing. On shiny, exposed organ surfaces (where the appearance suggests ice), free liquid, presumably water, appears within one or two minutes under the influence of the heat of the microscope lamp.

These observations suggest that there is no observable difference between overwintering juveniles and nonwintering adults in the frozen condition. But overwintering juveniles survive freezing, as numerous experiments demonstrate, while adults of species that overwinter in the egg stage apparently do not.

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Two New Species of the Pseudoscorpion Genus Paraliochthonius

William B. Muchmore[1]

The genus *Paraliochthonius* Beier of the Chthoniidae has been known for some time to be represented by several forms, found in littoral situations, in the Mediterranean area and in Madeira and the Canary Islands (see Beier, 1963). Recently Hoff (1963) has described a new species, *P. insulae,* from Jamaica, demonstrating that the genus occurs on the western, as well as eastern, side of the Atlantic Ocean. The present paper describes additional new species from Florida and from Puerto Rico, the occurrence of which suggests that the genus *Paraliochthonius* may be widely distributed along the Atlantic shores of America. I am indebted to Drs. P. Weygoldt and H. Heatwole for sending me the specimens from Florida and Puerto Rico, respectively. Type specimens will be deposited in the American Museum of Natural History.

Paraliochthonius weygoldti sp. n. (Figs. 1–4)

Material: Holotype male (WM875.01001), allotype female (WM875.01003) and a paratype female, collected from under wood at the drift line on Big Pine Key, Dade County, Florida, by Peter Weygoldt, 30 December 1965.

Description: Male: Form typical of the genus, but rather small and pale as compared to other American species. Carapace about as long as broad; epistome small and bluntly triangular. Four corneate eyes present, the anterior pair being slightly larger than the posterior; anterior eyes about one half the ocular diameter from the carapacal margin and about the same distance from the posterior eyes. Carapacal chaetotaxy d4d-4-4-2-2 = 16 + 2d, the dwarf setae (d) being located anterior and ventral to the anterior eyes.

[1] Department of Biology, University of Rochester, Rochester, New York 14627. This work was supported in part by a grant, GB5299, from the National Science Foundation.

Abdomen typical; pleural membranes finely granulate. Tergal chaetotaxy 4:4:5:7:7:8:8:7:7:5:T2T:0. Sternal chaetotaxy 8:[4-4]: $\frac{8\text{-}7}{(3)\ 6\ (3)}$:(2)6(2):8:9:10:10:8:7:0:mm. Coxal chaetotaxy 2-2-1:0-3-0:2-1-CS:2-3:2-3. On each coxa II are four irregularly pinnate spines arranged in a row on a convex base (Fig. 1). No intercoxal tubercle present. Genital area typical.

Chelicera slightly shorter than length of carapace, and 1.95 times as long as broad; palm with five setae; fixed finger with six or seven moderate sized teeth; movable finger with five to seven similar but smaller teeth and with a tiny denticle midway between the distal end of the row and the finger tip; galea represented by a very slight elevation of the finger margin; serrula exterior with 17 blades; serrula interior with 11 blades; flagellum with six to eight irregularly pinnate setae, so arranged that the distal one is noticeably separated from the others (Fig. 2).

Palps not heavily sclerotized and with relatively slender setae for the genus. Proportions of segments similar to those of female, shown in Figure 3; positions of tactile setae as shown in Figure 4. Three spinelike setae on the inner face of the chelal hand, the proximal one considerably shorter and more slender than the distal two; a similar, small, spinelike seta on the inner face of the base of the movable finger. Fixed finger of chela with a row of 23 acute, widely spaced teeth; in the distal half of the row, alternate teeth are offset to the medial side and are somewhat smaller than adjacent ones. Movable finger with 23 large, acute, and widely spaced teeth. Trochanter 1.9, femur 4.0, tibia 1.8, chela 4.9 and hand 1.7 times as long as broad; movable finger 1.73 times as long as hand.

Legs of typical chthoniid facies and moderately slender. Leg IV with tactile setae on the tibia 0.37, on the metatarsus 0.24, and on the telotarsus 0.31 the length of the segment from the proximal end.

Female: Similar to the male in most respects, but slightly larger and heavier. Carapacal chaetotaxy d4d-4-4-2-2 = 16 +

2d. Abdominal tergal chaetotaxy of allotype 4:4:5:7:7:7:8:7:7:6:T2T:0. Sternal chaetotaxy 9:(3)6(3):(2)6(2):10:9:9:9:9:9:0:mm. Allotype with three spines on each coxa II; paratype with three spines on the left and four on the right.

Chelicera 2.08 times as long as broad; palm with five setae; teeth of fingers as in the male but with no indication of an isolated denticle at the distal end of the row of teeth on the movable finger; no indication of a galeal elevation; flagellum as in the male, with the distal seta distinctly separated from the others.

Palps (Figs. 4 and 5) slightly larger and less slender than in the male, otherwise very similar. Chelal teeth as in the male, 26–29 on the fixed finger and 24–27 on the movable finger. Trochanter 1.8–1.9, femur 3.8–3.9, tibia 1.8, chela 4.7–4.9 and hand 1.6–1.7 times as long as broad; movable finger 1.75–1.81 times as long as hand.

Leg IV with tactile setae on the tibia 0.39 (0.41), on the metatarsus 0.28 (0.28), and on the telotarsus 0.28 (0.32) the length of the segment from the proximal end.

Measurements (in mm): *Male:* Body length 1.11. Carapace length 0.30; anterior eye 0.037 in diameter. Chelicera 0.38 by 0.14; movable finger 0.16. Palpal trochanter 0.15 by 0.08; femur 0.32 by 0.08; tibia 0.16 by 0.09; chela 0.52 by 0.105; hand 0.19 by 0.11; movable finger 0.33 long. Leg I: basifemur 0.19 by 0.05; telofemur 0.09 by 0.05; tibia 0.11 by 0.04; tarsus 0.20 by 0.03. Leg IV: entire femur 0.33 long; basifemur 0.16 by 0.14; telofemur 0.22 by 0.12; tibia 0.22 by 0.06; metatarsus 0.11 by 0.05; telotarsus 0.22 by 0.03.

Female (the first figures are for the allotype; while in parentheses are those for the paratype): Body length 1.19 (1.22). Carapace length 0.33 (0.33); anterior eye 0.037 in diameter. Chelicera 0.33 (0.31) by 0.16 (0.15); movable finger 0.18 (0.16) long. Palpal trochanter 0.17 (0.16) by 0.09 (0.09); femur 0.38 (0.35) by 0.10 (0.09); tibia 0.19 (0.17) by 0.10 (0.09); chela 0.59 (0.56) by 0.12 (0.12); hand 0.21 (0.20) by 0.13 (0.12); movable finger 0.38 (0.35) long. Leg I: basifemur 0.22

(0.21) by 0.06 (0.06); telofemur 0.11 (0.10) by 0.05 (0.05); tibia 0.12 (0.11) by 0.04 (0.04); tarsus 0.24 (0.21) by 0.03 (0.03). Leg IV: entire femur 0.38 (0.32); basifemur 0.19 (0.16) by 0.15 (0.14); telofemur 0.25 (0.24) by 0.14 (0.12); tibia 0.25 (0.23) by 0.07 (0.06); metatarsus 0.11 (0.11) by 0.05 (0.05); telotarsus 0.24 (0.24) by 0.03 (0.03).

Paraliochthonius puertoricensis sp. n. (Figs. 5–7)

Material: Holotype male (WM934.01002), allotype female (WM934.01001), and a paratype male, collected on Ramosito Key, PUERTO RICO, by Harold Heatwole and F. McKenzie on 6 November 1964.

Description: *Male*: Form typical of the genus, larger and more heavily sclerotized than *P. weygoldti*. Carapace about as long as broad; epistome prominent, about twice as long as broad. Four eyes present, the anterior being slightly larger and better developed than the posterior; anterior eyes about half an ocular diameter from the carapacal margin and about the same distance from the posterior eyes. Carapacal chaetotaxy d4d-4-4-2-2 = 16 + 2d, the dwarf seta (d) of each side being located on the carapacal margin ventral to the level of the anterior eye.

Abdomen typical; pleural membranes finely granulate. Tergal chaetotaxy of holotype 4:4:4:6:7:7:7:7:7:4:T2T:0; paratype similar. Sternal chaetotaxy of holotype 9:[4-4]: $\frac{9\text{-}11}{(3)\ 6\ (3)}$:(2)6(2):10:10:9:9:9:3T1T3:0:2; of paratype 7:[2-2]: $\frac{6\text{-}7}{(2)\ 6\ (2)}$:(2)6(1):9:9:7:8:8:9:0:2. Coxal chaetotaxy of holotype 2-2-1:0-3-0:2-1-CS:2-3:2-3; of paratype 2-2-1:0-3-0:2-1-CS:1-3:1-3. On each coxa II of the holotype are three irregularly pinnate spines arranged in a row on a convex base (Fig. 5); in the paratype there are six spines on the right coxa II and four on the left. No intercoxal tubercle present. Genital area typical.

Chelicera barely longer than the length of the carapace and 2.25 times as long as broad; surfaces smooth except for broad areas of tiny spinules on dorsal and ventral sides of hand. Palm of holotype with five setae; paratype with only four setae, *b* being absent. Fixed finger with six to nine moderate-sized teeth along the margin; movable finger with four or five obsolescent denticles, or merely with the finger margin irregularly roughened; no evidence of any galeal structure; serrula exterior with 21–23, and serrula interior with 14, blades; flagellum with seven or eight irregularly pinnate setae, so arranged that the distal one is noticeably separated from the others (as in *P. weygoldti,* Fig. 2).

Palps heavily sclerotized and with relatively heavy setae and spines. Proportions of the segments shown in Figure 6; positions of tactile setae as in Figure 7. In the holotype, there are four, heavy, spinelike setae on the inner face of the chelal hand and base of the fixed finger, and a similar, but smaller, seta on the inner face of the base of the movable finger; the paratype, however, has only three spinelike setae on each hand, lacking the posterior, dorsal ones found in the holotype and allotype. Fixed finger of chela with a row of 25 (26) spaced, large, acute teeth; in the distal half of the row, alternate teeth are smaller and offset to the medial side of the finger, though, not as obviously so as in *P. weygoldti.* Movable finger with 28 (31) similar teeth. Trochanter 2.0 (1.95), femur 4.6 (4.5), tibia 2.1 (2.0), chela 4.5 (4.5), and hand 1.65 (1.6) times as long as broad; movable finger 1.65 (1.75) times as long as hand.

Legs of typical chthoniid facies and moderately slender. Leg IV with tactile setae on the tibia 0.32 (0.36), on the metatarsus 0.24 (0.27), and on the telotarsus 0.06, 0.33 and 0.63 (0.04, 0.29 and 0.63) the length of the segment from the proximal end.

Female: Similar to the male in most respects, but slightly larger. Carapacal and tergal chaetotaxy like that of holotype male. Sternal chaetotaxy 10: (3)6(3) : (3)6(3) : 11:9:9:8: 8:8:0:2. Coxal area like that of holotype male, but with four spines on each coxa II.

Chelicera like that of male, 2.17 times as long as broad. Palm with five setae. No evidence of any galeal structure.

Palps with proportions, tactile setae, and spine-like setae like those of the holotype male. Fixed finger with 27 teeth and movable finger with 32 teeth. Trochanter 1.9, femur 4.6, tibia 2.1, chela 4.45, and hand 1.6 times as long as broad; movable finger 1.71 times as long as hand.

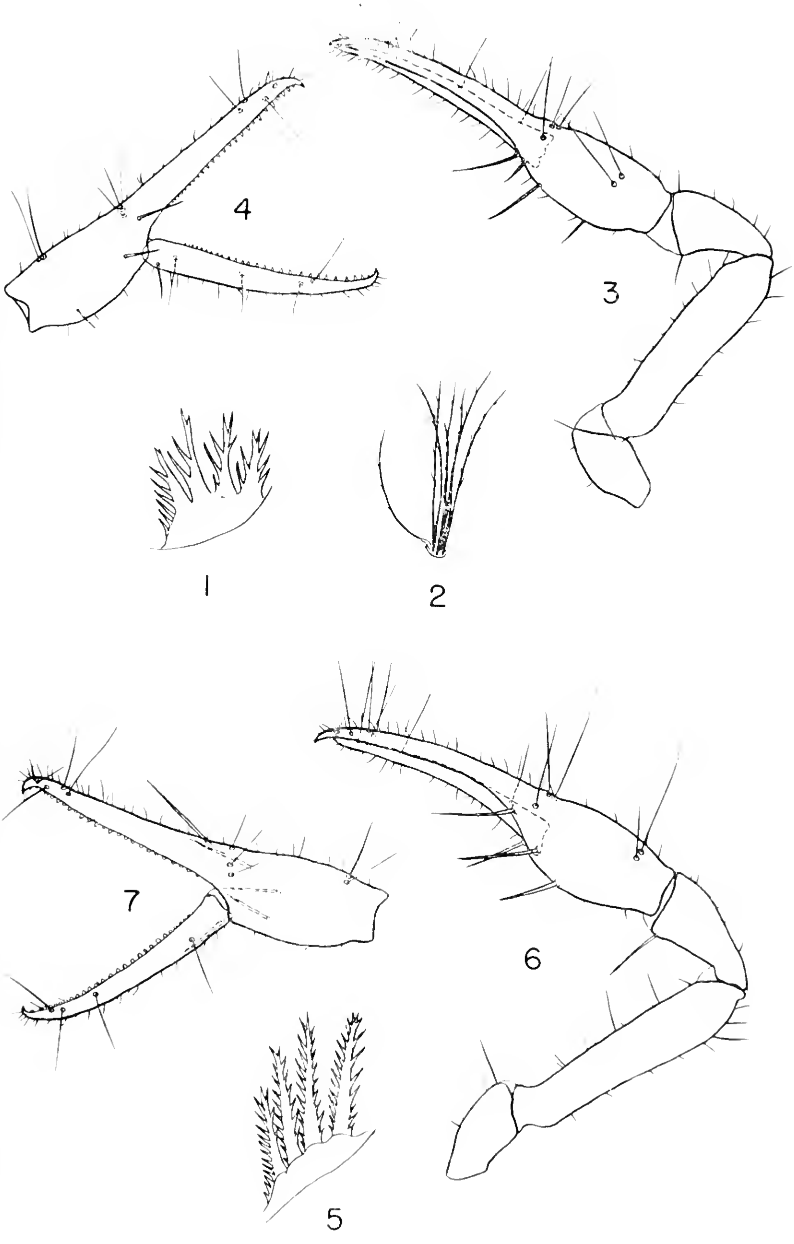
Legs as in the male, but slightly more slender. Leg IV with tactile setae on tibia 0.37, on metatarsus 0.23, and on telotarsus 0.07, 0.39 and 0.67 the length of the segment from the proximal end.

Measurements (in mm): *Male* (the first figures given are for the holotype, followed in parentheses by those for the paratype): Body length 1.83 (1.77). Carapace length 0.53 (0.50); anterior eye 0.056 in diameter. Chelicera 0.53 (0.52) long by 0.24 (0.24) broad; movable finger 0.30 (0.27) long. Palpal trochanter 0.32 (0.29) by 0.16 (0.15); femur 0.76 (0.72) by 0.165 (0.16); tibia 0.39 (0.35) by 0.19 (0.18); chela 1.09 (1.07) by 0.24 (0.24); hand 0.41 (0.38) by 0.25 (0.24); movable finger 0.67 (0.67) long. Leg I: basifemur 0.43 (0.41) by 0.09 (0.09); telofemur 0.21 (0.18) by 0.08 (0.07); tibia 0.24 (0.22) by 0.06 (0.06); tarsus 0.40 (0.42) by 0.05 (0.05). Leg IV: entire femur 0.69 (0.66) long; basifemur 0.32 (0.30) by 0.25 (0.23); telofemur 0.50 (0.48) by 0.23 (0.22), tibia 0.48 (0.47) by 0.10 (0.11); metatarsus 0.21 (0.21) by 0.08 (0.08); telotarsus 0.45 (0.47) by 0.05 (0.05).

Female: Body length 1.90. Carapace length 0.53; anterior eye 0.062 in diameter. Chelicera 0.56 by 0.26; movable finger 0.32 long. Palpal trochanter 0.32 by 0.17; femur 0.78 by 0.17; tibia 0.39 by 0.19; chela 1.11 by 0.25; hand 0.41 by 0.25; movable finger 0.70 long. Leg I: basifemur 0.44 by 0.09; telofemur 0.20 by 0.08; tibia 0.24 by 0.06; tarsus 0.42 by 0.05. Leg IV: entire femur 0.69 long; basifemur 0.30 by 0.23; telofemur 0.49 by 0.22; tibia 0.51 by 0.10; metatarsus 0.22 by 0.08; telotarsus 0.47 by 0.05.

FIGS. 1–4. *Paraliochthonius weygoldti* sp. n. 1. Coxal spines on right coxa II of holotype male. 2. Flagellum of left chelicera of holotype male. 3. Dorsal view of right palp of allotype female. 4. Medial view of left chela of allotype female.

FIGS. 5–7. *Paraliochthonius puertoricensis* sp. n. 5. Coxal spines on left coxa II of paratype male. 6. Dorsal view of right palp of holotype male. 7. Lateral view of left chela of holotype male.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Remarks: The reduced number of setae on several areas of the paratype male is considered to be an individual anomaly, inasmuch as this specimen was found in company with the other type specimens. It is possible, of course, that this individual represents a separate species; but further material will be required to clarify the issue.

A tritonymph is at hand which was collected at Spiny Butte, Puerto Rico. This specimen is probably referable to *P. puertoricensis,* but since it was not associated with adults, no definite assignment can be made at present.

It is pertinent to note here that the diagnostic criteria for the genus *Morikawia* Chamberlin (1962) are very similar to those for *Paraliochthonius.* Because of the paucity of material available, it is not possible at present to make a detailed comparison of the two genera, but it appears likely that *Morikawia* is synonymous with *Paraliochthonius.*

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A New Species of Fulicoffula (Mallophaga: Philopteridae) from Thailand

K. C. Emerson, Arlington, Virginia, and Roger D. Price, University of Minnesota, St. Paul

The genus *Fulicoffula* Clay and Meinertzhagen, 1938, was erected for the elongated forms of Ischnocera found on the avian family Rallidae (order Gruiformes). Later the elongated form found on *Podica senegalensis* (Vieillot), family Heliornithidae, was included in the genus. Recently the authors obtained specimens from a second host of the family Heliornithidae, *Heliopais personata* (G. R. Gray); these lice are herewith described as new and illustrated.

Fulicoffula personata, n. sp.

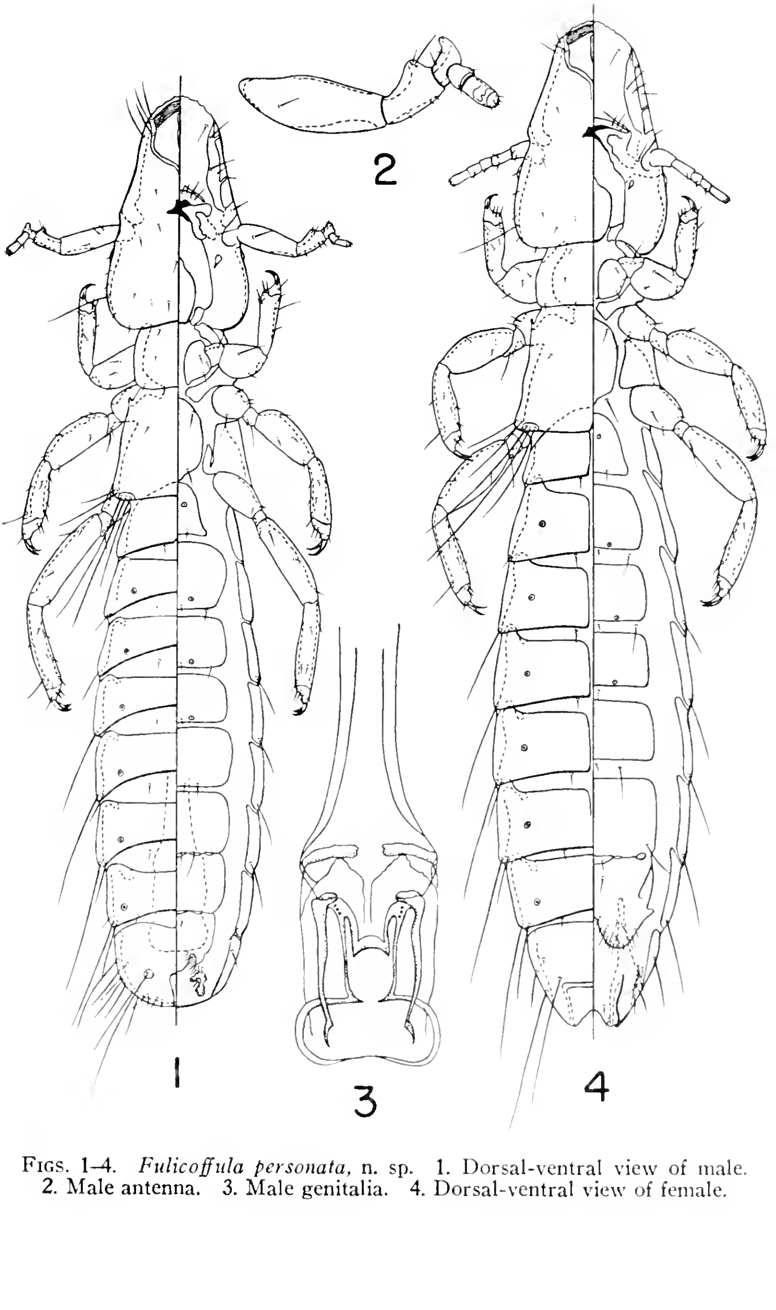
Male. Total length 2.54 mm. External morphology and chaetotaxy as shown in Fig. 1. Head, except for antennae, typical of genus. Dorsal anterior plate of forehead transversely striated anteriorly and partially divided medially by narrow suture with almost parallel sides. Antennae enlarged and elongated as shown in Fig. 2. Pronotum with only short setae, otherwise typical for genus. Pterothorax with a notch on each latero-anterior margin producing an anteriorly pointing small projection. Elongated legs and chaetotaxy of pterothorax typical for genus. Abdominal tergites II–VIII entire (the first apparent abdominal segment is here referred to as II, even though it probably represents composite I and II), each of III–VIII with spiracles near posterior margin. A pair of short medio-posterior setae on or near tergites II–VIII. Tergite of last segment (IX + X fused) with long and medium-length setae marginally, a pair of very long setae on the dorsal surface, and with posterior margin broadly rounded. Sternite II bell-shaped with a pair of short setae on posterior margin. Abdominal sternites III–VIII longer than tergites. Sternites II–V with paired sensilli. Shape and chaetotaxy of terminal abdominal segment as shown in Fig. 1. Genitalia, less sac, as shown in Fig. 3.

Female. Total length 2.82 mm. External morphology and chaetotaxy as shown in Fig. 4. Head (except for filiform antennae), thorax, and legs similar to those of the male. Tergites of abdominal segments II–VI divided medially, VII partially divided, and VIII entire; all longer than in the male with spiracles more anteriorly placed, but chaetotaxy essentially as for male. Tergite of terminal segment typical for the genus. Abdominal sternites II–VII much as for male, but with VIII and fused IX + X as shown in Fig. 4. Posterior margin of abdomen bifurcate.

Discussion. As might be suspected by the systematic position of the host, this species of louse is not entirely typical of the genus *Fulicoffula*. In size it suggests *Ardeicola,* a genus found on members of the Ciconiiformes. The divided abdominal tergal plates of the female are characteristic of *Ardeicola* as well as of certain *Fulicoffula* species. The striated divided anterior dorsal plate of the forehead, the general chaetotaxy (except for that on the terminal abdominal segment of the male), the shape and chaetotaxy of the terminal abdominal segment of the female, and the shape of abdominal sternite II are all characteristic of *Fulicoffula.* The male antennae, the broadly rounded terminal abdominal segment of the male, the structure of the male genitalia, and the presence of paired sensilli on abdominal sternites II–V are characters not heretofore included in either genus. After consideration of these characters, it has been determined more appropriate to include this species in *Fulicoffula* than to erect a new monotypic genus or to include it in *Ardeicola.* The combination of characters given above, in addition to other features of structure and chaetotaxy, easily distinguish it from all known species of *Fulicoffula.*

Type host. *Heliopais personata* (G. R. Gray).

Type material. Holotype male, allotype female, and 34 paratypes collected off the type host at Ban Saen Tung, Chanthaburi, Thailand, on 23 April 1966. Seventy-seven paratypes collected off the type host at Ban Saen Tung, Trat, Thailand, on 22 April 1966. Four paratypes collected off the type host from Sumatra (no other collection data) are in the British Museum



FIGS. 1–4. *Fulicoffula personata,* n. sp. 1. Dorsal-ventral view of male. 2. Male antenna. 3. Male genitalia. 4. Dorsal-ventral view of female.

(Natural History). The holotype and allotype will be deposited in the U. S. National Museum. Paratypes will be distributed to other leading museums in the U. S.

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Hopkins, G. H. E. and T. Clay. 1952. A check list of the genera and species of Mallophaga. British Museum (Natural History), London. 362 pp.

Reviews

Insect Hormones; Physiology, Morphology and Phylogeny of Insect Endocrines. By **V. J. A. Novak.** Third edition (translation), Methuen & Co., Ltd. Pp. xvii + 478. Barnes & Noble, Inc., New York, 1967. Price: $16.00.

Recent reviews on insect hormones include appropriately an up-to-date survey of the literature in this field. Their usefulness as reference books may compensate for tiresome reading, but one still feels the need for an interesting volume on insect endocrinology. V. J. A. Novak's "Insect Hormones" fills this void in that the book seems to have been written with the intent of helping the reader to understand the scope and problems involved in studying insect hormones. It lacks the more recent findings, but the literature that is covered is discussed meaningfully and completely.

The first chapter, for example, concerning techniques, presents an account of how one studies the endocrinology of insects. The novel implements and methods of the craft are described and illustrated for the benefit of the uninitiated; for the seasoned experimenter the chapter offers a wealth of ideas and tips which may be helpful in planning research.

Perhaps the most valuable section is the one hundred pages devoted to the activation hormone, the molting hormone, and the juvenile hormone. For the reader who is mainly familiar with publications in English, Novak has included a short paragraph at the outset of each discussion to clarify the synonyms used for the three hormones. For example, the activation hormone is synonomous with "Adenotropes Gehirnhormon" and "The Growth and Differentiation Hormone." Each of the hormones is approached in a similar manner beginning with an historical sketch, continuing with an explanation of gland morphology and histology (but no fine structure), touching on important aspects of the embryology and phylogeny of each gland, and finally the major part of each section is given to the physiological aspects of activation, secretion, and the effects of the hormones.

Novak treats the role of endocrine glands in insect evolution with an enthusiastic pen. Ample space is devoted to the theories of the evolution of holometabolous and hemimetabolous insects, but perhaps the author consumes too many pages on the rather passé gradient factor theory.

Shorter considerations are given to the literature on neurohormones, protohormones (which are no longer considered to be true hormones), exohormones, and finally the effects of insect hormones on other groups of organisms.

The main criticism of substance is that the book itself only covers material up to 1962. An annotated bibliography has been added in an attempt to fill this gap, but the 28 pages of notes appear as loose ends to the polished chapters preceding them. The final section of the book reflects the geometrical increase in the output of publications in this field during the last five years. It is probable that Novak's book represents the last possible comprehensive survey of insect hormones. For this reason it is worthy of your bookshelf; but, for a review of current thinking in the area of insect hormones, it will not suffice.—William J. Bell.

Hymenoptera of America North of Mexico. Synoptic Catalog (Agricultural Monographs No. 2) Second Supplement, 584 pages. By **Karl V. Krombein, B. D. Burks** and Staff. U. S. Government Printing Office, Washington, D. C., 1967. Price: $2.75.

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Insects

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ENTOMOLOGICAL NEWS

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Gmelin's 13th Edition of the Systema Naturae: A Case of Neglect

T. J. Spilman,[1] Entomology Research Division, A. R. S., U. S. Department of Agriculture, Washington, D. C.

Johan Friedrich Gmelin lived from 1748 to 1804 and was a contemporary of Panzer, Geoffroy, Herbst, Olivier, Fabricius, and other famous entomologists of the late 18th century. However, unlike those famous names, Gmelin's is seldom seen listed as the author of insect species or in synonymies, even though he described hundreds, perhaps thousands, of new species. A few well known animals do carry his name as author: the American oyster, *Crassostrea virginica;* a subspecies of the rough-legged hawk, *Buteo lagopus s. johannis;* the olive fruit fly, *Dacus oleae;* the Australian-pine borer, *Chrysobothris tranquebarica.* Thus he has not been completely overlooked, but only a small proportion of his new species are now catalogued.

Perhaps the absence of citations to Gmelin in insect literature today is primarily due to Fabricius. I scanned Fabricius' post-Gmelin works and did not see a reference to Gmelin. Because Fabricius' writings were for such a long time considered the basic references in entomology, Gmelin was essentially lost to 19th century workers.

Gmelin was the author of the 13th Edition of Linnaeus' Systema Naturae. It was published from 1788 to 1793 and consists of three volumes. Volume 1, on animals, was divided into

[1] I thank Dr. Melville H. Hatch, who brought the Gmelin problem to my attention in 1964, and Dr. Curtis W. Sabrosky, who, as usual, gave excellent nomenclatural advice during this study.

six parts, each of which is large enough to be called a volume; parts 4 and 5, on insects, were published in 1790; I have accepted the dates of publication given by Hopkinson.[2] Volume 2, on plants, was divided into two parts. Volume 3, on minerals, was in one part only. The title page of Gmelin's edition reads, "Caroli a Linne. Systema Naturae per Regna tria Naturae. Ed. 13. Cura Jo. Frid. Gmelin. Lippsiae." Though it is always referred to as an edition of Linneaus' Systema Naturae, it could more properly be considered a new work because of the vast amount of new material and rearrangements. The format is similar to that of Linnaeus; all species are described and have binomens. It should have the status and consideration given to other books of its time simply because it exists and fulfills nomenclatural requirements, not because it is good zoology. But it does not have that status.

An excellent evaluation of the nomenclature and zoology of Gmelin's 13th Edition was given by A. J. Kohn [3] in a study of the gastropod genus *Conus*. Much of what he said about Gmelin's treatment of gastropods would also apply to insects. Only Gmelin's nomenclature, not his zoological acumen, is of concern here.

Gmelin names which have been overlooked are probably very numerous in insects, but their omission depends on the amount of searching done by workers in each family. For example, Gmelin's name is frequently cited in the Elateridae but not in the Tenebrionidae. Certainly all of his new species should be recorded in catalogues. For each species Gmelin gives, in sequence, a specific name, a number, a description, sometimes a reference or references to previous authors, and a statement of habitat. His specific names would fall into the following four categories (my examples are taken from the Elateridae in volume 1, part 4):

1. *Elater indicus.* On page 1911, Gmelin uses the specific name as proposed by the previous author Herbst and gives a

[2] Proc. Zool. Soc. London, 1907, pp. 1035–1037.
[3] Jour. Linn. Soc. (Zool.), vol. 46, no. 308, pp. 73–102 (1966).

literature citation to the previous author's work which is now considered to have been validly published. This poses no problem; failure to cite Gmelin's use of a name in a complete synonymy is of no consequence. His use of the name *indicus* would merely be listed with other subsequent citations.

2. *Elater lineolatus.* On page 1916, Gmelin uses the specific name as proposed by a previous author and gives a literature citation to that previous work, "Mus. Lesk.,"[4] which is now considered not to have been validly published. Gmelin's use of the name *Elater lineolatus* with a description constitutes publication of a new species. The specific name was overlooked in recent catalogues.

3. *Elater erythropus.* On page 1912, Gmelin gives a literature citation to *Elater rufipes* Herbst by the species number assigned by Herbst, but Gmelin uses a different name, *erythropus.* Gmelin was merely renaming Herbst's species; the action was unnecessary. The name *erythropus* thus becomes a junior synonym of *rufipes.* Gmelin's specific name does not appear in recent catalogues.

4. *Elater tetrastichon.* On page 1910, Gmelin does not give a literature citation to a previous author. He is obviously presenting an original description of a new species. Gmelin's specific name does not appear in recent catalogues; it will have to be worked into the present classification or synonymy.

Those specific names of Gmelin that must be considered as new proposals, categories 2, 3, and 4, could cause many problems for taxonomists. What about comparing Gmelin's specimens with types of known species? Kohn[5] says, "Unfortunately it is likely that all of the new species were based entirely on published information, rather than on specimens." How-

[4] The citation "Mus. Lesk." refers to Museum Leskeanum, Regnum Animale, by D. L. G. Karsten, 1789, with the insect section written by J. J. Zschachi. The insect section had previously been published separately in 1788 by Zschachi. Zschachi's works are not completely binominal. Gmelin refers to many publications which we today do not consider validly published.

[5] *Op. cit.*

ever, in those cases where Gmelin refers to a previous author, the specimens used by that author or the figures published by him could be used as type material. Otherwise, Gmelin's descriptions must be used. But most of Gmelin's original descriptions would probably be worthless in comparing his species with currently known species. Perhaps the simplest solution would be to group the names of unrecognizable species as *nomina dubia* after known species of a genus.

A taxonomist could probably avoid bringing to life a Gmelin name as a senior subjective synonym by resorting to the 50-year rule, Article 23 (b) in the International Code of Zoological Nomenclature. But the problem of homonymy of Gmelin's names is not so easily avoided. How many of Gmelin's combinations of generic and specific names for new species will preoccupy later combinations? Quite a few, I fear—they could wreck some insect names of long standing. The 50-year rule does not apply to homonyms; as of now there is no way, save by suspension of the rules of nomenclature, to avoid destroying a younger well known homonym. Each of Gmelin's new species will have to be judged separately; the 13th Edition can not be thrown out in toto, for some of his names are already in common use.

It is extremely unfortunate that this large work has so long been overlooked or ignored. But Gmelin's 13th Edition, like a mountain, exists, and, like a mountain, must be climbed.

Diplocentrus bigbendensis, a New Species of Scorpion

Herbert L. Stahnke, Poisonous Animals Research Laboratory, Arizona State University, Tempe, Arizona

These are large diplocentrid scorpions with their center of distribution apparently in the Big Bend National Park, Texas. Venom reaction, typical for the family, consisting of relatively mild edema and burning sensation at site of sting.

Diplocentrus bigbendensis sp. n.

Holotype: ♂, ASU 57-1190. Grapevine Springs, Big Bend National Park, Texas, U. S. A. In definite burrow under door plank in front of adobe house. June 7, 1957. W. G. Degenhardt.

Allotype: ♀, ASU 57-1194. Locality same as holotype. "Crawling on ground near adobe house on hot dry night." June 10, 1957. W. G. Degenhardt.

Paratypes: All from Big Bend National Park, Texas. ASU 1643, ♂, bedroom floor, 8–26–55 (J. Palmer). ASU 56-231, ♀, in tent house, 9–27–56 (D. Rodriguez). ASU 56-38, ♂, Window Trail, under rock, 7–19–56 (R. Curbow). ASU 64-139, ♀, Government Springs, under rock, 8–20–59 (H. L. Stahnke).

All types are in the museum of the Arizona State University.

Diagnosis

A large scorpion; approximately the size of *Diplocentrus ochoterenai* Hoffman, 1931 and *Didymocentrus taibeli* Caporiacco, 1938. The Mexican species, *D. ochoterenai* has yellowish brown legs contrasting with a dorsum that to the unaided eye is a concolorous dark brown but actually has a fuscous, variegated pattern on trunk dorsum. The new species appears shiny black with legs a dark, reddish brown but also has a fuscous variegated pattern on trunk dorsum. Furthermore, the appendages and cauda have a variegated, fuscous pattern while in *D. ochoterenai* these are concolorous. The following comparative data indicate other relationships between the two species:

Table 1. Comparison of *D. ochoterenai* and *bigbendensis*.

		D. ochoterenai	D. bigbendensis
Tarsomere II spine formula:	♂	$\frac{7}{7}\frac{7}{7}$; $\frac{7}{8}\frac{7}{8}$; $\frac{8}{8}\frac{7}{8}$; $\frac{8}{8}\frac{8}{8}$	$\frac{5}{7}\frac{6}{7}$; $\frac{6}{8}\frac{6}{7}$; $\frac{7}{9}\frac{7}{8}$; $\frac{7}{8}\frac{7}{8}$
	♀	$\frac{6}{6}\frac{6}{6}$; $\frac{6}{7}\frac{7}{7}$; $\frac{7}{7}\frac{7}{8}$; $\frac{7}{8}\frac{7}{8}$	$\frac{6}{7}\frac{6}{7}$; $\frac{6}{8}\frac{6}{8}$; $\frac{6}{8}\frac{7}{8}$; $\frac{7}{8}\frac{7}{8}$
Pectinal Teeth:	♂	17/17	18/18 to 20/20
	♀	16/16	14/14 to 16/15
Ratios*: (code Nos.)			
$\frac{4}{6}$:	♂	0.90	0.92-1.00
	♀	0.94	0.94-1.00
$\frac{4}{25}$:	♂	0.97	1.06-1.11
	♀	1.15	1.27
$\frac{25}{37}$:	♂	0.81	0.66-0.69
	♀	0.78	0.65-0.71
$\frac{6-5}{4}$:	♂	0.59	0.49-0.56
	♀	0.55	0.51-0.56

* (Key to code numbers is given following Table 2.)

The difference in the above table together with those of coloration suggest a separate taxon.

Description

Both sexes, to unaided eye, appear a shiny black. Actually, appendages (except pectines), metasoma, and dorsum of prosoma and mesosoma a dark, reddish brown freely invaded by variegated, fuscous pattern; moderately hirsute and in general agranular. Legs slightly lighter than body proper. Pectines and venter of mesosoma concolorous; former yellowish brown and latter medium brown.

PROSOMA

Carapace with three pairs lateral eyes. Anterior median notch extends to level beyond that of posterior margin of first pair of lateral eyes. Surface shiny and essentially agranular. Central ocular furrow lacking. Posterior marginal furrow not continuous with posterior lateral furrows.

Sternum subpentagonal with lateral sides subparallel. Deep median furrow, which is not distinctly triangular in shape at base, extends through posterior half before forming a depressed, flat diamond-shaped area.

Chelicera with forked movable finger; inferior tine approximately three times length of superior tine; inner superior margin with one large tooth flanked by two considerably smaller subequal teeth; the most distal of the small teeth on the side of the superior tine, the proximal one is not connected to base of median tooth.

Pedipalps: Tarsus of chela very dark, reddish brown; densely hirsute; densely and coarsely punctate. Large lateral granules give cutting edge scalloped appearance. Tibia like tarsus in general appearance. Four trichobothria (Fig. 1) on inner surface; seven on exterior surface, including M_1. D_4 distal to D_5. Manus of ♂ with pronounced costate reticulations over entire exterior surface; ♀ with indistinct costate but distinct fuscous reticulations. On ♂ all keels strongly developed; weakly so on ♀ but well represented by pigmentation. Fifteen trichobothria (Fig. 1). $E_{2,\ 1\ \mathrm{and}\ 3}$ form acute angle; $B_{3,\ 4\ \mathrm{and}\ 5}$ form a scalene triangle. No three M trichobothria are in line. Patella with dorso-inner keel strongly developed, agranular, and bears three trichobothria. Exterior surface convex and bears 13 trichobothria: 5 proximad, followed by two groups of two each plus a cluster of four at distal end. Femur with three trichobothria: one on the extreme proximal margin of dorso-inner edge; another a short distance from proximal margin just above dorso-exterior edge; the third, about one-third the distance of the femur length from the proximal margin just below dorso-exterior edge. Inner surface and keels with large cone-shaped granules; other surfaces on keels agranular or bear only a few granules.

Walking Legs: Tarsal claws and pedal spurs well developed; median claws short and broad. Lateral terminal lobes rounded forming a sharply acute angle with median tarsal lobes; tarsal spines arranged along rounded, distal margin. See TABLE 2 for tarsal formulae.

OPISTHOSOMA

Mesosoma: Terga in ♂, finely and densely granular; in ♀ smooth, shiny with few granules; sparsely hirsute; without distinct keels. Sternite VII with four distinct keels which bifurcate posteriorly. Stigma elongate and recessed; distinctly so on ♂. Genital operculum subovular, at least twice as wide as long; undivided in ♀, divided in ♂ with well developed genital papillae. Pectines. See TABLE 2 for number of teeth. ♂ teeth much longer and broader than ♀ teeth. Free margin of basal middle lamella of ♂ forms 90° angle with denticular margin of pectin; ♀ angle about 140°. No small middle lamella; second marginal lamella extends to fulcra which are subtriangular and distinct. *Sinnesborsten* cover about 80% of the ventro-inner margin of each tooth on ♂; about 30% on ♀. Basal piece at least 1.75 times broader than long; posterior margin slightly convex, anterior margin with broad median notch.

Metasoma: All segments moderately hirsute on ventral and lateral surfaces; ♀ less so. Most keels well developed and essentially agranular except as noted. Median laterals agranular on segment I, weakly developed and bearing a few large granules on II. Inferior lateral granular on I and II; weakly developed and slightly agranular on III of ♂ but well developed and granular on ♀; on IV of ♂ vestigial with few granules but on ♀ well developed and agranular; on V both sexes bear very large, coarse granules. Inferior median keels strongly developed and granular on ♀ segments I–III but only on segments I and

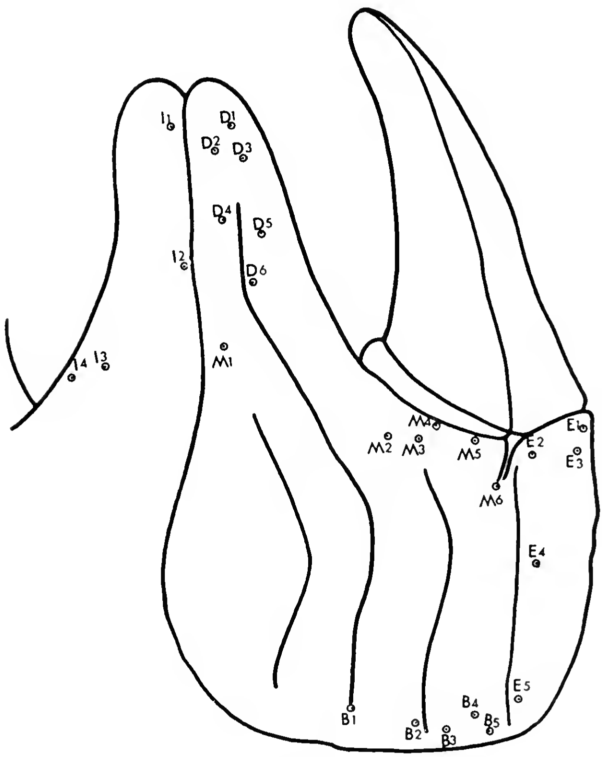


FIG. 1.

II of ♂; vestigial on ♂ segment IV, weakly developed on ♀ with granules on proximal two-thirds; on V a single, well developed median keel covered by large, conical granules. Crescentic area well developed, broader than long and sharply outlined with large granules which are *not* continuous with lateral granules of anterior crest of anal arch which bears a continuous row of nine broad, chisel-shaped granules. Posterior crest of anal arch

TABLE 2. Table of measurements in mm

Code for ratio numbers: 4, carapace length; 5, carapace anterior width; 6, carapace posterior width; 11, length of pecten dentate area; 25, caudal segment V length; 26, caudal segment V width; 27, telson length; 29, telson width; 33, pedipalp tibia length; 35, manus width; 37, tarsus (movable finger) length; 43, walking leg IV coxal length. Distance between trichobothria: 60, D_1–D_6; 61, D_1–M_1; 62, D_1–M_2; 71, D_6–M_1; 72, M_1–M_5; 73, M_1–B_1; 74, M_2–B_1.

Table of Measurements in mm

	Holotype	Paratypes		Allotype	Paratypes	
	57-1190	56-38	1643	57-1194	56-231	64-139
Sex	♂	♂	♂	♀	♀	♀
Pectinal teeth	20/20	18/18	19/19	16/15	14/15	15/14
Tarsal spine formula	$\frac{5}{7}\frac{6}{7}:\frac{6}{8}\frac{6}{7}:$	$\frac{6}{7}\frac{6}{7}:\frac{6}{7}\frac{6}{7}:$	$\frac{6}{7}\frac{6}{7}:\frac{6}{7}\frac{6}{7}:$	$\frac{6}{7}\frac{6}{7}:\frac{6}{8}\frac{6}{8}:$	$\frac{5}{7}\frac{5}{7}:\frac{7}{7}\frac{6}{7}:$	$\frac{5}{7}\frac{6}{7}:\frac{6}{8}\frac{7}{8}:$
	$\frac{7}{9}\frac{7}{8}:\frac{7}{8}\frac{7}{8}$	$\frac{7}{8}\frac{7}{8}:\frac{7}{8}\frac{7}{8}$	$\frac{7}{8}\frac{7}{8}:\frac{7}{8}\frac{7}{8}$	$\frac{6}{8}\frac{7}{8}:\frac{7}{8}\frac{7}{8}$	$\frac{7}{8}\frac{7}{8}:\frac{7}{8}\frac{7}{8}$	$\frac{8}{9}\frac{7}{8}:\frac{7}{8}\frac{8}{8}$
Total L.	65.65	63.60	63.90	73.51	67.40	53.40
Trunk L.	27.80	30.00*	27.20	37.34*	33.20	26.70*
Metasoma L.	37.85	33.60	36.70	36.17	35.20	26.70
Ratios:						
4/6	0.97	0.92	1.00	1.00	0.94	0.97
4/25	1.10	1.06	1.11	1.27	1.27	1.27
4/33	0.49	0.48	0.48	0.54	0.55	0.55
4/37	0.76	0.74	0.73	0.83	0.85	0.89
6-5/4	0.52	0.56	0.49	0.51	0.56	0.51
11/43	1.07	1.03	1.07	0.56	0.54	0.53
25/37	0.69	0.69	0.66	0.65	0.67	0.71
26/29	0.91	0.94	0.85	0.88	0.84	0.86
35/33	0.39	0.38	0.36	0.42	0.46	0.47
25/27	1.18	1.26	1.27	1.09	1.10	1.09
60/61	0.76	0.77	0.73	0.79	0.73	0.74
60/62	0.55	0.60	0.58	0.57	0.56	0.57
61/62	0.72	0.78	0.80	0.72	0.78	0.78
71/72	0.36	0.40	0.50	0.37	0.36	0.36
73/74	1.26	1.19	1.20	1.25	1.24	1.17

* Distended pre-abdomen

agranular. Telson moderately hirsute. Agranular except for clusters of 3, 3, 3 on ventro-proximal margin. Aculeus short, sharply curved with large, blunt subaculear tubercle whose distal edge forms about an 80° angle with telson surface. Ampulla width at least 1.09 times the width of caudal segment V and at least 0.72 times the width of caudal segment I.

Discussion

Measurements for trunk length made up of cumulative total of individual lengths of sclerotized areas of tergites plus carapace length. Even so, because of unusually distended preabdomen or *vice versa* this total length is not reliable. The metasomal length made up of cumulative total of individual lengths taken along posterior keels of non-telescopic portions plus telson length is highly repeatable. Sexual dimorphism is indicated as follows: (4/25) (4/33) (4/37). ♀ caudal segment V, pedipalp tibia and tarsal lengths shorter in relation to carapace than in the ♂. In (11/43) the ♂ the ratio of the coxal length of walking leg IV to length of pecten dentate area is about twice that of ♀. (35/33). Manus of ♂ pedipalp narrower in relation to tibia length than in ♀; thus ♀ chela visually seems much broader than that of ♂. (25/27). Caudal segment V of ♂ is longer in relation to telson length than in ♀ but telson length is greater than segment V in both sexes. Code numbers 60–74 indicate that trichobothrial distances are seemingly not influenced by sex and may be consistent throughout the species.

Some Phylogenetic Conclusions on the Eurygeniinae (Coleoptera: Anthicidae), with a Review of the North American Species of Eurygenius Including the Description of a New Species (E. darlingtoni) from Texas

MOHAMMAD ABDULLAH [1]

Cain and Harrison (1960) and Crowson (1965) have adequately discussed the principles of phyletic weighting so I shall not discuss them here. Studies of the Anthicidae and related families (especially Pyrochroidae and Meloidae) of the Heteromera have led me to believe that within the Anthicidae, the Pedilinae and Steropinae are primitive, Eurygeniinae and Anthicinae are the most highly evolved, while Copobaeninae and Macratriinae are more or less intermediate (Abdullah, 1966 b and thesis). Every group has some primitive characters (which could be traced back to the Pyrochroidae or even Pythidae) and some derivative characters (which may even persist in the Meloidae) (*vide* Abdullah, 1965 a–f).

Within the Eurygeniinae (*sensu mihi*), the following are the primitive characters: eyes entire; antennae eleven segmented; neck wide (i.e., width more than half that of head across tempora); pronotum without a distinct apical flange or collar (e.g., *Mitraelabrus* Solier, 1851); mesepisterna meeting or nearly so in front of mesosternum; hind wing with radial and anal cells closed; hind coxae contiguous or nearly so (i.e., separated by a distance usually not more than length of a coxa); internal keel of hind coxa reduced to a narrow-based apophysis; tarsal claws appendiculate (as in *Steriphodon* Abeille, 1894); legs without ctenidia in the male; metasternum not spinous in the male; and abdomen without ventral appendages near base in the male.

In my opinion, the following are the derivative features of the Eurygeniinae: eyes emarginate; antennae twelve-segmented (e.g., *Mastoremus* Casey, 1895); apical (i.e., fourth) segment

[1] Assisted by Mrs. Abida Abdullah, M.Sc.

of maxillary palp cultriform (e.g., *Stereopalpus* Ferté-Sénectère, 1849 and *Steriphodon*) or large (e.g., *Pergetus* Casey, 1895); front coxal cavities internally or externally closed behind (e.g., Ictistygnini); pronotum apically flanged; elytra similar in both sexes; wing without a radial cell (e.g., *Qadrius* Abdullah, 1964) and anal cell absent; tarsal claws simple; legs with ctenidia in the male (e.g., *Retocomus* Casey, 1895 and *Mitraelabrus*); metasternum spinous in the male (e.g., *Duboisius* Abdullah, 1961 and *Retocomus*); metendosternite with the anterior tendons arising on the laminae or at their junction with arms (e.g., *Steriphodon* and *Mitraelabrus*); abdomen with appendages in the male (e.g., *Steriphodon*); first two visible sterna connate (e.g., *Lagrioida*); aedeagus with the parameres fused throughout their lengths; and ovipositor with the coxite non-segmented or incompletely two-segmented (*vide* Abdullah, 1966 a and b). The evidence on which any phylogenetic conclusion is based is never complete in the sense that there is always the possibility of new discoveries or interpretations which may lead to a stronger belief in what appears to be reasonable at present or to such modifications as are justified in the interest of science and truth.

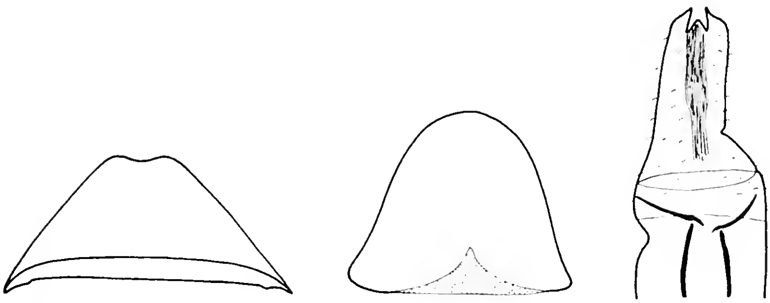
Considering the type-genus, *Eurygenius* Ferté-Sénectère, 1849, it may be said that the absence of an apical flange on the pronotum or the presence of non-palpiform galea would separate this genus (and its allies in the Eurygeniini) from the Mitraelabrini. The major distinction from the Ictistygnini (e.g., *Ictistygna* Pascoe, 1866, *inter alia*—Lagriidae *auctt.*) lies in the externally (i.e., visibly) open front coxal cavities. The fourth and recently discovered tribe (Lagrioidini) is unique in the Anthicidae in having the first two visible abdominal sterna connate (Abdullah & Abdullah, ms.). *Eurygenius,* as it stands, is a heterogeneous group and the Old World species would probably have to be placed elsewhere. The discovery of the male of the type-species (*E. reichei* Ferté-Sénectère, 1849) known from a single female specimen deposited in the Muséum National d'Histoire Naturelle, Paris, would probably establish the affinities of the genus near *Duboisius, Retocomus* and *Mastoremus,* but this remains to be confirmed. Several species formerly placed here have been transferred to other genera with the understanding that they could not have evolved from *E. reichei* or from an immediate common ancestor. The old grouping constituted an artificial or polyphyletic assemblage. These species are listed below with their original names followed by their new names: *E. arizonensis—Duboisius arizonensis* (Champion, 1916) Abdullah, 1964 c; *E. campanulatus—Pergetus campanulatus* (LeConte, 1874) Casey, 1895; *E. constrictus—Retocomus constrictus* (LeConte, 1852) Casey, 1895; *E. fulvopictus—Pseudostereopalpus fulvopictus* (Champion, 1925) Abdullah, 1964 b; *E. horridus—Rilettius horridus* (Champion, 1890) Abdullah, 1964 a; *E. lanuginosus—D. lanuginosus* (Champion, 1890) Abdullah, 1964 c; *E. mexicanus—D. mexicanus* (Champion, 1890) Abdullah, 1964 c; *E. murinus—R. murinus* (Haldeman, 1843) Casey, 1895; and *E. wildii—R. wildii* (LeConte, 1855) Casey, 1895.

In an earlier paper on North American *Eurygenius*, the following statement was made by Fall (1929): "Notwithstanding the rejection of *Retocomus* in the Leng List and the continuance of our species under *Eurygenius*, I am quite convinced after a careful study of La Ferté's generic descriptions and figures that if the characters on which his *Eurygenius* and *Stereopalpus* are based are accepted as of generic rank, then the course pursued by Casey is the only logical one." My own researches support the view (Abdullah, 1964 b and d, 1965 f, and 1966 b). The genus *Eurygenius* Ferté-Sénectère, 1949, includes three species in North America, two of which were described by Fall (1929) and one which has come to my attention relatively recently and is being described here.

The distinguishing features of *Eurygenius* are: pubescence uniform or dimorphic on elytra; tempora reduced; apical (i.e., fourth) segment of maxillary palp usually securiform to subcultriform; eyes entire, large, protuberant, hairy; antennae filiform, apical (i.e., eleventh) segment slightly longer than tenth segment; pronotum not campanulate, widest subapically above middle, slightly longer than wide, surface sculpture visible; mesepisterna meeting in front of mesosternum; wing with anal cell usually closed; in female, seventh abdominal sternum usually with a dorsal hook-like process subapically, and seventh tergum usually with three apical lobes. Males of only two species are known and for their characters see Figs. 5–11 and 17–22.

KEY TO THE NORTH AMERICAN SPECIES OF EURYGENIUS

1. California; in the female, seventh abdominal sternum truncate or very weakly emarginate (Fig. 23); for the male, see Figs. 17–22....... **E. perforatus** Fall, 1929
   Texas; in the female, seventh abdominal sternum distinctly emarginate (Figs. 1, 12)..................2
2. Seventh abdominal tergum entire and without lobes at apex (Fig. 2).............. **E. darlingtoni,** new species
   Seventh abdominal tergum deeply emarginate and with three lobes at apex (Figs. 14, 15).. **E. parvicornis** Fall, 1929



1 2 3

FIGS. 1–3. (1) *Eurygenius darlingtoni*, new species, holotype, female: 1, seventh (abdominal) sternum; 2, seventh tergum; 3, apex of ovipositor, ventral view.

(1) **Eurygenius darlingtoni,** new species (Figs. 1–3)

♀ (*Holotype*) (author's no. 520), U. S. A., TEXAS, Terrell County, 5 miles west of Sanderson, June 12, in the Museum of Comparative Zoology, Harvard University, Cambridge, Mass.

Color. Brown, head and pronotum dark, eyes reddish brown, elytra with white spots.

Vestiture. Pubescence sparse, not completely concealing surface sculpture below, yellowish-white, dimorphic, decumbent, irregularly macroscopically clustered on elytra, responsible for maculations; erect (flying) hairs present on tempora and pronotum.

Head widest across eyes, slightly narrower than pronotum at its widest part; apical segment of maxillary palp subcultriform; apical segment of labial palp nearly filiform. *Thorax.* Pronotum with median sulcus visible, line not impressed; wing with anal cell nearly closed. *Abdomen.* Seventh (i.e., fifth visible) sternum emarginate at apex (Fig. 1); seventh tergum entire at apex (Fig. 2); apex of ovipositor as in Fig. 3, styli (probably artificially) broken off.

Length, 8.5 mm.

The male of this species remains to be discovered. The female is unique in the genus (*s. str.*) in lacking apical lobes on the pygidium (or seventh tergite). I have much pleasure in naming this species in honor of Dr. Philip J. Darlington, Jr., of the M. C. Z., Harvard University, in appreciation of his assistance in my research studies.

(2) **Eurygenius parvicornis** Fall, 1929 (Figs. 4–16)

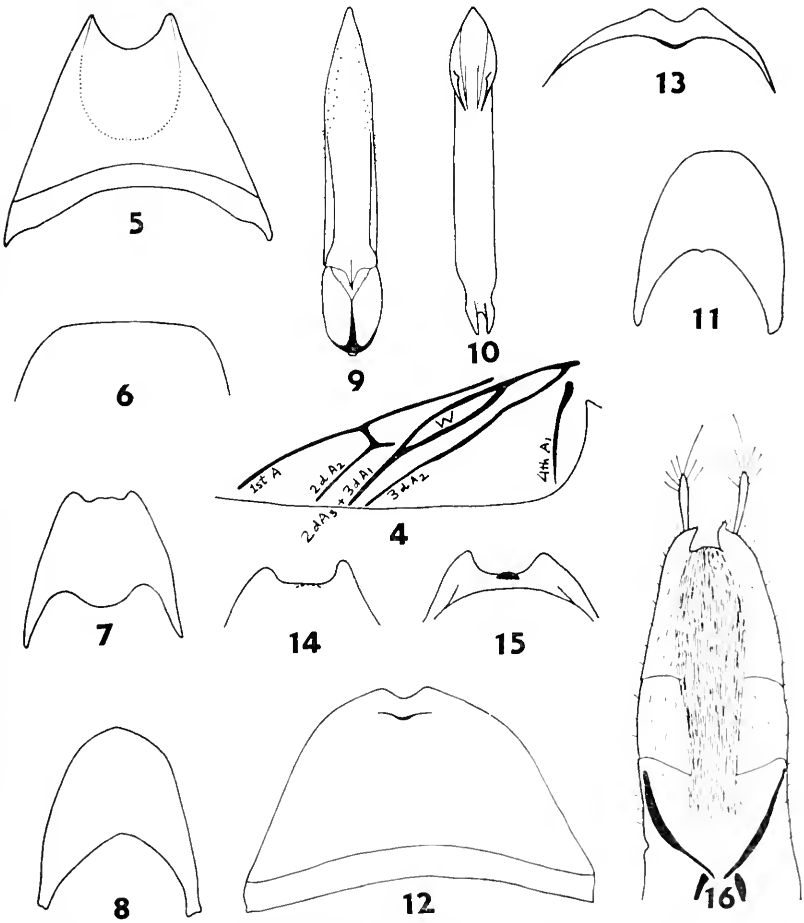
Eurygenius parvicornis Fall, 1929, pp. 333–334.

♂ (author's no. 518), U. S. A., TEXAS, Pecos County. 2 miles east of Sheffield, July 5 (J. J. duBois), in the California Academy of Sciences, San Francisco.

Color. Brown, head piceous but eyes reddish brown, pronotum dark.

Vestiture. Pubescence uniform, ashy white, decumbent, not contributing to over all appearance. Metasternum not spinous.

Head widest across eyes, slightly wider than pronotum at its widest part. Apical segment of maxillary palp subcultriform. Apical segment of labial palp nearly filiform or weakly securiform. *Thorax.* Pronotum with median sulcus distinct, line not impressed. Wing with anal cell closed (Fig. 4). *Abdomen.* Seventh sternum emarginate, sparsely spinous, rather pointed at apices, subapical median depression slight (Fig. 5); seventh tergum entire at apex (Fig. 6); eighth sternum with two weak, central processes and two strong lateral processes at apex, latter longer than former (Fig. 7); eighth tergum entire, slightly pointed at apex (Fig. 8) form variable,



FIGS. 4–16. (2) *Eurygenius parvicornis* Fall, 1929: 4, portion of hind wing; 5, seventh sternum of male; 6, apex of seventh tergum of male; 7, eighth sternum of male; 8, eighth tergum of male; 9, tegmen of male, ventral view; 10, median lobe of male, ventral view; 11, eighth tergum of male; 12, seventh sternum of female, ventral view; 13, apex of seventh sternum of female, dorsal view; 14, apex of seventh tergum of female, dorsal view; 15, apex of seventh tergum of female, ventral view; 16, apex of ovipositor, ventral view.

rounded in others (Fig. 11); parameres tapering at apex; spines along lateral margins slender, short, numerous and irregular, those on dorsal surface appearing as punctures in a ventral view, with a median sulcus near base; basal-piece with a median ventral ridge and a dorsally curved median process at basal end (Fig. 9); median lobe as in Fig. 10.

Length, 6 mm.

♀ (author's no. 521), U. S. A., TEXAS, Terrell County, Sanderson, May 18 (M. A. Embury), in the C. A. S., San Francisco. Differs from the male as follows: head nearly as wide as pronotum; seventh abdominal sternum emarginate at apex, with a dorsal ridge (Figs. 12 and 13); seventh tergum emarginate at apex, with a small, median ventral process scarcely visible in a dorsal view (Figs. 14 and 15); apex of ovipositor as in Fig. 16. Length 7 mm.

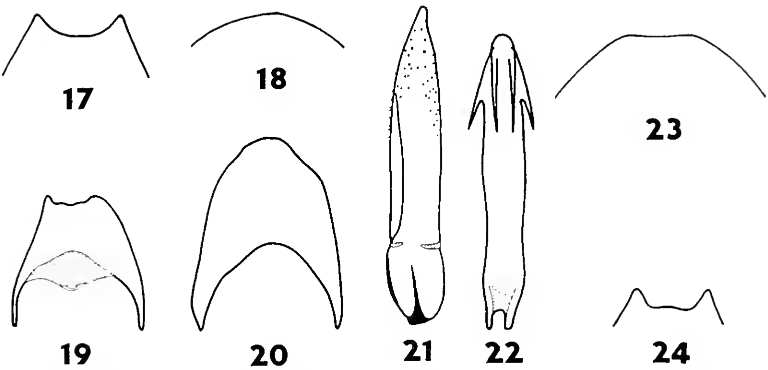
Type locality: U. S. A., TEXAS, Davis Mountains, Fort Davis Quad., Phantom Lake.

Records and Variation. U. S. A., TEXAS, Davis Mountains, Jeff Davis County, Fort Davis Quad., Phantom Lake, 1 ♂ (paratype), June 20 (F. M. Gaige), in the M. C. Z., Harvard University. Five miles west of Sanderson, Terrell County, 1 ♀, July 12, at Cornell University, Ithaca, N. Y.; 1 ♀, at Lund University, Sweden. Sheffield, Pecos County, 1 ♂, in the C. A. S., San Francisco; 1 ♂, 1 ♀, July 24, in the British Museum (Natural History) London; 1 ♂, in the Muséum National d'Histoire Naturelle, Paris; 2 miles east, July 6 (J. J. duBois), at Cornell University. State label only, 1 ♀ (G. H. Horn), in the Academy of Natural Sciences of Philadelphia, Penna.

Varies considerably: color light brown to dark brown; pronotum not too weakly constricted near middle; elytra maculate to nearly immaculate. Length varies from 5.5 to 6.5 mm among males and from 6.5 to 8.5 mm among females.

Collection dates: May 18 to July 24.

♀ (*Paratype*) (author's no. 607), U. S. A., CALIFORNIA, Riverside County, Palm Springs, August 30 (A. C. Davis), in the M. C. Z., Harvard University. Differs from the male as follows: seventh abdominal sternum very weakly, broadly, emarginate at apex, with a dorsal ridge (Fig. 23); seventh tergum with three apical lobes, central one small and ventrally curved (Fig. 24). Length, 6 mm.



FIGS. 17–24. (3) *Eurygenius perforatus* Fall, 1929, paratypes: 17, apex of seventh sternum of male; 18, apex of seventh tergum of male; 19, eighth sternum of male; 20, eighth tergum of male; 21, tegmen of male, slightly ventrolateral view; 22, median lobe of male, ventral view; 23, apex of seventh sternum of female, ventral view; 24, apex of seventh tergum of female, dorsal view.

(3) **Eurygenius perforatus** Fall, 1929 (Figs. 17–24)

Eurygenius perforatus Fall, 1929, p. 334.

♂ (*Paratype*) (author's no. 606), U. S. A., CALIFORNIA, Riverside County, Palm Springs, August 30 (A. C. Davis), in the M. C. Z., Harvard University.

Color. Light brown, labrum yellow, apices of mandibles black.

Vestiture. Pubescence uniform, yellowish white, decumbent, sparse, not contributing to over all appearance; metasternum not spinous.

Head widest across eyes, nearly as wide as pronotum at its widest part; apical segment of maxillary palp weakly subcultriform (apparently filiform); apical segment of labial palp weakly securiform. *Thorax.* Pronotum with median sulcus indistinct; wing with anal cell closed; punctures on elytra coarser and denser than in *E. parvicornis*. *Abdomen.* Seventh sternum emarginate, sparsely spinous at apex (Fig. 17);

seventh tergum entire at apex (Fig. 18); eighth sternum with two very weak central processes and two strong lateral processes at apex, with a small (*Retocomus*-like) sclerite at base, membranous above it (Fig. 19); eighth tergum entire, slightly narrowed at apex (Fig. 20); parameres tapering and narrowed at apex, spines along lateral margins slender, short, numerous and irregular, those on dorsal surface appearing as punctures in a ventral view; weakly, medially sulcate at base, basal-piece with a median ventral ridge and a dorsally curved median process at basal end (Fig. 21); median lobe as in Fig. 22.

Length, 5 mm.

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

Charles P. Alexander, Amherst, Massachusetts [1]

The preceding part under this title was published in Entomological News, Vol. 77 (8): 217–225. The present paper continues the discussion of the Hexatomine crane-flies that were collected in various parts of India by Dr. Fernand Schmid to whom I extend my sincere thanks for these materials.

TAIWANOMYIA Alexander

Taiwanomyia Alexander; Philippine Jour. Sci., 22: 476–477; 1923 (type *fragilicornis*) (Riedel, 1916); Archiv für Naturgeschichte, Jahrg. 82, Abt. A, Heft 5: 112–113; 1916 (as *Taseocera*)—Formosa.

Troglophila Brunetti; Rec. Indian Mus., 26: 99–100; 1924 Type *cavernicola* Brunetti, 1924). India: Assam.

Esakiomyia Alexander; Ann. Mag. Nat. Hist., (9) 15: 73–75; 1924. (type *filicornis* Alexander, 1925). Japan: Honshu.

Taiwanomyia is a genus of moderate size with the greatest concentration of species in the Oriental region. The most important characters for the separation of species are to be found in the venation and in the length and structure of the male antennae.

Taiwanomyia brevicornis, new species

General coloration of thorax yellowed, pleura with a conspicuous dark brown dorsal stripe; antennae of male short, about one-third the wing; wings pale brown, R_{2+3} about twice R_2 cell M_1 present but small.

♂. Length about 4.5 mm; wing 4.8–5 mm.; antenna about 1.5–1.8 mm.

Rostrum yellow; palpi light brown. Antennae of male short, as shown by the measurements, about one-third the wing, dark

[1] Contribution from the Entomological Laboratory, University of Massachusetts.

brown; flagellar segments becoming progressively shorter outwardly, verticils appressed, very reduced, the longest about one-third to one-half the segments, the remaining vestiture very small to microscopic. Head brownish gray.

Pronotum obscure yellow, weakly darkened laterally; pretergites light yellow. Mesonotal praescutum with the very reduced ground pale brown, more evident anteriorly, behind indicated by pale brown interspaces, the disk with four virtually confluent reddish brown stripes; posterior sclerites brownish yellow. Pleura yellow, with a conspicuous dark brown dorsal stripe extending caudad from the propleura, becoming obsolete on the pteropleurite. Halteres pale brown, base of stem narrowly yellowed. Legs with coxae and trochanters light yellow, the remainder yellowish brown to pale brown. Wings pale brown, unpatterned, prearcular and costal fields slightly more yellowed; veins pale brown. Venation: Sc_1 ending just beyond fork of Rs; R_{2+3} about twice R_2; cell M_1 small, about one-fourth its petiole; *m-cu* at or shortly before the fork of M.

Abdomen dark brown, hypopygium more brightened.

Habitat. INDIA (Assam, Kumaon). *Holotype:* ♂, Sirhoi Kashong, Manipur, Assam, 7,500 feet, June 9, 1960 (Fernand Schmid). *Paratype:* ♂, Simra, Pauri Garhwal, Kumaon, 5,800 feet, October 2, 1958 (Fernand Schmid).

Taiwanomyia perpendicularis (Alexander) of northern Thailand has the male antennae slightly longer and with the vestiture, including both the verticils and the normal setulae, much longer and with the darkened pleural stripe scarcely indicated. The paratype of the present species has the antennae slightly longer but appears to be conspecific.

Taiwanomyia brevissima, new species

General coloration of thorax reddish brown, the pleura with a dorsal longitudinal blackened stripe; antennae of male very short, less than one-third the wing, vestiture of segments long and coarse; wings faintly yellowed, the stigma and a vague cloud over the anterior cord very pale brown, trichia of wing veins long and conspicuous; R_{2+3} oblique, subequal to the pale transverse R_2; cell M_1 lacking, *1st* M_2 unusually long, M_{3+4} longer than M_4, *m-cu* close to the fork of M; male hypopygium with dististyles light brown.

♂. Length about 4 mm; wing 4.6 mm; antenna about 1.4 mm.

Rostrum and palpi light brown, remaining mouthparts more yellowed. Antennae unusually short, less than one-third the wing, dark brown; flagellar segments elongate-cylindrical, the terminal one longer than the penultimate, slightly enlarged, the vestiture much shorter than that of the more proximal segments where the coarse longer verticils are about one-third the segment. Head gray.

Pronotum light brown. Mesonotum almost uniform reddish brown to chestnut brown; pleura similar, with a blackened dorsal longitudinal stripe. Halteres obscure yellow. Legs with coxae and trochanters reddish brown; remainder of legs light brown, the vestiture very short and inconspicuous. Wings faintly yellowed, the stigma and a vague cloud over the anterior cord very pale brown; veins brown, their trichia long and conspicuous, black. Venation: R_{2+3} and R_2 subequal in length, the former oblique, the latter transverse, pale; cell *1st* M_2 unusually long, M_{3+4} longer than M_4; cell M_1 lacking; *m-cu* at or just before the fork of M.

Abdomen dark brown. Male hypopygium with the dististyles light brown, much paler than in *perpendicularis.*

Habitat. India (Sikkim). *Holotype*: ♂, Yoksam, 5,600 feet, April 10, 1959 (Fernand Schmid).

The most similar species is *Taiwanomyia perpendicularis* (Alexander), of Thailand, which differs in details of length and structure of the male antennae, and in the venation. The male antennae are the shortest of any of the regional species, including *T. brevicornis,* new species, which has cell M_1 of the wings preserved.

Taiwanomyia hispivena, new species

General coloration of thoracic dorsum medium brown, the pleura more yellowish brown; wings light brown, macrotrichia of veins beyond cord long and conspicuous; *Rs* and R_{2+3+4} long, subequal; cell M_1 lacking; *m-cu* at fork of M.

♀. Length about 4.5 mm; wing 5 mm; antenna about 1.5 mm. Rostrum light yellow: palpi brown. Antennae with scape and pedicel light yellow, flagellum black; flagellar segments of female cylindrical, setae conspicuous, including a single very long bristle on each segment, on the intermediate ones being nearly equal to the segment. Head with front and anterior vertex pale yellow, posterior part of head gray.

Pronotum brown above, yellow on sides. Mesonotum almost uniform medium brown, the pleura more yellowish brown. Halteres brown, base of stem narrowly pale. Legs with coxae and trochanters pale yellow; remainder brown, the tarsi slightly paler. Wings light brown, the prearcular and costal regions somewhat more yellowed; veins brown. Macrotrichia of veins beyond cord very long and conspicuous, nearly one-half the diameter of the adjoining cells; basad of cord with trichia on M and Cu, becoming smaller and finally lacking near origin. Venation: Sc_1 ending beyond level of $r\text{-}m$, Sc_2 near its tip; R_{2+3+4} long, subequal to Rs; R_{2+3} and R_{1+2} subequal; cell M_1 lacking; cell *1st* M_2 long-subrectangular, gradually widened outwardly; $m\text{-}cu$ at fork of M.

Abdominal tergites brownish black, sternites paler. Ovipositor with cerci appearing as slender styletlike points.

Habitat. INDIA (Assam). *Holotype*: ♀, Kongai, Manipur, 3,900 feet, July 7, 1960 (Fernand Schmid).

Taiwanomyia hispivena is distinguished from most other regional species by the unusually long coarse macrotrichia of the wing veins, in conjunction with the loss of cell M_1. The only other regional species without this cell is *Taiwanomyia cavernicola* (Brunetti), still known only from the unique type male taken in the Siju Cave, Garo Hills, Assam, at 3,600 feet from the cave entrance. This likewise has the wing trichia coarse, differing in the venation, with Sc much shorter, Sc_1 ending at midlength of the wing instead of at near two-thirds the length as in the present fly, and with $m\text{-}cu$ at some distance before the fork of M. Other venational details indicated by Brunetti for this species include vein R_{1+2} ending at three-fourths the wing, Sc shorter, and the more basal position of vein R_2.

Taiwanomyia pollosta, new species

General coloration of mesonotum dark brown, pleura with a broad brownish black dorsal stripe, yellowed ventrally; antennae of male very long, about one-half longer than the wing, flagellar segments long-cylindrical, the delicate vestiture shorter, much less than the stouter verticils; wings light brown, stigmal region vaguely more darkened, cell M_1 very small; male hypopygium with lateral apophyses appearing as small blades with acute tips.

♂. Length about 3.8–4 mm; wing 4.8–5.2 mm; antenna about 8–8.5 mm.

Rostrum brownish yellow; palpi brown. Antennae of male very long, about one-half longer than the wing and nearly twice the body, dark brown; flagellar segments long-cylindrical, setae appressed, setulae very short to virtually lacking. Head dull brown, the center of vertex slightly more pruinose.

Cervical region brownish black, pretergites light yellow. Mesonotum almost uniformly dark brown, without pattern. Pleura with a broad brownish black dorsal stripe from the cervical region to the postnotum, ventrally brownish yellow, the metapleura and adjoining areas light yellow. Halteres dusky. Legs with coxae and trochanters obscure yellow to brownish yellow, the remainder dark brown to brownish black. Wings light brown, the prearcular and costal regions more yellowed; stigmal region vaguely more darkened; veins brown. Veins with macrotrichia except near region of the arculus, basal section of Cu_1 glabrous except at outer end; macrotrichia much shorter than in *perretracta* and *perpendicularis*. Venation: Sc long, Sc_1 ending shortly beyond fork of Rs, Sc_2 near its tip; R_{2+3} oblique, about twice R_2; cell M_1 very small; *m-cu* at or shortly before fork of M, the extreme distance nearly one-half *m-cu*.

Abdomen brownish black. Male hypopygium with dististyles terminal; outer style nearly straight, bifid at apex, outer point a slender spine, lower blade broader. Phallosome pale, lateral gonapophyses appearing as small blades with acute tips.

Habitat. INDIA (Assam). *Holotype*: ♂, Ninghti, Manipur, 2,500 feet, July 30, 1960 (Fernand Schmid). *Paratopotypes*: 5 ♂♂, with the type.

The most similar species include *Taiwanomyia perpendicularis* (Alexander) and *T. sicula,* new species, which differ in details of coloration, venation and vein trichiation, and in hypopygial structure.

Taiwanomyia setulosa, new species

General coloration of thoracic notum brownish yellow, the posterior sclerites and pleura more yellowed; antennae of male short, a little less than the wing, flagellar segments with conspicuous outspreading delicate setae.

♂. Length about 4.5 mm; wing 5.2 mm; antenna about 4.8 mm.

Rostrum yellow; palpi brown. Antennae of male a little less than the wing; scape and pedicel testaceous yellow, flagellum brownish black; flagellar segments elongate-cylindrical, with abundant erect setae over the entire length, these longer than the stouter verticils or the diameter of the segment itself. Head brownish, slightly pruinose.

Pronotum brownish yellow. Mesonotal praescutum brownish yellow, with a vaguely indicated median darkening; posterior sclerites of notum and the pleura more yellowed. Halteres whitened, knob vaguely more darkened. Legs with coxae and trochanters yellow, the remainder brown. Wings light brown, prearcular and costal region more yellowed; veins light brown, more yellowed in the brightened fields. Venation: Sc_1 ending just beyond fork of *Rs*, Sc_2 slightly removed; R_{2+3} gently arcuated, about twice R_2; cell M_1 small; *m-cu* shortly before fork of *M*.

Abdominal tergites dark brown, paler outwardly, hypopygium more yellowed. Male hypopygium with dististyles terminal, outer style more slender than in related species.

Habitat. INDIA (Assam). *Holotype*: ♂, Phaiphengmun, Manipur, 2,157 feet, August 29, 1960 (Fernand Schmid).

Taiwanomyia setulosa is most similar to species such as *T. pollosta,* new species, and *T. sicula,* new species, differing evidently in the length and vestiture of the male antennae.

Taiwanomyia sicula, new species

Mesonotal praescutum dark brown, posterior sclerites variegated with yellow, pleura dark brown; antennae of male about one-half longer than the wing, vestiture of flagellar segments short; wings with vein R_{2+3} oblique to longitudinal in position; cell M_1 of moderate length.

♂. Length about 4.5–5 mm; wing 5–5.5 mm; antenna about 7–7.5 mm.

♀. Length about 5 mm; wing 5.5 mm.

Rostrum light brown, palpi slightly darker. Antennae of male very long, about one-half longer than the body or wing, dark brown; flagellar segments very long-cylindrical; major setae or verticils conspicuous, the abundant more delicate setae very small, almost microscopic, only a fraction of the size of the major setae. Head brownish gray.

Pronotum and mesonotal praescutum almost uniform dark brown; scutal lobes darkened, median area yellowed; scutellum dark brown, posterior border and parascutella brownish yellow; mediotergite brownish yellow on central portion, the remainder dark brown. Pleura dark brown, the meron and metapleura yellowed. Halteres light brown, base of stem narrowly yellow. Legs with fore coxae light brown, remaining coxae and all trochanters yellow; remainder of legs medium brown. Wings medium brown, stigma slightly darker; veins brown. Venation: R_{2+3+4} about three-fourths *Rs; R_{2+3}* oblique to longitudinal in position, from two to three times R_2; cell M_1 relatively small; *m-cu* at or just before fork of M.

Abdomen brownish black. Male hypopygium with dististyles terminal; outer style unequally bidentate at apex, the upper spine slender. Lateral gonapophyses appearing as narrow straight blades.

Habitat. INDIA (Kumaon, Sikkum). *Holotype*: ♂, Khumyara, Pauri Garhwal, Kumaon, 4,300–5,000 feet, May 4, 1958 (Fernand Schmid). Allotopotype: ♀, pinned with type. *Paratopotypes*: ♂♂, May 3 and 28, 1958. *Paratypes*: Dhar, Pauri Garhwal, 7,220 feet, August 17, 1958; ♂♂, Chumtang, Sikkim, 5,120 feet, July 18–23, 1959 (Fernand Schmid).

Taiwanomyia sicula is most similar to *T. pallosta,* new species, differing especially in the details of body coloration and venation.

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By Howard E. Evans

Museum of Comparative Zoology,
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ENTOMOLOGICAL NEWS

Vol. LXXVIII OCTOBER, 1967 No. 8

Notes on Some Nearctic Chironomid Larvae

Ole A. Sæther, University of Oslo, Department of Limnology, Blindern, Norway

The few, but interesting, chironomid larvae described in this paper have been found in mud samples collected by Dr. Kåre Elgmork, Department of Zoology, University of Oslo. The larvae were entrusted to me for identification.

The mud samples were taken in Ferguson Lake, Keyhole Lake, and Squaw Lake in Mackenzie, Canada, and from Rangeley Lake, Maine, U. S. A. The Canadian lakes are all strictly oligotrophic, while Rangeley Lake, although mentioned as of the oligotrophic type by Cooper (1940, p. 17), seems to be more or less mesotrophic. Ferguson Lake and Rangeley Lake are large, deep lakes, and Keyhole Lake and Squaw Lake are small.

Monodiamesa cf. ekmani Brund.

Keyhole Lake, 6 m, 6 November 1963, 1 larva.

Descriptions of larvae: Thienemann 1919, pp. 209–212, 1944b, pp. 632–633, Johannsen 1937, pp. 31–32, Tshernovskij 1949, pp. 106–107, Brundin 1951, pp. 45–47, 50, Romaniszyn 1958, pp. 50–51.

Distribution of the genus: Northern Europe, the Alps, Russia, Siberia, Japan, North America, and Southern South America (Pagast 1947, pp. 548–587, Tshernovskij 1949, p. 107, Brundin 1951, pp. 45–49, 1956a, p. 65, 1967, p. 367).

Length 6.5 mm. Coloration (specimen preserved in formalin), yellowish green, brownish marbled especially on thoracic segments. Eye-spot and head as in *M. ekmani* Brund. (Brundin

1952, fig. 20). Anterior and posterior prolegs, abdominal segments with bristles, procerci and tubuli anales as in *M. bathyphila* Kieff. (Thienemann 1919, pp. 209–212). Antenna (Fig. 1B) with 4 segments. Ratio of antennal segments to each other 50:24:3:2; length of blade of basal segment in same ratio 40: length of second style in same ratio 6; width of basal segment to width of second segment to width of blade as 9:5:3; annular organ one-third from base, second mark three-fourths from base: the sense pin a little below apex of second segment is longer than segments 3 and 4 combined. The antenna differs from previously described larvae of *Monodiamesa* in northern Europe in having its basal segment not twice as long as the remainder, and the large sense pin placed below third antennal segment and not at the apex as in *M. bathyphila* (Thienemann 1919, p. 210). In the Russian species *M.* sp. gr. *bathyphila*, the second mark of basal segment is at apex and the sense pin seems to have a position as in this specimen (Tshernovskij 1949, fig. 90). Johannsen (1937, p. 31) does not mention sense pin or second mark. The shorter basal antennal segment is probably due to the immaturity; the larva is probably a third instar. Labrum, epipharyngeal area, maxillae, hypopharynx, mandibles, and premandibles as mentioned by Thienemann (1919, pp. 210–211) and Johannsen (1937, fig. 98), but there is a faintly sclerotized plate between setae anteriores and epipharyngeal area. The dorsal bristles of mandible near together as in Thienemann (1919, fig. 7) and Johannsen (1937, fig. 99), and not as in Tshernovskij (1949, fig. 90) and Romaniszyn (1958, fig. 45). Ratio of antenna to mandible to premandible as 39:75:33. Labium (Fig. 1A) as in Thienemann (1919, figs. 8–9), Johannsen (1937, figs. 101, 103), and Tshernovskij (1949, fig. 90).

Four species are known from the genus *Monodiamesa,* namely *bathyphila* Kieff., *nitida* (Kieff.) Pag., *ekmani* Brund., and *alpicola* Brund. According to Brundin (1951, p. 50), the larvae of these are very similar. However, differences in the descriptions of the various authors are easily found. A preliminary key follows.

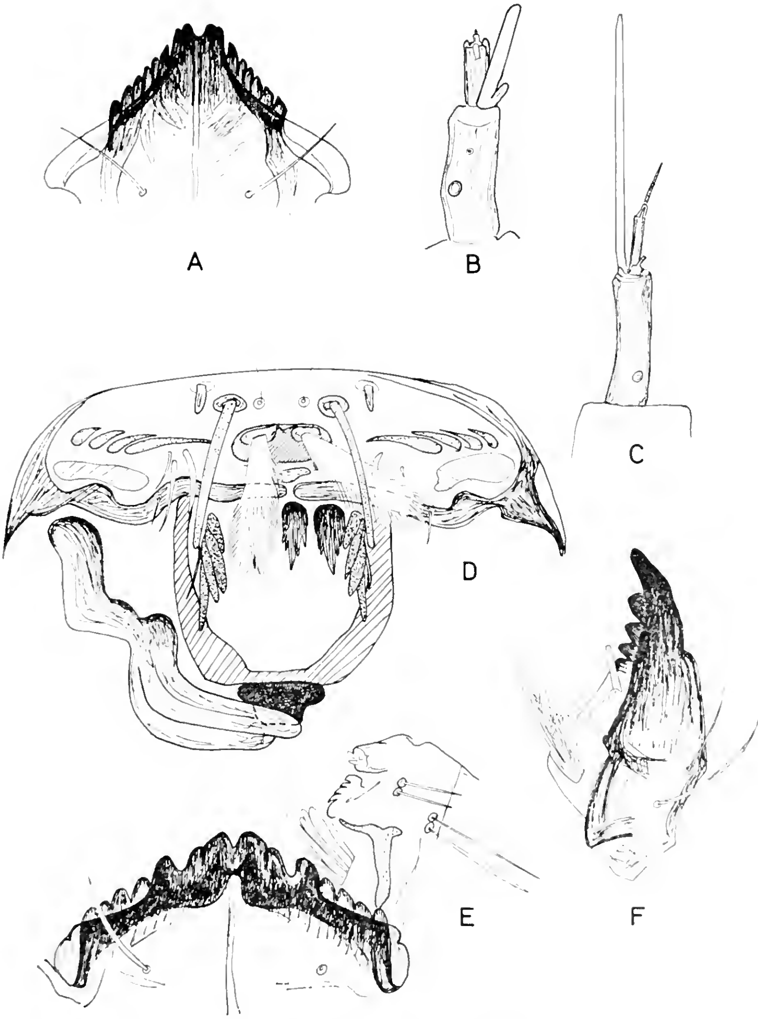

Fig. 1. A. Labium of *Monodiamesa* cf. *ekmani* Brund. B. Antenna of same. C. Antenna of *Heterotrissocladius* sp. *A*. D. Labrum, epipharyngeal area, and premandible of same. E. Labium and maxilla of same. F. Mandible of same.

1 (6) Dorsal bristles of mandible placed close together. Second mark of basal segment placed about $\frac{3}{4}$ from base.......................................2
2 (5) Eye-spots separated from each other by a distance equal to or barely greater than the diameter of one of them.......................................3
3 (4) Length of full-grown larvae 12.5 mm....**ekmani** Brund.
4 (3) Length of full-grown larva 14–16 mm..Specimens from Johannsen (1937)
5 (2) Eye-spot smaller and separated from each other by a distance clearly greater than the diameter of one of them. Length of full-grown larva 14–16 mm..............................**bathyphila** Kieff.
6 (1) Dorsal bristles of mandible not close together. Second mark of basal antennal segment placed at apex............Specimens from Tshernovskij (1949) and Romaniszyn (1958), probably **nitida** (Kieff.) Pag.

As appears from the key, the third instar from Keyhole Lake seems to belong to *Monodiamesa ekmani*. It may, however, also be the same species as Johannsen's specimens. Brundin (1967, p. 367) mentions that *Monodiamesa* in North America is represented by two still undescribed species.

According to Brundin (1951, p. 46), the *ekmani* larvae are pronouncedly cold stenothermic while the *bathyphila* larvae are less so. *M. ekmani* is an exclusively oligotrophic species which is better placed in the *Heterotrissocladius subpilosus* community than in *Tanytarsus* community (Brundin 1956b, p. 217). *Monodiamesa* is a pronouncedly plesiomorphic Diamesinae genus with bipolar distribution (Brundin 1956b, p. 217, 1967, p. 367).

HETEROTRISSOCLADIUS Spärck

Descriptions of larvae: Potthast 1915, pp. 362–366, Spärck 1922, pp. 92–95, Albrecht 1924, pp. 197–199, Zavřel 1935, pp. 8–12, Thienemann 1943, pp. 196–197, 1944b, p. 633, Brundin 1949, pp. 815–816, Tshernovskij 1949, p. 143, Romaniszyn 1958, pp. 83–84, Sæther 1967, pp. 105–106 (the larva called *Trichocladius* sp. *1* by Roback (1957, p. 85, figs. 216–218) resembles a *Heterotrissocladius* but has only 5 segments. According to Roback (personal communication), however, the last segment consists of three parts, but without any detectable break between the parts at the point of indentation, *i.e.*, one would have to presume the antenna either 5 or 7 segmented.)

Previously known distribution of the genus: Northern and Central Europe (most of the species), East Greenland, Bear Island, Ellesmere Island and Baffin Island (*H. subpilosus* (Kieff.) Edw.) (Brundin 1949, pp. 704–708, Tshernovskij 1949, p. 143, Oliver 1963, p. 177, 1964, p. 17, Sæther 1967, p. 106).

Heterotrissocladius sp. **A.**

Ferguson Lake, 50 m, 4 November 1963, 2 larvae.

Length 9.5 and 10.0 mm. Coloration (specimens preserved in formalin) olive green with brownish tint, but transparent; head light brown with darker occipital margin. Gula luteous, labium fuscous. Head small, ratio of length to width as 26:18. Thoracic segments a little swollen. Anterior prolegs with claws except the distal ones finely serrated. Anterior as well as posterior prolegs slender. Procerci slightly higher than wide with 6 apical bristles and 2 small lateral bristles. Tubuli anales slightly shorter than posterior prolegs, pointed at apex, and slightly constricted in the middle. Eye-spots as in *H. marcidus* Walk. (Zavřel 1935, fig. D). Antenna (Fig. 1C) with segments 2–6 very slender; ratio of antennal segments to each other as 100: 36:10:16:7:5; width of basal segment in same ratio 28; blade at apex of basal segment in same ratio 184; second small style in same ratio 15; annular organ in first fifth of basal segment. Labrum, epipharyngeal area, and premandible appear in Fig. 1D. Mandible (Fig. 1F) of same type as in other members of the genus. Hypopharynx as in *H. cubitalis* Kieff. (Potthast 1915, fig. 159). Labium and maxilla appear in Fig. 1E. Maxilla of same type as in *H. marcidus* (Zavřel 1935, fig. B) and *H. cubitalis* (Potthast 1915, fig. 158). Ratio of antenna to mandible to premandible as 118:87:59.

The species differs from previously described larvae of the genus by having a longer blade of antenna, more slender antennal segments 2–6, and a labium with a bifid median tooth with lateral notches.

Heterotrissocladius sp. **B.**

Keyhole Lake, 6 m, 6 November 1963, 1 larva.

Length 2.5 mm. The larva may be identical with *Heterotrissocladius* sp. *A,* but the style at apex of basal segment of antenna does not overreach the antenna. The specimen found, however, had one damaged antenna, and it is possible that the style on the other one is broken. If the style is really shorter than segments 2–5 combined, the specimen will fall in *H. grimshawi* Edw. (syn. *scutellaris* Goetgh.) according to the key of Brundin (149, p. 816) and Thienemann (1943, p. 196).

Heterotrissocladius sp. *A* will probably occupy the same ecological niche as *H. subpilosus* which is a pronounced cold stenothermic and ultra-oligotrophic arctic-subarctic species (Brundin 1949, pp. 610, 662, 708–709, 1956b, pp. 192–202).

Cricotopus (Eucricotopus) cf. **glacialis** Edw.

Squaw Lake, 24 January 1964, 1 larva.

Description of larva of *C. glacialis:* Andersen 1937, pp. 51–53, Thienemann 1944b, p. 624.

Distribution: Spitzbergen, N. Edinburgh Island (SW of Prince Charles' Foreland), and Ella Island in East Greenland (Edwards 1922, p. 209, Andersen 1937, p. 53).

Length 1.8 mm (probably third instar). Coloration pale yellowish green with brownish head. Length of head to width of head as 70:49. Eye-spots appear in Fig. 2B. Abdomen a little flattened dorso-ventrally and with anal margins forming a collar over oral margins of the following segments as mentioned by Andersen. Abdominal segments I–VII with a tuft of bristles on each side, longest bristles reaching 350 μ. There are 3 bristles in each tuft on abdominal segment I, 4 in tufts of segment II, 6 in segment III, 8 in segment IV, about 7 in segments V and VI, and 3–4 in segment VII. The number of bristles is smaller than in the specimens mentioned by Andersen, but his specimens measured 3 mm and thus were probably last instar. Procerci as high as wide, with 2 lateral bristles reaching 30 μ

and 20 μ, and 6 long, apical bristles reaching about 560 μ in length which is about one-third the length of the larva as in Andersen's specimens. Posterior segments as in Fig. 2A. The very long and slender tubuli anales of differing length are not mentioned by Andersen; the longest reaches 260 μ, the other ones 160 μ, 152 μ, and 68 μ. *C. tendipedellus* Kieff. (Thienemann 1944a, pp. 302–304, 1944b, p. 624) has similar long tubuli anales. Ratio of antenna (Fig. 2E) to mandible to premandible (Fig. 2D) as 38:60:34. Ratio of antennal segments to each other as 42:16:14:2:5:1.5, *i.e.*, basal segment shorter than in Andersen's specimens; width of basal segment to width of second to width of third in same ratio 14:8:3; length of first and second style at apex of basal segment in same ratio 26 and 15; annular organ at base; Lauterborn organs as long as second segment. Labrum, epipharyngeal area, and mandible as in Andersen (1937, figs. 31–33). Labium (Fig. 2H) differs somewhat from *C. trifasciatus* Panzer (Malloch 1915, plate 29, fig. 12) which is mentioned as identical with the labium of *C. glacialis.* The median are lighter than the lateral teeth, and first lateral teeth with their lateral notches are fused with the broader median tooth.

The differences in antennal ratio, labium, and tubuli anales (?) may add up to a new species closely related to *C. glacialis*, but the differences are probably due to their belonging to different instars.

In the lakes of Ella Island, the larvae were never found at depths exceeding 1 m and thus able to survive the winter frozen up (Andersen 1946, p. 37).

Sergentia coracina Zett. (Syn. **profundorum** Kieff., **longiventris** Kieff. pro parte)

Rangeley Lake, 43 m, 25 September 1963, 16 larvae.

Descriptions of *Sergentia* larvae: Zavřel 1926, p. 199, Lenz 1927, pp. 178–180, 1942, pp. 31–32, 1962, pp. 248–250, Andersen 1937, pp. 31–32, Tshernovskij 1949, pp. 83–85, Linevitsh 1958, pp. 196–198, Stahl 1959, pp. 56–57, Wülker 1961, pp. 310–311. *Tanytarsus (Tanytarsus) obediens* Joh. and *Tany-*

tarsus (*Tanytarsus*) sp. *1* (Roback 1957, pp. 120–121) are probably members of the genus *Sergentia*, while *Chironomus fulviventris* Joh. (Johannsen 1905, p. 229, Malloch 1915, p. 404) falls in *Sergentia* or *Lenzia*.

Distribution of the genus: Northern and Central Europe, the Arctic Isles, North America, and Japan (?) (Wülker 1961, pp. 326–328, Stahl 1966, pp. 95, 114–116).

Length 5.0–8.5 mm, *i.e.*, according to Wülker (1961, table 2) all probably are third instars. The larvae are in all details, except for the epipharyngeal comb, in accord with the description of Lenz (*loc. cit.*). The comb has 3 longer teeth and 9–12 teeth, *i.e.*, as in the specimens described by Stahl (1959, fig. 5), and not only 4–6 shorter teeth as mentioned by Lenz. The small apical bristle on basal segment mentioned by Andersen is present. The premandible is as in *S. coracina* (Wülker 1961, Fig. 1).

S. coracina is a northern, cold stenothermic species which is mainly littoral and upper profundal in arctic-subarctic lakes and a stenobathic inhabitant of the profundal in more southern lakes where it may be reckoned as a glacial relict. The ecology and the position in lake typology as a mesotrophic or moderately oligotrophic species is discussed by Brundin (1949, 1956b).

Micropsectra cf. **groenlandica** And.

Keyhole Lake, 6 m, 6 November 1963, 4 larvae.

Descriptions of larvae of *groenlandica* type: Andersen 1937, pp. 34–35, Sæther 1967, pp. 112–113. *Tanytarsus* (*Micropsectra*) sp. *E* of Johannsen (1937, p. 14 (= *Calopsectra* sp. *E* (Joh.) of Roback (1957, p. 135)) also has the spur of the antennal socle reaching 24 μ in length.

Distribution of *M. groenlandica:* Norway, Sweden, and Greenland (Brundin 1949, p. 787, 1956b, p. 196, Sæther in MS).

Length 3.5–4.0 mm. Coloration of these formalin preserved specimens light reddish brown with greenish tint and reddish brown posterior abdominal segments. The different particulars seem quite similar to those of *M. groenlandica* And. and *M. groenlandica* type (Sæther). The labium (Fig. 2J), however,

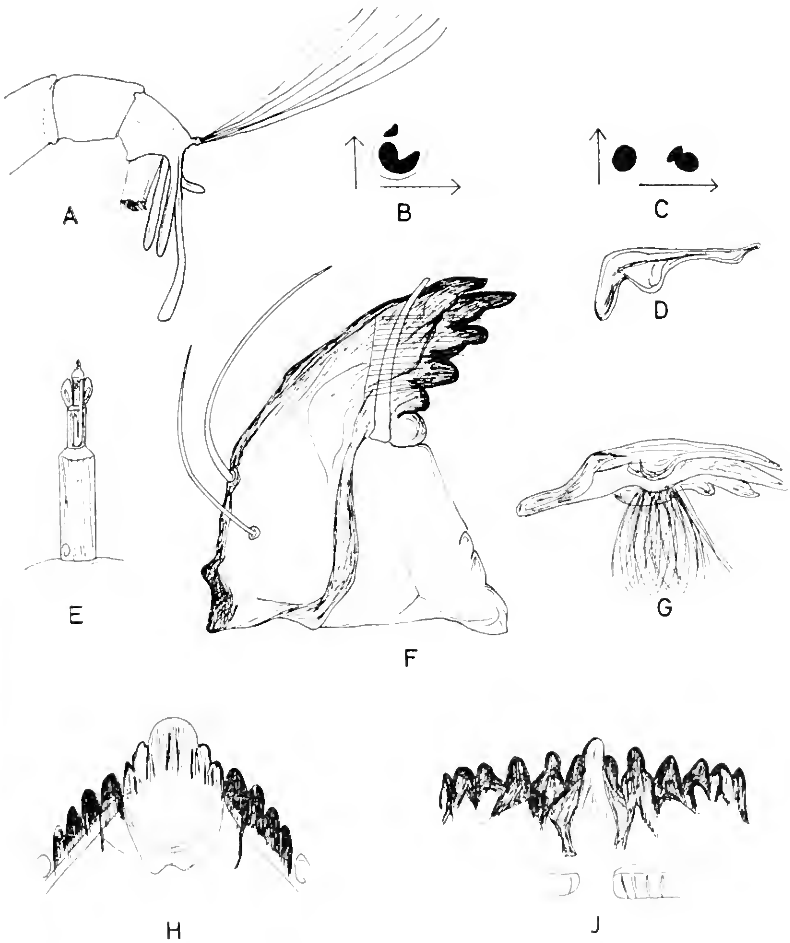

FIG. 2. A. *Cricotopus* cf. *glacialis* Edw. Posterior segments. B. Eye-spots of same. C. *Tanytarsus acuminatus* Kieff. — *niger* And. type. Eye-spots. D. Premandible of *Cricotopus* cf. *glacialis*. E. Antenna of same. F. Mandible of *Tanytarsus acuminatus* — *niger* type. G. Premandible of same. H. Labium of *Cricotopus* cf. *glacialis*. J. Labium of *Micropsectra* cf. *groenlandica* And.

differs a little from that of *M. groenlandica* in the same way as the specimen of *M. groendlandica* type drawn by Sæther (1967, fig. 4Q). The last-mentioned type, however, had the bristle of basal segment in the distal half and not as *M. groenlandica* and these specimens in the proximal half. Ratio of antennal segments to each other as 129:59:9:7:4; length to width of antennal socle to width of basal segment to width of second segment to width of third segment in same ratio 55:35:14:8.5:2; length of bristle of basal segment (placed 52/129 from base) to length of style at apex of basal segment to length of Lauterborn organs with petioles in same ratio 39:35:113. Spur of antennal socle reached 24 μ in length.

According to Brundin (1956b, p. 196), *M. groenlandica* may be reckoned as a member of the arctic *Tanytarsus* lake which is an ultra-oligotrophic littoral lake.

Tanytarsus acuminatus Kieff. – **niger** And. type.

Rangeley Lake, 43 m, 25 September 1963, 1 larva.

Description of larvae: *T. acuminatus:* Zavřel 1926, pp. 257, 273, Thienemann 1929, p. 99. *T. niger:* Andersen 1937, pp. 40–42.

Distribution: *T. acuminatus:* Czechoslovakia (Zavřel *loc. cit.*, Thienemann 1929, p. 108). *T. niger:* Ella Island in East Greenland and Ellesmere Island (Andersen 1937, p. 42, Oliver 1964, p. 178).

Length 7 mm. Coloration reddish. Appendices on seventh abdominal segment lacking. Eye-spots will appear from Fig. 2C. Bristles of frontal plate simple, 68 μ long. Bristles of basal antennal segment placed exactly in the middle. Antennal socle 76 μ long and 38 μ wide. Length of antenna 153 μ; length of Lauterborn organs with petioles 63 μ. Ratio of antennal segments to each other as 39:11.5:5:4.5:2:1.5; length of style at apex of first segment in same ratio 11. Lauterborn organs with petioles as long as the last 3 segments. First and second antennal segment colored to apex. Median tooth of labial plate trifid with light center. Mandible with 1 large dorsal tooth and 2 small dorso-mesal teeth (Fig. 2F). Premandible with 4 teeth

(Fig. 2G). Ratio of mandible to premandible as 87:51. Labrum and epipharyngeal area as in *T. heusdenensis* Goetgh. (Krüger 1943, pp. 1102–1104). Hypopharynx indistinct.

The larva belongs to the *Eutanytarsus gregarius* group of Bause (1913). Of this group, only *T. acuminatus* and *T. niger* are known to have the bristle of basal segment in the middle and the bristles of the frontal plate simple.

With the exception of *Sergentia coracina,* none of the described larvae has been reported from the U. S. A. or Canada. *Micropsectra groenlandica* and *Cricotopus glacialis,* however, are known from East Greenland.

Monodiamesa cf. *ekmani, Heterotrissocladius* sp. *B* (which may be identical with *H. grimshawi* Edw.) and *Micropsectra* cf. *groenlandica* indicate Keyhole Lake as an arctic *Tanytarsus* lake, *i.e.,* an ultra-oligotrophic littoral lake (cf., Brundin 1956b, p. 196), while Ferguson Lake probably is an ultra-oligotrophic *Heterotrissocladius* lake, and Rangeley Lake a mesotrophic or moderately oligotrophic *Sergentia coracina* lake.

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A New Record of Tolype velleda Stoll. (Lepidoptera: Lasiocampidae) in North Carolina

DAVID L. WRAY, Curator, Division of Entomology.
N. C. Department of Agriculture, Raleigh

The following constitute new records for *Tolype velleda* Stoll. in North Carolina. Five specimens from the walls of a small office building near the base of a T.V. tower ten miles southeast of Raleigh on October 23, 1959. I had gone there on this foggy morning to pick up dead birds which had flown into the T.V. tower anchor cables. The moths were apparently attracted to the bright lights around the office eaves. The next record was for four specimens at a light trap near Valle Crucis, Watauga County, N. C., at an elevation of 4,000 feet on October 8, 1965. In the same locality on October 10, 1966, I found six more specimens. This appears to be a very late flying moth in North Carolina.

A New Species and New United States Record of Anamphidora Casey (Coleoptera, Alleculidae) [1]

JAMES D. MARSHALL, Biology Department,
The College of Idaho, Caldwell, Idaho

Casey (1924) originally described *Anamphidora* to include a single species from Mexico, but he erroneously placed this genus in the Tenebrionidae. Spilman (1958) discovered the misplacement and transferred it to the Alleculidae. During the course of revising the North American constituents of the Alleculidae, a new species representing a new United States record for the genus was discovered.

The species is described below. In the description the size of the eyes is expressed as the ocular index, a quantitative character explained fully by Campbell and Marshall (1964).

Anamphidora campbelli Marshall, new species

Description of Female Holotype.—Moderately convex in cross-section; integument brown, shining throughout; body glabrous above, appendages sparsely pubescent.

Head narrowing gradually behind eyes, not constricted, punctures moderately impressed, rather dense laterally and posteriorly, becoming somewhat more sparse on front at middle between eyes; terminal segment of maxillary palpi with angle formed at junction of inner and basal sides almost 90°, inner side sinuate, approximately same length as outer side; antennae one-third as long as body, segments four through eleven about two times as long as greatest distal width; eyes small, ocular index = 62.8.

Thorax subquadrate in shape, cephalic margin four-fifths as wide as caudal margin; caudal margin broadly and very feebly sinuate; basal foveae faintly impressed; basal angles rounded.

[1] The new species description was originally presented in a thesis submitted in partial fulfillment of requirements for the degree of Doctor of Philosophy at Cornell University.

Pronotum somewhat coarsely, rather unevenly and somewhat densely punctate throughout.

Elytra impunctate throughout; one-and-one-half times wider at base than caudal margin of pronotum; sides rounded, becoming wider posteriorly; not quite twice (9:5) as long as greatest width; striae pronounced, intervals feebly convex on disk, becoming more so apically.

Abdomen shining throughout; pubescence very sparse, moderately long, semi-erect.

Length: 6.8 mm.

Holotype: ♀, Alpine, Texas, Wickham, Aug. 16–17. To be deposited in the collection of the United States National Museum.

Paratype: ♀, 15 mi. W. of Ft. Davis, Texas, H. and A. Howden. To be deposited in the collection of J. M. Campbell.

Discussion.—The paratype is piceo-castaneous in color and has a total length of 7.7 mm; its ocular index is 61.0.

Anamphidora parvula Casey from Mexico, the only other species in the genus, does not have impressed elytral striae. In addition the intervals are punctate, so it is easily separable from *campbelli.*

This species is named for my friend and colleague Dr. J. M. Campbell of the Canadian National Collection, whose work is making a valuable contribution to our knowledge of the Alleculidae.

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Novobisium (Arachnida, Chelonethida, Neobisiidae, Neobisiinae), a New Genus of Pseudoscorpions Based on Obisium carolinensis Banks[1]

William B. Muchmore, Department of Biology, University of Rochester, Rochester, New York

The pseudoscorpion genus *Neobisium* was erected by J. C. Chamberlin (1930, p. 11) with the European *Obisium muscorum* Leach as the type species. On the basis of gross morphology, the eastern North American species, *Obisium carolinensis* Banks, was also included in the genus (1930, p. 15).

Recently Vachon and Gabbutt (1964) have made a careful study of the form and development of the cheliceral flagellum in a number of European species of *Neobisium* and the closely related genus, *Roncus*. These authors have demonstrated clearly that the pattern of setae in the flagellum is quite constant in, and is diagnostic for, each of the genera. Also, on the evidence of a figure by Chamberlin (1931, fig. 15E) they note that the flagellar pattern of *Parobisium*, which was only recently elevated to the generic level from a subgenus of *Neobisium* (Chamberlin, 1962), is basically different from that of *Neobisium* and of *Roncus*. Further, they note that another figure by Chamberlin (1931, fig. 15D) indicates that the flagellum of *Neobisium carolinense* (Banks) differs in pattern from that of European species of *Neobisium*. I have made a close study of the cheliceral flagella of numerous specimens from the Appalachian mountains of eastern United States, and find that there is, indeed, a fundamental difference in the pattern of flagellar setae between the European and North American forms assigned to *Neobisium*.

Also, when published figures of chaetotaxies of the male genital opercula in *Neobisium carolinense* (Chamberlin, 1931, fig. 45B and C), *N. muscorum* (Gabbutt, 1965a, fig. 19), *N. car-*

[1] This work was supported in part by a grant, GB5299, from the National Science Foundation.

penteri and *N. maritimum* (Gabbutt, 1965b, figs. 33 and 41) are compared, it can be seen that there is a distinct difference between the American and European forms. Study of specimens from the Appalachian region confirms that the configuration of setae shown by Chamberlin is the only one found in American forms. In addition, study of the female genital opercula of American specimens reveals a constant difference between these and the European species of *Neobisium* treated by Gabbutt (1965a, fig. 18; 1965b, figs. 24 and 42).

The differences just mentioned appear to be great enough to warrant separation at the generic level of the European *Neobisium* from the American forms, for which the generic name *Novobisium* is proposed.

NOVOBISIUM, new genus

Type species: Obisium carolinensis Banks, 1895.

Description: With the characteristics of the subfamily Neobisiinae. Carapace subquadrate, a little longer than wide; surface smooth; with a prominent triangular epistome; four well-developed eyes of nearly equal size, the anterior eyes about one and a half ocular diameters from the carapacal margin; a total of about 24 acuminate setae, of which four are at the anterior margin and six to eight along the posterior margin. Abdomen with tergites and sternites entire and smooth; pleural membranes strongly granulate. Cheliceral flagellum composed of a row of eight setae (occasionally seven or nine), of characteristic shapes and sizes (Fig. 1)—the four distal setae are always serrate along the outer two-thirds of their anterior margins and increase gradually in size from distal to proximal; the fifth seta is the longest and is usually smooth, but sometimes weakly serrate along the outer half of its anterior margin; the sixth and seventh setae are always smooth and slightly shorter than the fifth; the most proximal seta is smooth and short, being only about one-third the length of the longest. Spinneret a prominent rounded elevation. Palm of chelicera with six (rarely seven) acuminate setae. Palp moderately robust. Tactile seta *sb* of the movable chelal finger clearly closer to *b* than to *st*. Tactile setae of fixed chelal finger clearly separated into two groups, with *ist* near *it, est* and *et* in the distal half, and *isb, ib, esb* and *eb* closely grouped at the base of the finger. Legs typical of the subfamily; subterminal tarsal setae deeply but unequally forked, with subsidiary denticles on both branches; tactile seta on tibia at about the middle, on metatarsus in the proximal fifth, and on telotarsus just proximal to the middle of the segment. Chaetotaxy of male genital area as shown in Fig. 2; peculiar to the genus is the row of 10–20 close-set, short, heavy setae on the middle of the anterior margin of the posterior genital operculum. Chaetotaxy of female genital area as shown in figure 3; characteristic of the genus are the two separate groups of from one to four short, delicate setae on the anterior operculum.

Material examined: Although no type specimens have been available, a number of specimens from stations near the type localities have been studied, as follows:

Stations within 15 miles of Retreat, Haywood County, North Carolina, type locality of *N. carolinense* (Banks)—1 ♀ from Mt. Pisgah, Haywood County; 1 ♀ from Richland Balsam, Haywood County; 1 ♀ from Cold Mountain, Translyvania County; and 1 ♂ from Water Rock Knob, Jackson County.

Stations within 10 miles of Mt. Le Conte, Sevier County, Tennessee, type locality of *N. tenue* (Chamberlin)—3 ♂ and 4 ♀ from Brushy Mountain, Sevier County; 2 ♀ from Elkmont, Sevier County.

Also, 8 ♂ and 4 ♀ from Mt. Mitchell, Yancey County, North Carolina (cf. Chamberlin, 1962); 6 ♂ and 12 ♀ from various stations in North Carolina, South Carolina, Tennessee, Kentucky, and Virginia.

Remarks: Specimens belonging to the genus *Novobisium* have been found only in the Appalachian mountain region from Pennsylvania to Alabama. Three species have been described, namely *N. carolinense* (Banks), *N. tenue* (Chamberlin), and *N. ingratum* (Chamberlin) (cf. Chamberlin, 1962), but material at hand indicates that much further study is required before the actual numbers, relations, and distributions of the various forms can be clearly understood.

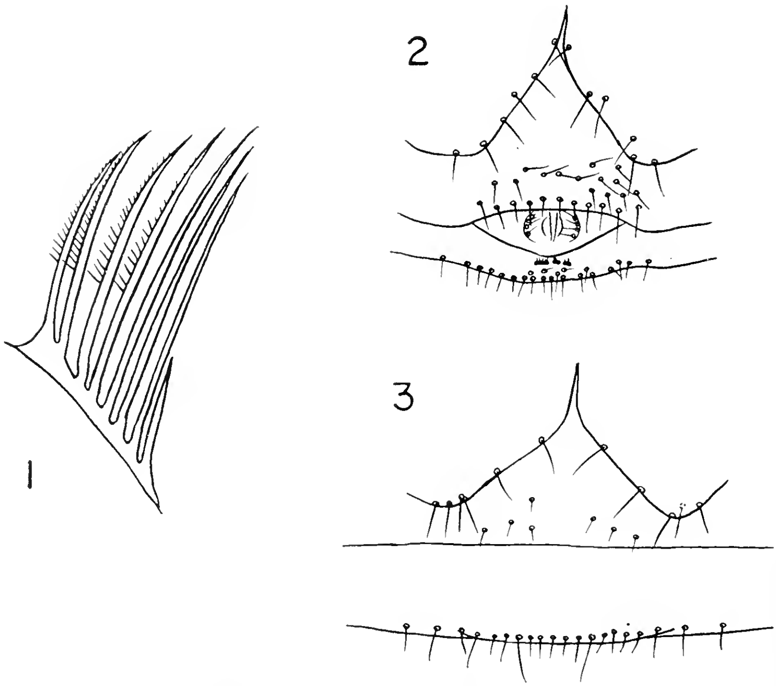

FIG. 1. *Novobisium* sp., ♀, from Brushy Mountain Heath Bald, Sevier County, Tennessee. Ventral view of flagellum of right chelicera. FIG. 2. *Novobisium carolinense*, ♂, from Mount Mitchell, Yancey County, North Carolina. Chaetotaxy of genital area. FIG. 3. *Novobisium* sp., ♀, from Big Black Mountain, Harlan County, Kentucky. Chaetotaxy of genital area.

Comparison of the flagellum of *Novobisium* with that of specimens of *Parobisium* from Utah demonstrates that the two genera are indeed distinct. The flagellum of *Parobisium*, described in detail elsewhere (Muchmore, 1967), is composed of eight setae, all serrate and of nearly equal size.

Adult specimens of the genera *Neobisium* and *Novobisium* can be distinguished by the following combinations of characters:

Cheliceral flagellum with seven to eleven setae, of which only the two distal ones are serrate, the others being smooth and acuminate; posterior genital operculum of male with a patch of small setae across the middle of the anterior edge; anterior genital operculum of female with a group, or row, of setae across the middle of the sternite. . . . . **Neobisium** Chamberlin.

Cheliceral flagellum with eight (rarely seven or nine) setae, of which the distal four (rarely five) are serrate, the others being smooth and acuminate; posterior genital operculum of male with a comb-like row of close-set, short, heavy setae in the center of the anterior edge; anterior genital operculum of female with two separate, small groups of setae, one group on either side of the midline. . . . . **Novobisium,** new genus.

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A New Species of Empidideicus Becker from Texas (Diptera: Bombyliidae)

JACK C. HALL *

Melander (1946) gave a brief history of *Empidideicus* Becker and at that time described three new species, thereby establishing the genus in North America. Melander's species were re-

* Department of Biological Control, University of California, Riverside, California 92502.

corded from southern California and Arizona. The present species extends the range of distribution of *Empidideicus* to southwestern Texas.

These flies are among the smallest of the Bombyliidae, rarely, if ever, exceeding 2 mm in length and as such are undoubtedly frequently overlooked. They are remarkable in their reduction of the wing venation and in this respect they approach not only *Mythicomyia* but also *Cyrtosia.*

The following key has been adapted from Melander to include the new species.

Key to American Species of Empidideicus

1. Second vein vestigial, no distinctive marginal cell; basal cells of equal length, anterior basal veins pale; anal lobe wider than anal cell........................2
   Second vein distinct, curving to meet the first vein; second basal cell shorter than first basal cell; veins black; anal lobe no wider than anal cell; legs black; a conspicuous bright yellow spot above fore coxae...... ....**propleuralis** Mel.
2. Scutellum nearly entirely yellow or white; abdomen predominantly pale..................................3
   Scutellum black; abdomen black with the incisures narrowly yellow; humeri and notopleural suture yellow (♂), or humeri, broad notopleural mark and post-alar callosities yellow (♀)......**humeralis** Mel.
3. Legs yellow, basal ⅔ of femora black; last four abdominal segments yellow (Calif.).......**scutellaris** Mel.
   Legs, except for tips of tarsi, entirely white; fourth abdominal segment with a median, basal, black spot; terminal segment entirely shining black (♂), side of abdomen with a broad black stripe from base to apex (♀)........................**timberlakei** n. sp.

Empidideicus timberlakei n. sp.

Quite similar to *scutellaris* but differs primarily in the distribution of black on the abdominal dorsum and the pale yellow to white legs. In *scutellaris* the color is yellow and the basal two-thirds of the femora are black.

Male: (1.2 mm). Black with white markings. Head shining black; front with lower half broadly white; width at median ocellus equal to length from antennal base to median ocellus; with a median longitudinal depression. Face from mouth opening to antennae, white, color continuous with that on front; rest of face black. Proboscis projecting a short way beyond epistoma, nearly as long as head height, more or less rigid with fleshy labellae. Palpi minute, not readily apparent. Antennae black, first segment extremely small, pale; apex of second segment pale; third segment swollen, nearly twice as long as basal segments combined, with short black hair at least on inner surface; arista distinctly separated and nearly as long as third segment, tapering from base to acuminate tip, minutely setulose. Occiput shining black, swollen, with short, thin, scattered pale yellow hair.

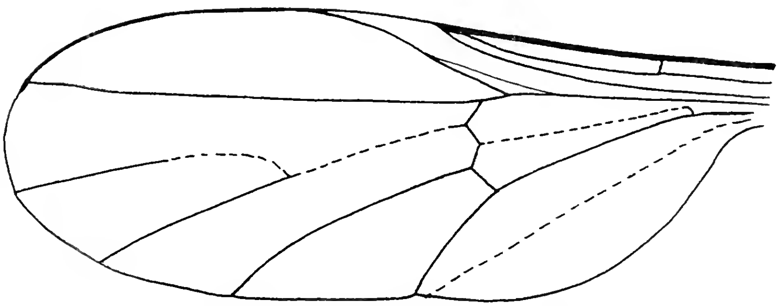

Fig. 1. *Empididicus timberlakei*, n. sp. Holotype male.

Mesonotum, to scutellum, shining black, lateral margin white from humeral callus to post-alar callus, with short, scattered pale yellow hair. Pleura black, subshining, a broad white stripe runs from propleuron to wing base, color contiguous with that on side of mesonotum; a light spot above fore coxae, sutures faintly and narrowly pale. Coxae dull black, apices white. Legs except for dark tarsi, white. Halter entirely white. Squama white, without an apparent fringe. Scutellum white, narrowly black at base. Wing hyaline, veins at anterior basal third of the wing pale, rest brown; second vein forms an obscure, small marginal cell (Fig. 1); base of fourth vein from *r–m* crossvein to fork only obscurely present, as is axilliary vein and the vein separating the two coextensive basal cells; anal lobe nearly twice as wide as anal cell; discal cell confluent with second posterior cell; costa extends to apex of third vein, not reaching apex of wing.

Abdomen white, middle of first four segments broadly black, color decreasing in amount posteriorly, black color does not reach lateral margin; dorsal plate of genitalia shining black, dorsum with short, pale pile; venter entirely white. Genitalia with dorsal plate large, emarginate on side, nearly completely covering the open pygidium.

Female: Like the male except the light color tends more toward yellow than white. Side of abdomen with a broad, median black stripe extending from base to apex; first sternite black. Genitalia entirely yellow.

The variations in the eight specimens before me are slight indeed; the pale spot above the fore coxae may or may not be present as is a similar spot above the hind coxae. The first and second veins may be completely coalesced rather than as described, or obscured by the color of the first vein and the associated membrane.

E. timberlakei is placed somewhere between *scutellaris* and *propleuralis*. The eyes in both sexes are widely separated as in *scutellaris* and the basal cells are equal in length. The second vein forms a small marginal cell as in *propleuralis*.

Holotype male, allotype female and five paratypes from 26.2 mi. E. Sierra Blanca, Hudspeth Co., Texas, 4 September 1965 (P. H. Timberlake) on flowers of *Tidestromia* sp. All in the collection of the University of California at Riverside.

Reference

Melander, A. L. 1944. Ann. Ent. Soc. America, 39: 451–495, 1 pl.

The Strecker Letters from Naturalists*

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

When the Field Museum of Chicago bought the Herman Strecker collection of Lepidoptera about fifty years ago, it also acquired Strecker's correspondence files. These contain well over 10,000 letters written by naturalists who either supplied material to Strecker or purchased it from him, or with whom he corresponded on taxonomic problems. In 1963, I made arrangements with the Board of Trustees of the museum through Dr. Rupert Wenzel, the curator of the entomological collections, to study some of these letters. In 1965, further arrangements were made with the museum and a special National Science Foundation grant GS 969 was awarded to curate the letter collection. Since 1963, Dr. Dolores Renze, Archivist for the State of Colorado, has been associated with me in this project of conserving the Strecker hoard. Thus far two groups of letters have been fully processed and returned to the Field Museum.

The letters, as received at the Archives, are in their original covers and tied in bundles. The great majority of them are extremely dry and fragile and require special handling. The bundles are opened and the letter in their covers spread on trays in the humidifier and often must be kept there for four or five months. When sufficiently relaxed, they are opened, pressed flat, Xeroxed and put into temporary files with the cover of each letter attached to it with a stainless steel paper clip. The Xerox work copies then are arranged in chronological order and those with no date or indefinite date placed in sequence upon the basis of content. Groups of letters containing important entomological data are noted for future study and report. Thus far five groups of letters have been reported upon in ento-

* This work was started as an adjunct to N.S.F. Grant GB 194 and is being continued under N.S.F. Grant GS 969.

mological literature and a like number set aside for near future reporting. Graduate students at Denver University who are working in the field of archival retrieval and processing carry on much of the laborious work connected with the project under the direct supervision of Dr. Renze.

The processed letters are stored in special pure rag paper liner folders which are placed in tougher outer folios. Groups of folios are cased in standard archive shelf-boxes. Microfilms have been prepared of the processed papers so as to protect the originals from undue wear that might occur from repeated searches. In addition to the microfilm at the Field Museum there is a second copy on file in the Colorado State Archives. A third set of the letters is in my library in the form of the Xerox copies. These are intended for "work copies" and are being so used in connection with my studies of type material. They are available to qualified researchers on a limited loan basis.

The authors of the letters thus far processed are the following:

Group I

Author	*Dates*	*No. of Folios*	*No. of Items*
Oscar Theodore Baron [1]	1879–93	7	74
Thomas E. Bean	1876–96	4	46
Hans Herman Behr [1]	1874–1900	4	40
Henry Edwards	1869–91	12	121
William Henry Edwards	1870–87	4	46
William Chapman Hewitson [3]	1871–78	6	64
Walter James Hoffman	1870–73	2	19
Charles Adam Hoke McCauley	1877–83	3	32
Herbert Knowles Morrison	1871–85	14	140
Tyron Reakirt [1]	1866–72	9	97
Samuel Hubbard Scudder	1873–93	1	15
Richard Harper Stretch	1870–84	3	31

Group II

William Barnes	1885–97	1	5
E. Baumhauer	1882–97	3	22

James Behrens	1872–83	7	46
H. H. Brehme	1890	1	3
David Bruce [1]	1882–97	11	114
Arthur Gardiner Butler [3]	1878–79	1	9
F. Cormack	1897	1	3
William Couper	1872–85	4	38
Doncaster & Watkins	1878–93	4	39
Harrison Gray Dyar	1894	1	6
Thomas Edmunds	1882–86	2	16
Albert Koebele	1890–97	1	5
R. J. Oliphant	1897	1	3
Ernest J. Oslar	1897	1	3
Rodrigues Ottolengui	1897	1	7
Eugene Pilate [1, 4]	1874–98	14	131
William Saunders	1878–87	1	5
Theodore Edward Weidenheimer	1894–97	2	(6)[2]
C. E. Worthington	1877–79	1	10
William Greenwood Wright	1881–83	3	27

[1] These letters have been the basis of the following papers published by F. M. Brown in recent years: "Oscar Theodore Baron." 1956. J. Lepid. Soc. 19: 35–46. "Letters from H. H. Behr to Herman Strecker." *Ibid.*, in press. "Tryon Reakirt (1844–?)." 1964. *Ibid.* 18: 211–214. "David Bruce (1833–1903) and other Entomological Collectors in Colorado." 1966. Jour. N. Y. Ent. Soc. 74: 126–133. "Eugene Pilate (1884–1890)." Ent. News 78: 57–59.

[2] Additional letters have been found and are being processed.

[3] Xerox copies have been deposited with the British Museum (N. H.).

[4] Work copies on loan to Dayton Museum of Natural History.

In Memorium

RUDOLF G. SCHMIEDER

1898–1967

Rudolf G. Schmieder, editor of ENTOMOLOGICAL NEWS since 1958, died suddenly at his home in Elwyn, Pa., August 23, 1967. An account of his life will be published in a later issue.

New Books

TRAP-NESTING WASPS AND BEES: Life Histories, Nests, and Associates. By **Karl V. Krombein.** The Smithsonian Press, Washington, D. C. 20560. 570 pp. Price: $12.50.

To those "biologists" whose research relies heavily on complicated (and expensive) equipment, and whose productivity seemingly is geared to the computer, it may be of more than passing interest to be reminded that basic research in biology and ecology can still be done by a competent investigator using a simple and inexpensive technique. What technique can be simpler than a hole in a small block of wood?

Actually, various types of holes in wood are vitally important to certain bees and wasps, as they are the microenvironments in which the species have been perpetuated through the centuries. By providing such holes in natural locations, Dr. Karl Krombein was able to "trap" the insect occupants for study in his laboratory. Krombein's extensive use of the trap technique during a 12-year period is culminated in this outstanding book.

As Krombein pointed out in the introduction to his book, a long-term study in several different faunal zones could be expected to yield considerable information. Such was the case, attested by 486 pages of carefully documented records on the nests of 75 species of solitary wasps in the Vespidae, Pompilidae, and Ampulicidae, 43 species of solitary bees in the Colletidae, Megachilidae, and Xylocopidae, and 83 species of parasites and predators associated with their host wasps or bees. The detailed original records have been thoroughly collated with the published information of previous investigators. There are 139 excellent black and white figures that show various aspects of the trap-nest technique, including views of cell architecture, cell occupants, prey, and parasites.

This book is a superb contribution to insect biology. It will be an indispensable reference work for students of bees and wasps in the groups concerned. It also will be of interest to students of evolution and behavior, as it summarizes our information on certain fundamental mechanisms needed for survival during insect development in a linear burrow. It is necessary that larvae are oriented head outward in the borings at times cocoons are spun, and that males and females are arranged in proper sequence when both are present in the linear series of cells. Krombein explains how such mechanisms are provided for unborn and unseen progeny at the time the mother insect builds the cell partitions and controls the sex of the egg she lays.

Dr. Karl Krombein is Chairman of the Department of Entomology at the Smithsonian Institution's Museum of Natural History. He conducted his investigations while Leader of Taxonomic Investigations of Hymenoptera in the U. S. Department of Agriculture, Entomology Research Division, U. S. National Museum. His book is recommended to both the Hymenoptera specialist and persons interested in natural-history. Readers will be fascinated by the microcosm of the nesting hole, revealed so well by Dr. Krombein's careful research.—J. T. Medler.

Centennial of Entomology in Canada 1863–1963. A Tribute to Edmund M. Walker, edited by **Glenn B. Wiggins.** Contribution No. 69, Life Sciences, Royal Ontario Museum, University of Toronto, pp. 1–94, 1966. Price: $5.00.

Following an introductory chapter by G. B. Wiggins there are six other chapters by G. P. Holland on Entomology in Canada, an Autobiographic Sketch by Edmund M. Walker, J. R. Dymond on Walker as a Professor of Zoology, Glenn B. Wiggins on Walker as Curator, Royal Ontario Museum, F. A. Urquhart on Walker's Work on the Orthoptera, and H. H. J. Nesbitt on Grylloblatta, and by Philip S. Corbet on The Study of the Odonata, and finally by J. G. Oughton: Impression of Delight. The final ten pages are devoted to listing the Publications of E. M. Walker. This handsome volume is a fitting tribute to the outstanding personality in Canadian Entomology. There are ten fine illustrations, including photographs of Dr. Walker and also a colored reproduction of one of Dr. Walker's paintings "Spring Pools in the Bush."—R. G. S.

Notice

The new editor of Entomological News will be Ross H. Arnett, Jr., Professor of Entomology at Purdue University. Address all correspondence regarding editorial matters to Dr. Arnett at: 550 Elston Road, Lafayette, Indiana 47905.

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MEMOIRS OF THE AMERICAN ENTOMOLOGICAL SOCIETY

Number 20

A REVISION OF THE MEXICAN AND CENTRAL AMERICAN SPIDER WASPS OF THE SUBFAMILY POMPILINAE (HYMENOPTERA: POMPILIDAE)

By Howard E. Evans

Museum of Comparative Zoology,
Harvard University

433 pages of text; 11 plates; 80 maps; 2 text-figures; table of contents and index.

This is the first comprehensive treatment of the Mexican and Central American Pompilinae since the Biologia Centrali-Americana (1893). The 143 species are placed in 39 genera and subgenera, one of the subgenera being newly described. Much new synonymy is indicated, 25 new combinations are made, and 24 new species and subspecies are described (including several from the United States and several from the West Indies). The taxonomic material is preceded by a 15 page discussion of the composition of the Mexican and Central American pompiline fauna.

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CONTENTS

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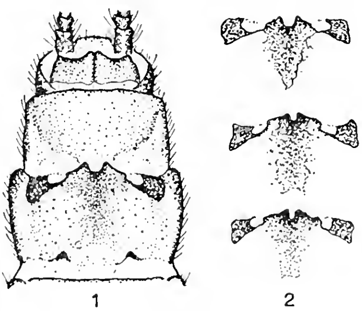
ENTOMOLOGICAL NEWS

VOL. LXXVIII   NOVEMBER, 1967   No. 9

The Female of Capnia labradora Ricker (Capniidae, Plecoptera)

ALAN V. NEBEKER, National Water Quality Laboratory, Duluth, Minnesota

Eight specimens of this rare species were collected on April 6, 1966 by JEH Martin from Baie St. Paul, Quebec. Dr. Ricker, Nanaimo, B. C., obtained them and sent them to me so that I might describe the female in order to complete the work with the *Capnia columbiana* complex (Nebeker & Gaufin, 1965).



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(See text for explanation of figures)

This species was previously known only from two male specimens, the holotype and one paratype, obtained from Nain, Labrador. The males collected from Quebec are identical with those from Labrador and need no further illustration or description here. Dr. Ricker described the males (1944) as a variant of *Capnia columbiana* but later (1954) gave them full specific status based on further considerations of the male genitalia and associated structures. The female is distinct when compared with the western *C. columbiana* but they are closely related. The female is here described:

FEMALE.—Wings macropterous. Length of forewing 7.7–8.0 mm. Length of body 7.0–7.3 mm. Eighth abdominal sternite (Fig. 1) with well developed subgenital plate, posterior edge wide, being about $\frac{1}{3}$ the width of sternite. Anterior sclerotization of 8th sternite present, but confined to 2 small median dots. Posterior edge of subgenital plate (Fig. 2) somewhat variable but consisting basically of two rectangular lobes separated by a median notch, giving the appearance of 4 low corners. Lateral sclerotized patches of 8th sternite consistent, somewhat square, each $\frac{1}{6}$ to $\frac{1}{8}$ width of sternite.

TYPES.—Allotype female, Que, Baie St. Paul, April 6, 1966. JEH Martin Four males and 3 females collected with allotype All deposited in the Canadian National Collection, Ottawa.

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——, 1954. Proc. Ent. Soc. British Columbia 51: 37–39.

New Records of Two Curculionid Beetles in North Carolina

DAVID L. WRAY, Curator, Division of Entomology, N. C. Department of Agriculture, Raleigh

Gymnetron antirrhini Paykull was recorded for the first time in North Carolina when six specimens were collected September 5, 1966, by the writer. These were on a flower head of a plant in a pasture at 5,500 feet near the top of Hanging Rock Mt., in southwestern Watauga County, North Carolina. The determination was made by R. E. Warner, U.S. National Museum.

Another snout beetle, **Hylobius pinicola** (Couper), was collected July 19, 1966, by A. H. Maxwell near the top of Mount Mitchell, North Carolina, at 6,600 feet, on Fraser Fir, *Abies Fraseri* (Pursh.). One other record (Warner 1966) was from "Black Mts." which would be in the same range as Mount Mitchell. According to the literature this is the southernmost record for this beetle in the United States.

Reference

WARNER, R. E. 1966. Coleopterists' Bull. 20(3): 65–81.

Some New North American Collembola

DAVID L. WRAY [1]

The following forms of springtails, which I here describe as new, have come to me from widely separated areas of the United States. The first form, *Deuterosminthurus yumanensis*, n. sp., occurs in a wide area from California to Indiana. Three forms belong to the Sminthuridae, viz.: *D. yumanensis, S. adamsi*, and *D. macomba;* the fourth, *Neanura palmeri*, belongs to the Poduridae. Appreciation is herewith expressed to the collectors who sent these specimens to me for study.

Deuterosminthurus yumanensis, new species (Fig. 1-A–G)

Length up to 0.75 mm. Two color forms are present. The dark form (Fig. 1-A) is heavily colored purple on dorso-posterior of body and has two dark lines on dorsum which run forward to head; with dark streaks from eyespots down and forward on cheeks. The light form has the color more or less in four longitudinal dark streaks on dorsum and sides of body (Fig. 1-B, C). Antennae with first two joints light yellowish and last two lightly colored bluish. Legs, furcula, and venter

[1] Entomologist, Insect Survey, Division of Entomology, N. C. Department of Agriculture, Raleigh, N. C.

of body whitish in both color forms. With a transverse depression behind the middle of abdomen. Eyes 8 on each side and in dark eyespots. Antennae with 4 segments, last segment with 4 distinct subsegments besides basal and distal segment. A definite whorl of hairs on each subsegment. Proportions of antennal segments as 10:45:68:135. End bulb very evident on fourth segment (Fig. 1-D). Proportional length of head to antennae as 165:258. Unguis (Fig. 1-E) nearly straight basally and only slightly curved apically; with or without an evident inner tooth. Unguiculus small, spinnate, and having a terminal, knobbed bristle which extends only slightly beyond apex of unguis (Fig. 1-E). Two or three definite knobbed tenent hairs as shown in Fig. 1-E. Supra-anal segment of abdomen possesses 6 to 8 heavy, stout, curving hairs bent posteriorly over anal region. Anal appendage of female (Fig. 1-G) very evident, smooth, blade-like, and curved; no evident serrations or raggedness noted. Proportions of furcula as follows: manubrium 140, dens 100, mucro 40. Dens with 3 to 4 ventral, suppressed, long setae evident; with 8 long, outstanding, dorsal setae in a row, with basal seta being longer than others. Mucro spoon-shaped (Fig. 1-F) with no serrations or crenulations evident. With three bothriotrichia on side of abdomen in an oblique straight row (Fig. 1-C).

Type locality: Calexico, CALIFORNIA, July 16, 1958, specimens collected by E. I. Schlinger by means of a vacuum cleaner in alfalfa field. Other specimens were examined from Stillwater, Oklahoma, collected July 22, 1963, on *Cynodon* by R. M. Ahring. Some specimens also came from Indiana.

The co-types of this species and the following described new species are deposited in the N. C. Insect Survey Collection, Raleigh, N. C.

Sminthurus adamsi, new species (Fig. 1-H–K)

Length up to 2.0 mm. Deep purplish-black [color] on dorsum of body as patterned in Figure 1-H. Most of purplish color on postero-dorsal surface with intermingled light spots and ob-

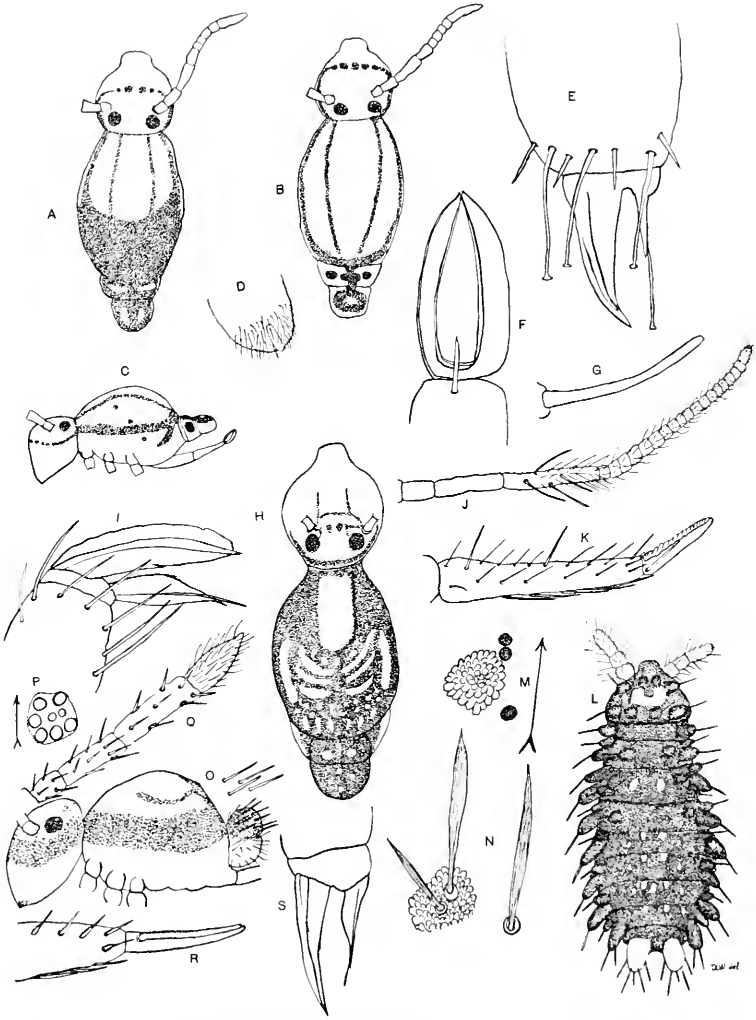


Fig. 1. *Deuterosminthurus yumanensis,* A–G: A—dorsal view of dark form, B—dorsal view of light form, C—lateral view color pattern of light form, D—fourth antennal bulb, E—unguis and unguiculus, F—mucro, G—female anal appendage; *Sminthurus adamsi,* H–K: H—dorsal color pattern, I—unguis and unguiculus, J—antennal segments, K—dens and mucro; *Neanura palmeri,* L–N: L—dorsal color pattern, M—eyes and ocular tubercle, N—forms of tubercle hairs; *Dicyrtoma macomba,* O–S: O—lateral color pattern, P—eyes, Q—antennal segments, R—mucro, S—unguis and unguiculus.

long streaks. Head [colored] purplish on under surface and only some dark spots and streaks in area of insertion of antennae. Venter of body, furcula, and tibia white. Other parts of legs just lightly pigmented. First 3 antennal segments unpigmented; fourth segment deep purplish-blue color. Ventral tube unpigmented, long and heavily tuberculate. Eyes 8 on each side in dark eyespots. Antennal segments in proportion as follows: 20:35:42:65; the fourth segment with 19 annulations. Unguis with well developed tunica which ends before tip of unguis; unguis only slightly curved, not very broad basally and with 1 tooth evident on inner margin (Fig. 1-I). Unguiculus broadly lanceolate ending spinnately and with a terminal spine which extends as far as the apex of unguis. Knobbed tenent hairs absent. Mucronal seta present. Outer edge of mucro serrate, bearing about 17–20 serrations; inner edge with about 6 to 8 slight crenulations. Mucro to dens as 1:3.5. Dens with 5 suppressed ventral setae; a row of 8 dorsal hairs, with two long and outstanding as compared to other hairs (Fig. 1-K).

Hairs on distal part of second antennal segment longest (Fig. 1-J); hairs present on third and fourth antennal segment as normal for this genus, fourth having about 1 whorl of hairs to each annulation. Posterior margin of head with 6 to 8 heavy, long hairs, four in a posterior row. With several heavy backward curving hairs on anal segment of body. Tibia with a row of heavy hairs on anterior surface.

Type locality: Mt. Mitchell State Park, North Carolina. Collected at 6,200 feet altitude, June 20, 1958, by D. A. Adams for whom this species is named.

Neanura palmeri, new species (Fig. 1-L–N)

Length up to 3.5 mm. Dark purple color (Fig. 1, L) over entire body with the following exceptions:—the entire antennae are white, last two dorsal tubercles of anal segment are white; most of legs are white up to coxae, with only slight color streaks on upper femora; ventral tube is white; proboscis is white; venter only lightly colored.

Antennae are conical, shorter than head, and segments 3 and 4 are only faintly demarcated. Proportional lengths of antennal segments are 25:20:17:20, the first segment wider and longer than the others. Organ of third segment with 2 sense rods and 2 blunt hairs; fourth segment with 6 to 8 olfactory hairs and a 3-lobed knob at apex. Eyes 3 on each side, the anterior one directly anterior to the one next to tubercle and not touching tubercle (Fig. 1-M). Postantennal organ absent. Mouthparts for piercing and with buccal cone well developed. Segmental tubercles distinctly tuberculate, with arrangement and numbers as follows: head with 10, 4 in a posterior row, two dorsal ocular, two small tubercles on dorsum and just anterior to ocular, and with a small lateral tubercle on each side of head near posterior row; pronotum with 4, mesonotum to fourth abdominal segment with only 6 discernible tubercles each; fifth abdominal segment with only 4 tubercles, and sixth with 2 prominent tubercles (Fig. 1-L). The tubercles on the fourth, fifth, and sixth abdominal segments are the most prominent and developed. The dorsal tubercles are greatly reduced and none were discernible on dorsum from second abdominal segment posteriorly.

Unguis heavy, curved and untoothed. Unguiculus absent. Tenent hairs absent. Large hairs of the body long, pointed, and most somewhat striated and not serrate. The hairs of posterior are somewhat sword-shaped; some tubercles have 5 hairs and some with at least 2 emerging from dorsum of tubercles (Fig. 1-N). Most of lateral tubercles have at least one long pointed hair outstanding.

This species closely resembles *N. barberi*, but differs in the size and situation of tubercles on dorsum and sides of body, and in the number and position of eyes.

Type locality: taken in leaf mould at 6,200 feet altitude near the top of Mount Mitchell, N. C., July 1, 1959. Collections were made by D. L. Wray and W. M. Palmer for whom the species is named.

Dicyrtoma macomba, new species (Fig. 1-O–S)

Length up to 0.8 mm. Purplish pigmentation mostly over dorsal half of body and upper part of head. Heavy pigmentation along sides of body in wide bands and patches. Dorsum of abdomen lighter, except there is a Y-shaped design of purple on dorsum directed forward. Venter of body, legs, and furcula light (Fig. 1-O). Antennae purplish throughout. Head to length of antennae as 145:189. Proportions of antennal segments as 20:57:67:45; without subsegments, fourth segment with 7 to 8 definite whorls of hairs. Unguis long, narrow and ending rather sharply pointed; only faint dentation noted on inner margin, sometimes without teeth (Fig. 1-S). Unguiculus narrow, lamellate at base, and with a subapical bristle which reaches three-fourths length of unguis. No inner spine seen on basal lamella. Eyes 8 on each side in a dark eye patch (Fig. 1-P), with the 2 inner eyes much smaller than others. Dens to mucro as 5:15; with 3 ventral suppressed bristles on inner side and with 5 to 6 dorsal bristles and a longer basal bristle. Mucro long and narrow, ending bluntly with a divided apex, toothed on both margins, but teeth very minute and not serrate as most species of this genus.

With thick heavy bristles on anal segment (Fig. 1-O), and with somewhat similar but shorter bristles on postero-dorsum of head. Hairs of antennae as shown in Fig. 1-Q.

Type locality: MaComb, Illinois, specimens collected from moss September 21, 1958, by R. A. Scott.

Studies on North American Ants. II. Myrmecina

William L. Brown, Jr., Cornell University,
Ithaca, New York 14850

The myrmicine genus *Myrmecina* contains at least 25 described and undescribed species, most of which inhabit the Indo-Australian region. A few species form a close-knit complex of forms, widely distributed in the temperate parts of Eurasia and North America, that we may call the *graminicola* group. Brown (1949, 1951) presented revisionary notes on this group; insofar as these papers dealt with the North American representatives of the group, the main result was the synonymy of three "subspecies" or "varieties" of *M. americana* (*brevispinosa, texana, quadrispina*). The types of these forms match individual or nest variants found throughout eastern temperate North America, and despite vague and partly contradictory indications to the contrary, the names do not correspond to geographical entities that could be classified as "races" by those who recognize this category in the sense of Mayr (1942) and Creighton (1950), though the latter does attempt to maintain *brevispinosa* and *texana* in a racial framework.

Smith (1948) had meanwhile complicated the picture by describing *M. californica* from Santa Barbara, California, based on a single worker that is small and with unusually reduced sculpture, and is lighter and more reddish in color. Smith also mentioned the "tridentate" (trituberculate) anterior clypeal border and flattened scape bases as characteristic of *M. californica,* but as Snelling (1965) has shown, these last two characters vary locally in California, and may be present or absent there in different samples. Brown (1951) stated,

> . . . series from the southwestern United States average smaller, are often lighter in color, have smaller propodeal teeth and are more lightly sculptured. An extreme in these respects is reached by M. R. Smith's *M. californica,* which may, when collections from the West are more complete, prove to be one end of a gradual cline.

In this same paper, Brown put into evidence two small, smooth, light-colored *Myrmecina* workers taken by Wray with the Berlese funnel at Pittsboro, North Carolina. Under the circumstances, we do not know what the rest of the Pittsboro nest series was like. Nevertheless, these two workers fit the *M. californica* concept in sculpture and color, and their propodeal armament is greatly reduced. Since that time, on 29 August 1954, a very significant nest of *Myrmecina americana* has been found by Brown at Lexington, Massachusetts. This series consisted of a nest queen, a few winged queens and males, about 50 workers, and brood of all stages, found under a rock in a hilltop woodland. Of the workers, the three smallest ones are light in color and have definitely reduced sculpture and propodeal spines. These specimens are smoother than is the *californica* type. In the papers cited, Brown has already given evidence to show that reduction of sculpture, pigmentation and propodeal teeth are allometric characters at least partly phenotypically enforced by environmental deficiencies (such as low food supply). Though these considerations naturally cast doubt on the specific distinctness of *M. californica,* the lack of material from the Far West prevented further analysis of the situation. Recently, however, samples of *Myrmecina* have been taken in Arizona and California that help us to understand the status of the western populations.

The first collection, a single worker taken at Salmon Falls, El Dorado County, California (Wasbauer, 1965), was not much help by itself. I examined it through the kindness of Dr. Wasbauer, and determined it as Smith's *californicus,* though the clypeal and scapal base characters were perhaps not as well-marked as in the type specimen, which was not available for direct comparison. Now Snelling (1965) has reported on 4 more samples, 3 from widespread California localities and one from the Chiricahua Mountains of southeastern Arizona. Through Mr. Snelling's kindness, I have seen most of these specimens, as well as additional material from the Chiricahuas. I have also reviewed other southwestern material, including samples from Texas and a couple of workers taken at the base of the Huachuca Mountains in extreme southeastern Arizona by R. G. Wesson, most of this in the Museum of Comparative Zoology at Harvard University.

I can confirm Snelling's finding that the new western material is mostly smoother and more shining, and lighter in color, than are eastern samples. The head is also a little narrower on the average in the West, but the cephalic index overlap is broad in the lower and intermediate size classes (Fig. 1). The western populations can therefore be said to differ from the eastern

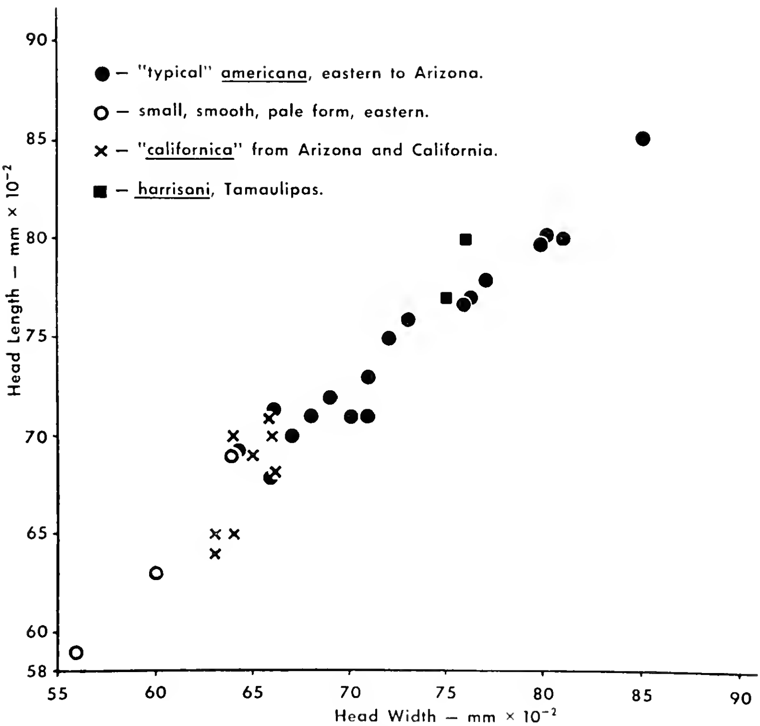


FIG. 1. Scatter diagram to illustrate regression of head length on head width in some samples of North American *Myrmecina* workers. Data and discussion in text.

mainly in average smaller size (and size-dependent characters), but the difference is not absolute.

It is also clear that the western samples differ fairly widely among themselves in all of the characters so far considered as diagnostic. Dark, fairly heavily sculptured variants have been found sympatrically with a smooth, light-colored one in southeastern Arizona, but the same is true of Lexington, Massachusetts, and Pittsboro, North Carolina, in the East. It would not be at all surprising to find that dark, heavily-sculptured *Myrmecina* also occur in favorable (moist) habitats in the Pacific Coast states. Meanwhile, it does not seem to me necessary to dignify the predominantly small, light, weakly sculptured *Myrmecina* samples from the West with a separate name, even a subspecies one. We can easily obscure the real situation by trying to force these populations into a conventional subspecies interpretation. Snelling's (1965) paper gives a key to the "subspecies" *texana, californica, americana* and *brevispinosa,* but he had not seen my revisionary notes of 1949 and 1951 at the time he wrote. Even so, *americana* and *brevispinosa* as he gives their ranges are sympatric over most of the eastern United States, and (by inference) over much of the central and western part of the country as well. It should be noted, incidentally, that the range of *M. americana* extends well beyond New York, at least into New England. Smith (1951) also cites a record from Montana.

In summary, the synonymy of *M. americana* is as follows:

Myrmecina americana
= subsp. *quadrispina*
= subsp. *texana*
= var. or subsp. *brevispinosa*
= *M. californica,* new synonymy.

The scatter diagram (Fig. 1) is based on the following worker head lengths (clypeus included) and head widths (excluding the eyes) from full-face view. For each specimen, the measurements (in hundredths of mm) are given separated by a diagonal, with head length first, in the form HL/HW.

M. americana: Pittsboro, North Carolina, strays (D. L. Wray), 59/56, 63/60. Lexington, Massachusetts, 29 Aug. 1954, nest series with winged sexes (W. L. Brown), 69/64, 71/71, 68/66, 77/76, 71/68, 76/73, 77/76. Gainesville, Georgia (J. C. Bradley), 80/81, 80/80. Buffalo River Campground, Marion Co., Arkansas, nest series (Cornell University Mexican Field Party, 1965), 85/85, 80/80, 78/77. Schooler Lake, Choctaw Co., Oklahoma (Cornell University Mexican Field Party, 1965), 72/69. Southwestern Research Station, Chiricahua Mts., Arizona, berlesates, L. M. Smith and R. D. Schuster, August 1958, 71/66, 73/71, 69/64, 70/67, 71/70, 75/72, 71/66. Eaton Canyon Wash, Altadena, Los Angeles Co., California, 6 June 1963 (R. R. Snelling), 68/66, 65/64. Pleasant's Valley, California, 5 April 1961 (A. Beck), 70/64, 69/65. 5.4 miles southwest of Winters, Yolo Co., California, 16 April 1960 (F. C. Raney), 65/63, 70/66, 64/63.

Types of *M. harrisoni,* see description below.

A Mexican Myrmecina

Up to now, *Myrmecina* has not been collected south of the U. S.-Mexican border, although the collections from southeastern Arizona suggest that it extends southward. We now have established that a population exists even in southern Tamaulipas, a little way south of the Tropic of Cancer. This population appears to represent a hitherto undescribed species.

Myrmecina harrisoni sp. nov. (Fig. 3)

Holotype worker: TL 3.4, HL 0.77, HW (without eyes) 0.75 (CI 97), ML (adjusted because mandibles are partly open) 0.21, WL 0.90, antennal scape L (chord, from basal collar) 0.61 mm.

Sculpture of head and alitrunk coarser than in *M. americana,* costulae thicker, and the spaces between the costulae relatively narrower and with nearly smooth, shining bottoms. Promesonotal disc with costulae strongly diverging anteriad, forming an irregular triangle with three transverse anterior elements (Fig. 3).

Other characters within the range of variation of eastern *M. americana;* median lobe of clypeus squarely truncate, with lateral and median tubercles present and about equally developed, not very prominent. Scapes not notably flattened at base. Propodeal teeth prominent, diverging, but also straight. Integument of gastric dorsum shining, with "Scotch-grain" shagreening or microreticulation distinct on basal segment.

Color black, shading to castaneous on mouthparts, coxae, and lower petiole and postpetiole; antennae and legs dull yellowish.

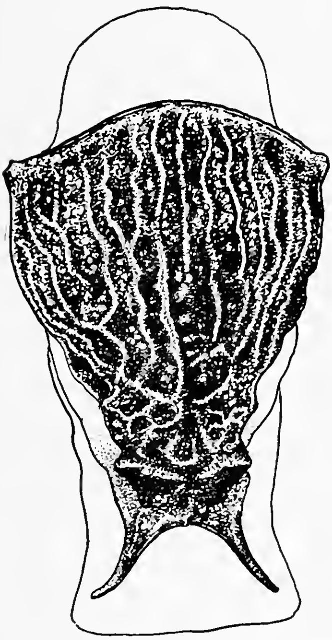
Holotype deposited in the Museum of Comparative Zoology, Harvard University. Paratype in the collection of the Department of Entomology, Cornell University.

Paratype worker: TL 3.5, HL 0.80, HW 0.76 (CI 95), ML 0.22, WL 0.90, scape L 0.65 mm.

Similar to the holotype, but a trifle larger. Median clypeal lobe with a more concave anterior border, the 3 tubercles somewhat better developed than in holotype. Details of sculpture, color and pilosity almost exactly as in holotype.

Holotype and paratype taken separately from different rotten logs in wet mountain forest dominated by oaks, *Liquidambar*, and *Podocarpus* at about 1,070 m altitude, Rancho del Cielo, Sierra Guatemala, above the village of Gomez Farías in southern Tamaulipas, Mexico, 23 July, 1965 (Cornell University Field Party). This wonderful locality is described by Martin (1958) in his account of the herpetofauna of the Gomez Farías region. The samples were taken in the forest within 500 m of the house of Mr. Francis Harrison, proprietor of Rancho del Cielo, naturalist, and frequent host to itinerant naturalists, to whose memory the species is dedicated. Months after our visit to Rancho del Cielo, "Frank" Harrison was cruelly and senselessly murdered. Let us hope that his attempts to save some part of the northernmost true wet tropical forest in the Western Hemisphere will not have been in vain.

The species *M. harrisoni* was described only after much deliberation. After all, it may prove to be a mere southern geographical variant of *M. americana,* already known from such fairly close areas as Austin, Texas (about 520 miles as the crow flies) or the Chiricahuas of southeastern Arizona (over 850 miles). Possibly *Myrmecina* samples will eventually be found in the Sierra del Carmen or other ranges south of Texas; if so, they should be helpful in judging the status of *M. harrisoni.* But the specific distinctness of this form is for the present indicated by its sculpture, which is completely outside the known variation of available North American samples, and which sharply reverses the prevailing trend toward reduction seen in the southwestern United States (Compare Figs. 2 and 3).



FIGS. 2 and 3. Sculpture of dorsal surface of alitrunk of North American *Myrmecina* workers of about the same size. FIG. 2 (left), *M. americana* from Marion Co., Arkansas. FIG. 3 (right), *M. harrisoni* sp. nov., holotype.

Acknowledgments

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Male Genitalia of the Sericomyiini Complex (Diptera: Syrphidae) Part I

Kenneth E. Weisman, Department of Biological Sciences, Western Illinois University, Macomb, Illinois *

Previous studies within the Syrphidae have shown that the male genitalia afford excellent structures for defining generic and subgeneric limits. Although the Sericomyiini are a complex group and present numerous problems in interpreting relationships, the male genitalia, with exception of two species, have never been illustrated or utilized diagnostically.

The primary purpose of this study is to redefine the limits of the supra-specific groups within the Sericomyiini complex. Secondarily, an endeavor is made to present a clearer understanding of the species of the complex and their relationships to each other through utilization of the genitalia. Also, degrees of asymmetry observed in the genitalia will be applied to further elucidate relationships. This study will deal primarily with the species of North America, although as larger numbers of specimens become available from other regions they will be included.

The following brief historical review of the complex is not intended to be complete. Its purpose is to present the status of the groups within the complex at various times.

Schiner (1860) was apparently the first to consider the possible relationships of *Arctophila* and *Sericomyia*. Lioy (1864) placed *Sericomyia, Arctophila,* and *Volucella* within the subfamily Parassitini, a member of the family Eristaliti. However, his classification at that particular time was used in a different sense from their accepted present meaning. Lioy's term "family" corresponds to our present subfamily rank with his "subfamily" corresponding to tribe. Williston (1886) first utilized Sericomyini as a tribe, composed of *Arctophila* and *Sericomyia*. Hunter (1897) upon establishing the genus *Pyritis* acknowledged that the type-species fell naturally into Williston's tribe.

* Present address: Forest Lake Road, Land O'Lakes, Wisconsin 54540.

Coquillett (1907) in establishment of the genus *Condidea* asserted that the type-species was practically a *Sericomyia*, thus forming a possible link between the tribes Sericomyiini and Eristalini. Curran (1923, 1934) composed keys to the species of *Sericomyia* which also contained the type-species of *Condidea*. Osburn (1926) upon naming a new species of *Condidea* stated that this genus was closely related to *Sericomyia*.

Hull (1949) in his world review accords the complex subfamily rank containing *Sericomyia* as a tribogenus with *Conosyrphus*, *Condidea*, *Arctophila*, *Paractophila*, and *Bulboscrobia* as subgenera; the remaining genera being *Pseudovolucella*, *Pyritis*, and *Tapetomyia*. Seguy (1961) also gives the complex subfamily rank composed of *Sericomyia* (= *Cinxia*) and *Arctophila* as occurring in Western Europe. Stone *et al.* (1965) gives the complex tribal rank composed of the genera *Sericomyia*, *Arctophila*, and *Pyritis* as occurring in America north of Mexico.

I wish to thank W. W. Wirth who kindly arranged the loan of specimens through the United States National Museum and Y. S. Sedman of Western Illinois University for the loan of his personal collection.

Genus **ARCTOPHILA** Schiner

Arctophila Schiner, 1860, Wiener Entomologische Monatschrift 4: 215.

Hull (1949) gives their numbers and distribution as follows: Palearctic 3, Nearctic 2, and Oriental 1. The species of *Arctophila* considered in the first part of this study include both forms from North America, *A. flagrans* Osten Sacken, 1875 and *A. harveyi* Osburn, 1908. The Palearctic members represented being *A. mussitans* (Fabricius), 1781 and *A. bombiformis* (Fallen), 1810 the type-species. At this time I have not seen the Oriental species nor the third Palearctic species.

Members of the genus may generally be distinguished from others of the complex by their dense pilosity and elongate face.

Male Genitalia

The genitalia being displaced from their original or primitive plane are directed cephalad instead of caudad; for clarity, descriptions (unless otherwise noted) used throughout this study refer to the original or nonrotated condition. Preparation of genitalia and morphological terminology are based primarily on Metcalf (1921). The genitalia are composed of the ninth abdominal segment along with its associated structures: paired anal cerci, paired claspers, and a penis sheath housing the axial system (Figs. A, B, C, D; 1–4).

Epandrium: Although the epandrium (9th segment) is rather consistent in shape throughout the genus a somewhat asymmetrical condition is observed in the lateral areas at which point the claspers articulate (Figs. 1–8). This condition probably results from the asymmetrical configuration of the claspers at this point.

Cerci: Arising from the mid-caudal angle of the epandrium these structures are symmetrical while differing slightly in shape between species.

Claspers: These paired structures, articulating with the caudolateral borders of the epandrium are strongly asymmetrical. This expression of asymmetry is most evident in their relative lengths, the abbreviated left clasper (right clasper when in rotated condition) as compared to the length of the right clasper. Although this study of the complex is not yet complete samplings of numerous species within the various genera and subgenera indicate that this asymmetrical condition of the claspers is not confined to the *Arctophila* alone. The asymmetry is, to varying degrees, consistent throughout the Sericomyiini complex and may well be considered a characteristic of the complex.

The asymmetry of the claspers is pronounced distally while the proximal areas are generally similar to each other with exception of the dorsocephalad regions where articulation with the epandrium occurs; this is most evident in *A. flagrans* (Figs. 3, 7). The right claspers (Figs. 5–8) are elongate, bent mesad, with their apical $\frac{1}{3}$ attenuated and terminating in a "claw-like" process. The apical termination of the left clasper (Figs. 1–4) is quite variable between species. *A. flagrans* (Fig. 3) displays a truncate condition apically which is lacking in the other representatives.

Penis Sheath: For reasons of clarity in preparing illustrations the penis sheath has been displaced from its normal position which is that of its apical $\frac{1}{2}$ to $\frac{1}{4}$ being located between the claspers. The axial system, prior to being removed from the sheath and illustrated separately (Figs. 17–20), has been retained in normal position within the sheath but has not been stippled (Figs. 1–4, 9–16).

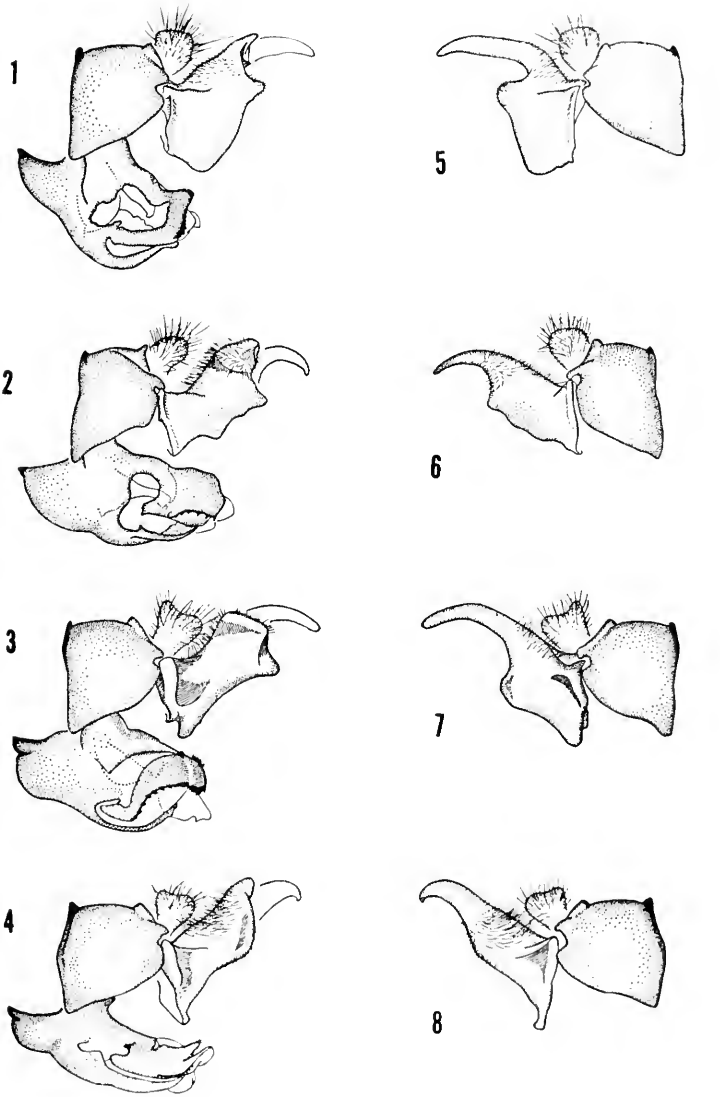
The penis sheath, cylindrical in shape and housing the axial system, articulates near the ventrocephalad areas of the epandrium. The caudal portion is highly specialized and displays pronounced interspecific variations while the cephalad area shows little modification. Laterally the sheath displays apparent openings of various shapes; actually these areas are covered by a diaphanous membrane. In *A. mussitans* (Fig. 2) and *A. harveyi* (Fig. 4) these areas are continuous with the cephalic emargination while in *A. bombiformis* (Fig. 1) the area is separated from the emargination, and in *A. flagrans* (Fig. 3) it is indistinct.

Dorsally the superior lobes comprise the apico-lateral angles of the penis sheath. Along the apico-ventral margins of the lobes are found highly sclerotized serrations which may serve in a clasping function. In *A. harveyi* (Figs. 4, 16) a unique configuration of the lobes is found when compared to the other representatives, i.e., the lobes are strongly bilobed dorsally, with the apical lobe being concave on its anterior surface.

Explanation of Figures

Figs. 1–4. Epandrium and associated structures: 1, *A. bombiformis;* 2, *A. mussitans;* 3, *A. flagrans;* 4, *A. harveyi.*

Figs. 5–8. Epandrium and right clasper; 5, *A. bombiformis;* 6, *A. mussitans;* 7, *A. flagrans;* 8, *A. harveyi.*



Figs. 1–8.

The apical termination of the sheath is open both on its dorsal and ventral surfaces thus allowing the caudal end of the chitinous box to project forward out of the sheath. Dorsally (Figs. 13–16) the apical $\frac{1}{3}$ to $\frac{1}{2}$ is open; ventrally (Figs. 9–12) the cephalic emargination extends backward to varying lengths and is interrupted medially by a lingula-like structure which is variable in shape (Figs. 9–12). It is difficult to determine whether this structure is the lingula of Metcalf or possibly the inferior lobes.

Although no asymmetry has been found within the penis sheaths of the studied *Arctophila* degrees of asymmetry of some other groups of the complex, most noticeably those of the *Condidea* group, are prevalent both in the sheaths and axial systems.

Axial System: This structure, housed within the penis sheath, is composed of a sustentacular apodeme, paired internal lobes, and a chitinous box. Attached to the chitinous box, therefore considered as part of the axial system, are the ejaculatory apodeme and ejaculatory duct (Figs. D, 17–20).

The elongate sustentacular apodeme has its free end within the epandrium and projects forward into the penis sheath where its opposite end articulates with the chitinous box. This apodeme while being compressed laterally exhibits a keel-like projection ventrally. In both Palearctic species (Figs. 17, 18) the keel is flanged laterally with the flange being continuous along the anterior surface of the keel to the dorsal surface of the apodeme. The two Nearctic species do not have a flanged keel.

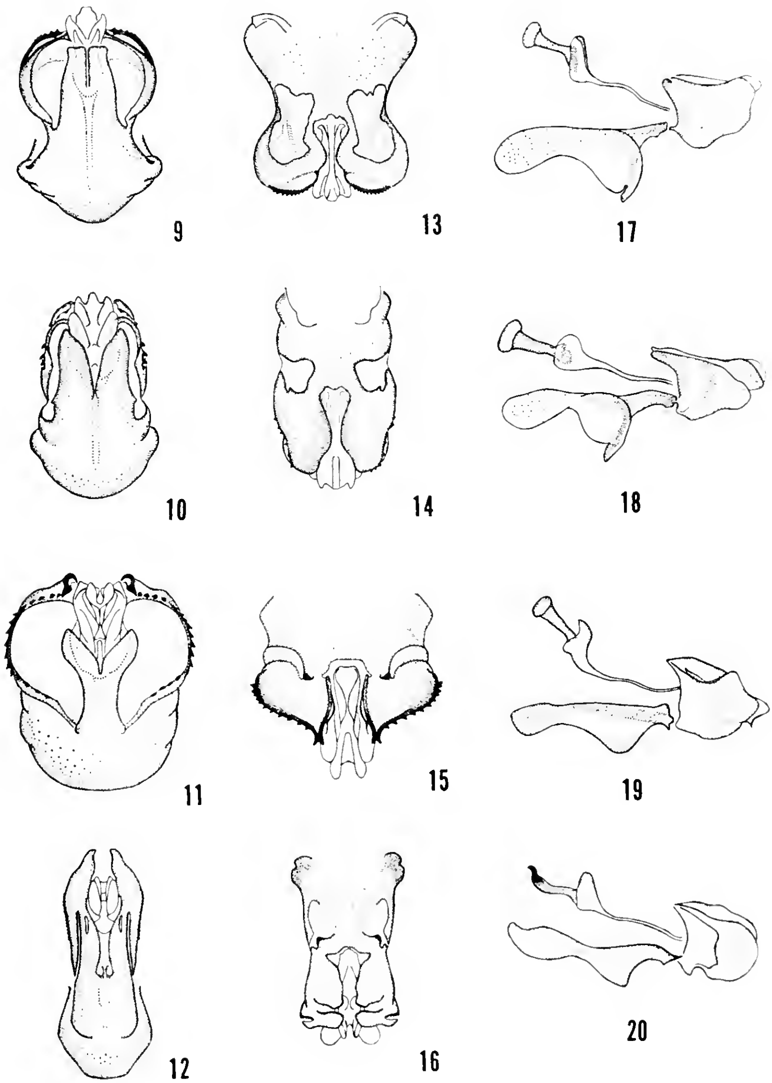
The chitinous box, surrounded laterally to varying degrees by the paired internal lobes, articulates with both the caudal apex of the sustentacular apodeme and the innermost margin of the penis sheath's dorsal invagination (Figs. 13–16). Metcalf has considered the paired internal lobes to function as claspers.

Explanation of Figures

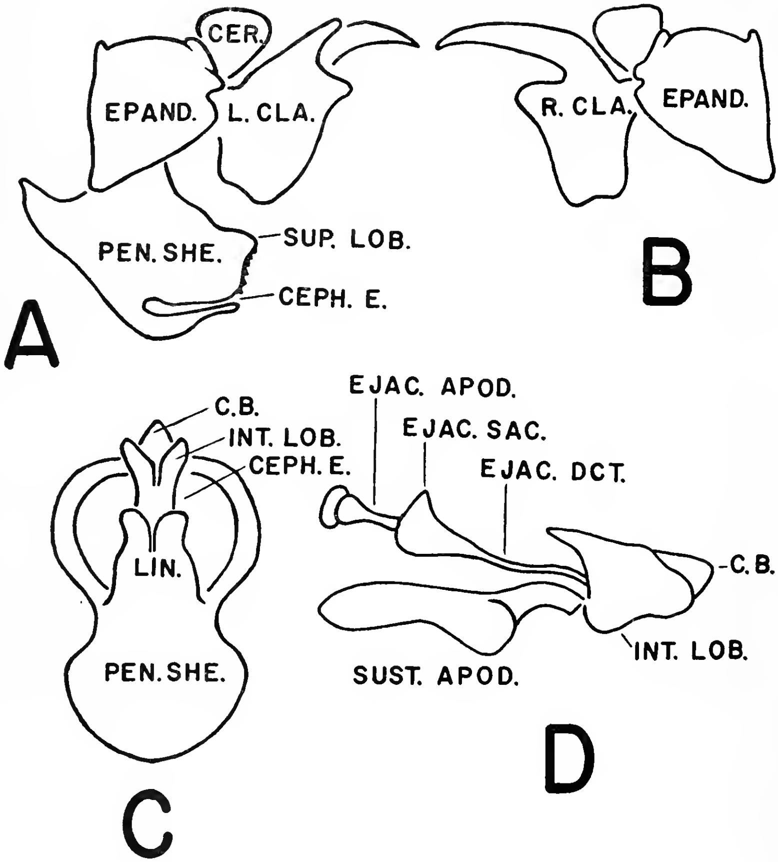
Figs. 9–12. Ventral aspect of penis sheath: 9, *A. bombiformis;* 10, *A. mussitans;* 11, *A. flagrans;* 12, *A. harveyi.*

Figs. 13–16. Dorsal aspect of penis sheath: 13, *A. bombiformis;* 14, *A. mussitans;* 15, *A. flagrans;* 16, *A. harveyi.*

Figs. 17–20. Axial system: 17, *A. bombiformis;* 18, *A. mussitans;* 19, *A. flagrans;* 20, *A. harveyi.*



Figs. 9–20.



Diagrammatic Representation of Male Genitalia

A, Epandrium and associated structures; B, Epandrium and right clasper; C, Ventral aspect of penis sheath; D, Axial system.

C. B., chitinous box.
CER., cercus.
CEPH. E., cephalic emargination.
EJAC. APOD., ejaculatory apodeme.
EJAC. DCT., ejaculatory duct.
EJAC. SAC., ejaculatory sac.
EPAN., epandrium.
INT. LOB., internal lobe.
L. CLA., left clasper.
LIN., lingula.
PEN. SHE., penis sheath.
R. CLA., right clasper.
SUP. LOB., superior lobe.
SUST. APOD., sustentacular apodeme.

The ejaculatory apodeme, with but one exception, has its apex expanded into a globular structure. The exception occurs in *A. harveyi* (Fig. 20) where the apical termination is acute or "claw-shaped." In all species studied the body of the apodeme is somewhat constricted medially with the basal end gradually expanding until it terminates within the ejaculatory sac. This sac is an expanded portion of the ejaculatory duct which has its opposite end communicating within the chitinous box.

Presumed Relationships: Although the entire emphasis in this study has dealt with the genitalia, an interpretation of relationships based solely on these structures may be suggested.

As mentioned previously the structure of the sustentacular apodeme most clearly indicates the relationship between those species of the same geographical region. The two Palearctic species *A. bombiformis* and *A. mussitans* (Figs. 17, 18) display the same keeled-flanged configuration of this structure, conversely both Nearctic species (Figs. 19, 20) lack this character. However, when other morphological structures are considered, specifically the superior lobes and cephalic emargination, it would appear that *A. bombiformis* is somewhat more closely related to *A. flagrans* than it is to *A. mussitans*, the other Palearctic species. In both *A. bombiformis* (Fig. 13) and *A. flagrans* (Fig. 15) the lobes are expanded laterally, in ventral aspect (Figs. 9, 11) this possible relationship is more apparent when the width of the cephalic emargination is considered. The greatest degree of divergence from the other species may be observed in *A. harveyi*, as shown in the configuration and bilobed condition of the superior lobes (Figs. 4, 16), the lack of a (or extremely narrowed) cephalic emargination laterally (Fig. 12), the general narrowness of the penis sheath (Fig. 4), and the uniqueness of the apical termination of the ejaculatory apodeme (Fig. 20).

Sequential papers will also deal with the male genitalia of the supra-specific groups within the Sericomyiini complex. The last paper of the series will attempt to redefine the limits of these groups and their status within the complex.

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Feeding of Horseflies (Tabanidae: Diptera) on Plant Juices[1]

R. H. ROBERTS, Entomology Research Division, Agr. Res. Serv., USDA, Stoneville, Mississippi

Although the adult female tabanid is well-known as a blood feeder, relatively little is known about the feeding of the male and female on plant juices. The present note reports observed feeding of adults of several species of Tabanidae on tree sap.

On June 13, 1963, James D. Solomon, an entomologist from the U. S. Southern Hardwoods Research Laboratory, Stoneville, Mississippi, informed me that he had noticed adult tabanids flying around and landing on trees in one of his research plots in the station's experimental forest. I visited the area and found that adult tabanids were apparently attracted to the trees (the overcup oak, *Quercus lyrata* Walt., and the nuttall oak, *Q. nuttallii* Palmer) by the liquid exudate that was

[1] In cooperation with the Delta Branch of the Mississippi Agricultural Experiment Station.

seeping from the tunnels of the carpenterworm, *Prionoxystus robiniae* (Peck). The flies were actively feeding on this exudate.

A half-hour's collecting with a sweep net yielded the following species: *Tabanus atratus* F., 1 ♀ and 5 ♂♂; *T. americanus* Forster, 3 ♀♀ and 12 ♂♂; *T. proximus* Walker, 2 ♀♀; and *T.* stygius Say, 1 ♀.

On the same day, collections from a bait horse showed that in addition to the above species, the following were also present in the same area: *T. fuscicostatus* Hine, *T. lineola* F., *T. subsimilis* Bellardi, and *T. wilsoni* Pechuman. Occasional observations on the tabanids visiting these trees were made until June 22, but none of these latter species were found feeding on the tree exudate.

On June 22, about 2 inches of rain was recorded in the area. Thereafter, tabanids were not observed visiting the trees though the exudate was still present. The previous measurable rainfall in the area had fallen May 6 (2.2 in.). When my observations and collections were made, the forest was very dry, and, except for occasional ponds in several large drainage canals, no other water was present. On the basis of these data, the tabanids probably visited the trees more to obtain moisture than food.

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Number 20

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By Howard E. Evans

Museum of Comparative Zoology,
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ENTOMOLOGICAL NEWS

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A New Collembola-hunting Microstigmus with Notes on M. guianensis Rohwer (Hymenoptera, Sphecidae)

Karl V. Krombein, Smithsonian Institution, Washington, D. C.

R. W. Matthews, Museum of Comparative Zoology, recently submitted for identification a series of a Collembola-hunting *Microstigmus* from Costa Rica. This tiny pemphredonine wasp is clearly a new species; it is described below to provide a name for Dr. Matthews' projected publication on the behavior, life history and nest architecture of this interesting subsocial wasp. I am very grateful to him for allowing me to place the primary types in the U. S. National Museum.

Matthews' series was compared with specimens in the National Museum including the holotypes of *M. guianensis* Rohwer and *M. brunniventris* Rohwer, and with material of *M. theridii* Ducke as identified by Rohwer (1923). All species were also compared with Richards' (1932) excellent taxonomic notes on various other species of *Microstigmus*. The results of my study of these materials is as follows.

Microstigmus comes, new species

M. comes runs best to *theridii* in Richards' key to the females. However, it differs from that species in having the scutellum strongly convex and the antennal scape reaching three-fourths of the distance to the anterior ocellus. Specimens from São Paulo, Brazil, identified as *theridii* by Rohwer, run without difficulty to that species in Richards' key. If Rohwer's material is correctly identified, then *comes* also differs from *theridii* in having the front and vertex highly polished and smooth as contrasted to the delicately shagreened and somewhat duller appearance of these parts in *theridii.*

The present record of *comes* from Costa Rica extends the known range of *Microstigmus* considerably to the west. Previously, the genus was recorded only from Trinidad, French and British Guiana, Brazil, and Paraguay.

Holotype. ♀; 2.5 mi. SW of Rincon (8°42′ N, 83°29′ W), Osa Peninsula, Puntarenas Prov., Costa Rica; 21–28 February, 1967 (R. W. Matthews; Field Note #112). U. S. National Museum Type No. 69656.

Length 3.3 mm, forewing 2.5 mm. Predominantly pale stramineous to testaceous, but the mandibular teeth, extreme apical margin of propodeum and sting guides black, and the following almost white—middle of mandible, side of clypeus, pronotal lobe, tegula, middle of scutellum, fore and mid legs except tarsi, and hind legs except tibia and tarsus; wings with a slight yellowish cast, veins stramineous, stigma stramineous at base and dark brown elsewhere.

Head highly polished, almost devoid of surface sculpture except for tiny micropunctures bearing short hairs, the height (apex of clypeus to top of head) 0.9 times the greatest width across eyes; malar space long, 0.4 times the length of scape, the latter extending three-fourths the distance from antennal insertion to anterior ocellus; clypeus moderately convex in middle, flattened laterally, the margin of median lobe slightly emarginate, lateral teeth lacking; ocelli in an elongate triangle, the postocellar distance 1.25 times the diameter of anterior ocellus; ratio of postocellar, lateral ocellar, ocellocular, and ocelloccipital distances as 5:6:13:15; scape as long as pedicel plus flagellar segments 1–4; antennal segments having relative lengths of 62, 15, 13, 12, 12, 12, 11, 10, 10, 9, 7 and 15, flagellar segments 1–4 being approximately three times as long as wide; flagellar segments rather uniform in width except 9th half again as wide and 10th about twice as wide as basal segments.

Thorax not quite so shiny as head, the scutum appearing duller because of moderately dense, short, appressed vestiture;

pronotum with a low, sharp keel across middle which curves laterally onto pronotal lobe, the anterolateral angles rounded, not salient, pronotal surface smooth elsewhere; scutellum at base with a narrow smooth area, strongly raised in middle, subtriangular as viewed from in front, the anterior surface of raised part truncate, the posterior half with a weak median carina; postscutellum somewhat raised on median section and with a truncate, vertical anterior surface, the posterior horizontal section with a median carina, the furrow between scutellum and postscutellum not crenate; meso- and metapleura smooth; dorsal propodeal surface not so shiny, its margin set off by a curved keel, at base with a small U-shaped area delimited by a weak carina from which radiates a series of weak carinae extending to the keel delimiting the dorsal surface; posterior surface also less shiny, divided into three main areas by two strong transverse keels, the areas between these and the dorsal keel subdivided by some weaker longitudinal carinae; lateral surface with a few delicate oblique carinae.

Allotype. ♂; same data as type, but 1–7 March, 1967, from nest 72–1 (USNM).

Length 3.4 mm, forewing 2.4 mm. Coloration much as in female except the few darkened areas brown instead of black, and the white much more extensive as follows—mandible except teeth, front, thorax except postscutellum and propodeum, petiole, basal two-thirds of second tergum, sixth and seventh terga, and all sterna except first; wings and legs colored as in female.

Head with sculpture and proportions as in female; antennal segments with relative lengths of 60, 15, 15, 13, 13, 13, 12, 10, 10, 10, 9, 8 and 14, the basal flagellar segments about 2½ times as long as wide, the terminal segments only slightly wider than basal ones.

Pronotum and scutum as in female; scutellum also similar in shape but the narrow basal area crenulate; other details of thoracic and propodeal sculpture as in female.

Abdominal sterna without specialized vestiture; exposed part of hypopygium triangular, about as wide at base as long.

None of basitarsi flattened or curved as in some other species of Pemphredonini.

Paratypes. 22 ♀, 24 ♂; same locality and collector as type, bearing dates of 21–28 February, 1–7 March, 1–11 March or 8–12 March, and notations of being from various nests or associated with field notes. Paratypes are in the collections of the U. S. National Museum, Museum of Comparative Zoology and of R. W. Matthews. Female paratypes vary in length from 3.0–3.2 mm; in several specimens the scutum is whitish as is the base of the second tergum; occasionally the dorsal surface of propodeum is irregularly reticulate. Male paratypes are 3.0–3.4 mm long; in several specimens the bases of the abdominal terga are broadly whitish, and several specimens are entirely stramineous; the more pallid specimens are tenerals.

Microstigmus guianensis Rohwer

Microstigmus hingstoni Richards, 1932, p. 373. NEW SYNONYMY.

The unique female type of *guianensis* from Kartabo, Bartica District, British Guiana, agrees almost exactly with Richards' carefully detailed description of *hingstoni,* based on a unique female from Moraballi Creek, Essequibo River, British Guiana, in the British Museum. Richards was clearly unaware of Rohwer's earlier paper and, regrettably, I must place Richards' species in synonymy.

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Notice

The volume flyleaf and the index for volume 78 may be lifted out of the center of this issue to facilitate binding by opening the staples, removing the pages and closing the staples. These sections may then be placed at the beginning and at the end of the volume as appropriate.—R. H. A.

Another Two New Fleas from Tanzania

C. ANDRESEN HUBBARD, Malaria Institute, Amani, Tanzania; Tigard, Oregon 97223

During May of 1965 a week was spent at the 6,000 foot elevation of the Western Usambara Mountains in north-east Tanzania, at the old German saw mill town of Shume, about 20 miles north-west, by road, from Lushoto. Shume is a ghost town now for the primival forest has long since been logged off and the reforested pine is not yet ready to harvest. It was at the foot of these young pine trees that six small black shrews were taken in small live catch box traps. Dr. J. Meester, shrew specialist at Transvaal Museum identified them as *Crocidura nigricans*, a shrew not before recorded from Tanzania. The shrews carried four fleas of the species *Ctenophthalmus particularis* described by Berteaux from the Kivu area of the Congo. In 1963 the writer separated the Njombe, Tanzania, form and named it *C. p. hopkinsi*. At that time the writer had four females of the flea from Shume which did not seem different from the Njombe form. However, when there were two males in the new Shume material the series was sent to Frans Smit of the British Museum who checked them against the types of *C. p. hopkinsi* and proclaimed them different. The new flea shall be called:

Ctenophthalmus particularis smiti n. ssp.

According to Smit, although 500 miles separates the type localities the females are inseparable but in the males the apical outline of the VIII St. is distinct, that of *C. p. hopkinsi* having a slight bay while *C. p. smiti* has a deep bay low down which causes the lower lobe to look like a finger-like appendage. Further, the posterio-ventral angle of the process of the clasper of *C. p. hopkinsi* is flat while that of *C. p. smiti* is indented.

The holotype male and allotype female are on separate slides bearing the writer's number T2401, dated May 21, 1965, with type locality as Shume, Tanzania, and type host as *Crocidura* *nigricans* and are deposited in the Rothschild Collection of the British Museum. All paratypes are in the U. S. National Museum.

This flea bears the name of Frans Smit, custodian of the Rothschild Collection of Fleas of the British Museum. The original British Duo, Jordan and Rothschild, have long since passed beyond, leaving in their chairs and atmosphere younger Frans Smit and older Harry Hopkins, present day world authorities on fleas, to carry on. For all time their names will be carried by these closely related fleas found on the opposite sides of Tanzania.

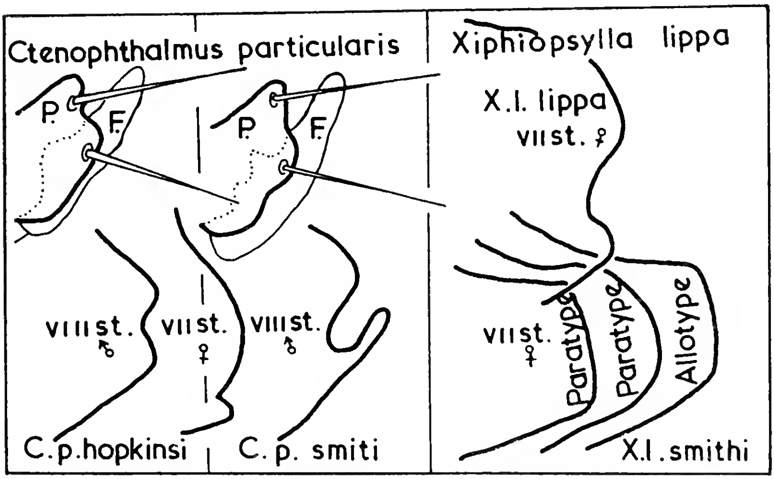
On August 27, 1965, a few days were spent about Ngorongoro Crater in north-central Tanzania. Here several specimens of *Lophuromys f. aquilus* were taken about the Michael Grzimek monument at the 8,000 foot level of the Rim. From two of these there was removed a female each of a flea similar to *Xiphiopsylla lippa* Jordan 1933, but with apical outline of VII St. quite different. The flea which is described here as new shall be called:

Xiphiopsylla lippa smithi n. spp.

There are before the writer at this time and all from Ngorongoro Crater Rim: Holotype male off *Pelomys fallax* (Creek Rat), Jan. 22, 1963, No. T1760. Allotype female off *Mus triton* (Pigmy Mouse), Oct. 2, 1962, No. T1108. Paratypes, 2 females off *Lophuromys f. aquilus* (Chocolate Brown Mouse), Aug. 27, 1965, No. T2921.

When these are compared with the original description of *X. lippa* the males seem to be inseparable. But in females the original illustration of the apical outline of the VII St. of *X. lippa* has a broad upper lobe and small lower lobe with a noticeable bay between whereas in *X. l. smithi* the apical outline is a single nicely rounded lobe without a bay and slightly flattened along the posterior border. This new flea is probably vicarious, perhaps slightly favoring *Lophuromys* as a host. The type slides are deposited in the Rothschild Collection, the paratypes in the U. S. National Museum.

This flea bears the name of Robert Smith, Scotsman from Aberdeen, who for some years has been superintendent of Buildings and Grounds at the Malaria Institute, and who has been invaluable to the writer in designing and allowing his crews to build and maintain the writer's field and laboratory equipment. It was through Mr. Smith's thoughtfulness that the only specimens of the elephant shrew fleas *Chimaeropsylla potis potis* Rothschild 1911 and *Chimaeropsylla haddowi* Smit 1960 came to the writer's hands. Smith's dog had cornered and held for Smith, in his back yard, the first specimen of the Red



and Black Elephant shrew *Rhynchocyon petersi fisheri* Newmann that had been seen in the vicinity for years and when it was delivered by Smith to the writer in a polythene bag it was with its compliment of 24 fleas, 12 each of the above named, including the first 6 females of the latter to be known and from which the writer described the female.

This is the eighth paper to be written and published by the writer under U. S. National Science Foundation grant GB1954 and the two fleas here described as new bring to 16, the number of new ones he has named from Tanzania.

Lectotype Designation for Chrysops shermani Hine (Diptera, Tabanidae)

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

In connection with another study currently in progress, it seems well to designate at this time a lectotype for *Chrysops shermani* Hine, a distinctive North American species.

Hine (1907) described *Chrysops shermani* from, "A number of females received from Franklin Sherman, Jr. and collected at Highlands, North Carolina." Included in the type series, in addition to the specimens collected by Sherman, were two females from Highlands collected by C. S. Brimley and a single female from Hayden, Ontario, collected by E. B. Williamson. Hine did not state the number of specimens in his series or give collection dates. The writer has seen in various collections specimens of *shermani* collected at Highlands in 1906 and 1907 which carry a small red "type" label.

Dr. C. A. Triplehorn kindly sent four such specimens from The Ohio State University collection where most of Hine's types are deposited. Two of these are from Highlands with the collection date of July 1907 (F. Sherman). The third specimen, also from Highlands is dated 5 July 1906 (F. Sherman) and carries a determination label "*Chrysops shermani* Hine" in Hine's handwriting. This specimen is designated as lectotype by the writer and has been so labeled. It has been returned to The Ohio State collection.

The fourth specimen is the one from Hayden, Ontario and the date of collection is 30 July 1906 (E. B. Williamson). Although the locality label is clearly written "Hayden" as Hine reported it, no such locality can be found in Ontario. It was probably collected at Heyden, a locality well within the range of *C. shermani*.

REFERENCE

HINE, J. S. 1907. Descriptions of new North American Tabanidae. Ohio Nat. 8(2): 221–230.

Dactylolabis (Eudactylolabis) vestigipennis Alexander, a Xerophytic Subapterous Crane-Fly New to California (Diptera: Tipulidae)

David C. Rentz and Wayne C. Gagné, University of California, Berkeley

Collecting at night on the Mojave Desert of California revealed a small subapterous crane-fly. Specimens were referred to Dr. Frank R. Cole of the California Insect Survey, who submitted them to Dr. Charles P. Alexander who informed us that they represented a species previously known from the type series of two males from the Tucson Mountains, Pima County, Arizona, 4,500 feet elevation, February 21, 1937.

Owen Bryant, collector of the type and paratopotype of *D. vestigipennis*, was quoted by Alexander in the original description as indicating that the specimens were found beneath sticks and stones on the ground. Bryant also made the observation that he believed that the species hid beneath stones and fragments of wood during the day and was active at night. These observations are confirmed by our discoveries.

The subgenus *Eudactylolabis* contains but two species (*damula* and *vestigipennis*) both showing peculiar features. The type *damula* (Osten Sacken) is a fully winged species that was first found at Crafton's Retreat, San Bernardino County, California, about twenty miles southeast of the Cajon Pass habitat. *D. vestigipennis* is a small cranefly with extremely minute wings with the venation completely atrophied in both sexes. It is uniform dark brownish-black in body color with the wings whitish. The legs are lighter brown, darkened at the joints. A series of sixteen specimens was taken at the Los Angeles County locality and nearly 100 specimens were captured near Cajon Pass. Seven specimens of each sex were measured. Males ranged from 5.2 to 5.6 mm in body length with an average length of 5.36 mm; females from 6.5 to 8.0 mm in body length with an average of 7.87 mm.

We found the species at two localities, the first in Los Angeles County, 22 miles west of the junction of highways 138 and 14, February 10, 1967, the second in a similar habitat 3 miles north of Cajon Pass on Interstate highway 15, San Bernardino County, March 19, 1967.

All specimens were collected between 8 P.M. and midnight, and within 18 inches of the ground. Some were hanging motionless on grass stems but many were moving about. Various instances of mating were observed and several males were always found near a single female. The soil of both areas was sandy and rather moist. Temperatures were between 40° and 45°. No instances of oviposition were observed.

The California specimens all came from the juniper-pinyon association as described by Küchler (1964) in his book and accompanying map. Joshua tree (*Yucca brevifolia*) occurs at both California habitats. The Arizona specimens came from the creosote-bur sage association. No creosote bush (*Larrea divaricata*) occurs at either California habitat.

It is interesting to surmise why the species has gone unnoticed in California. Perhaps the species could be cyclic, appearing in numbers only during certain years, possibly during periods of great precipitation. This is not, however, greatly borne out by weather conditions in the early winter of 1966–67. Another possibility, and perhaps the real reason, is that the flies are adult during a period of the year when collecting is ordinarily not done, with the added possibility that they are active only on cooler nights.

We wish to thank Dr. F. R. Cole for criticizing the manuscript and for helpful suggestions. Also we are indebted to Dr. Alexander for encouraging us to present this note and for supplying certain details concerning the species.

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Selected Life History Phenomena of Lepidocyrtus cyaneus f. cinereus Folsom with Reference to Grooming and the Role of the Collophore (Collembola: Entomobryidae)[1, 2]

LARRY P. PEDIGO, Department of Entomology, Purdue University, West Lafayette, Indiana 47907

INTRODUCTION

The collembolan, *Lepidocyrtus cyaneus* Tullberg, 1871, is a cosmopolitan species, reported as being primarily from humus (Maynard, 1951), but observed by the author in other situations such as pond shore vegetation. It has 6 forms,[2] one of which *L. c.* f. *cinereus*, is unique in being entirely clothed with gray metallic scales.

Lepidocyrtus cyaneus f. *cinereus* Folsom is approximately 0.9 mm long, and is metallic gray throughout, with traces of iridescent purple. Denuded of scales, the body is a pale yellow with small amounts of purple pigment. Morphologicaly, it is similar to the typical *L. cyaneus*, having a mesonotum which obscures the pronotum and projects partially over the head. The unguis has a pair of large lateral teeth and 2 pairs of inner teeth. The unguiculus is narrow and untoothed, and the mucro has a long apical tooth with a strong subapical spine.

L. c. f. *cinereus* has been collected previously in New York, Washington, Iowa, Canada, and New Zealand (Salmon, 1964). Ecological studies like life history studies of this form are nonexistent with the exception of its mention by Thomas (1939) among a list of animals associated with edible fungi. The present study was undertaken to define basic phenomena in the life history and to establish an efficient rearing and handling technique for the species.

[1] Journal Paper No. 3046 of the Purdue University Agricultural Experiment Station.

[2] The term "form" is used in this study as a reference to color variants. Although it may be a misnomer, it is used as a neutral term in most collembolan papers, where geographical and ecological entities are unknown.

Notable collembolan life history studies have been made by Davis and Harris (1936) on *Pseudosinella violenta* (Folsom), and by Vail (1965), who studied the colonization of *Hypogastrura manubrialis* Tullberg. Britt (1951) made observations on *Hypogastrura armata* (Nicolet).

Materials and Methods

The culture chambers used were similar to those of Abbatiello (1965) but modified by pressing glass cover slips into the plaster substrate before it dried to provide a smooth, nonabsorbent surface for food placement (Vail, 1965). The food consisted of moistened dry yeast on which various molds were allowed to grow.

Since preliminary observations indicated a preference for oviposition sites other than the plaster substrate, a piece of pipe cleaner, $\frac{3}{4}$ inch long, was placed in each culture chamber. Eggs laid on the pipe cleaner could be easily observed and counted.

Culture chambers with springtails were placed in petri dishes filled to a depth of $\frac{1}{4}$ inch with de-ionized water. This water was absorbed by the plaster substrate, and thus atmospheres near the point of saturation were maintained at the surface. Cultures were kept at room temperature, where the mean was 23.4° C and daily fluctuations were usually less than 3° C. Water lost by evaporation was replaced daily.

Collembola are generally difficult to manipulate, and for this study, a pointed plastic rod, $\frac{1}{8}$ inch in diameter and 7 inches long, was used to transfer eggs, juveniles, and adults. By rubbing such a rod with Fiberglas insulation, a static charge was created which attracted eggs and individuals anesthetized with ether. These were released by thumping the rod with a finger.

With springtail cultures thus established, daily observations on life history phenomena were recorded.

Results and Discussion

Egg.—Eggs were usually laid on surfaces above the plaster substrate, such as cast skins, fungal hyphae, and, most frequently, pipe cleaners. Eggs transferred to different chambers and placed on the plaster substrate failed to hatch. This failure and the fact that most eggs were laid on objects above the substrate indicated unfavorable hatching conditions there (possibly due to a thin water film over the saturated surface).

Newly laid eggs were opaque white and spherical, approximately 0.18 mm in diameter. By the third day the eggs became flattened at opposite poles and segmentation within was observed. On the fifth day they had a rough appearance apparently caused by material sloughing off the exterior. Eye spots generally could be observed on the sixth day, and hatching on the seventh. The mean incubation period at room temperature was 7.1 days with a range of 6 to 9 days.

In the only hatching process observed, the individual escaped by splitting the chorion and leaving the egg abdomen first. It is possible that some also escaped head first as with *H. manubrialis* (Vail, 1965). Empty egg shells were examined for possible first instar exuviae inside, but none was found.

JUVENILE.—From rearings of isolated individuals, it was found that *L. c.* f. *cinereus* has 6 juvenile instars. The first, approximately 0.37 mm long, was more definitive than later instars, since it was a transparent white with no pigmentation and lacked the scales present in later instars. The compound microscope revealed no obvious structural differences, except the absence of a genital opening, between later instars and the adult. Because of this, body length alone (a dubious criterion) had to be used to distinguish instars later than the first. Table 1

TABLE 1. Body Lengths and Duration of Stadia of Juvenile Instars

Instar	Mean Body Length (mm)	Duration of Stadia (in days)		
		Mean	Max.	Min.
1	0.37	3.8	5	3
2	0.44	3.8	5	3
3	0.56	3.5	4	3
4	0.66	3.0	4	2
5	0.74	4.0	5	3
6	0.81	4.0	5	2

shows mean body length of the juvenile instars with stadia length statistics. In addition, the mean period of development from egg to full size was 29.2 days, with a range of 24 to 32 days.

Adult.—Molting continued throughout the life of the animal. Ecdysis began with the individual attaching itself firmly to a substrate, bending its head down, and producing pumping movements of the thorax whose cuticula then split along the mid-dorsal line. The individual escaped by freeing the head and antennae, then passing peristaltic movements down the body to free the abdomen. Frequent pauses occurred between movements. The furcula was last to be freed, sometimes requiring 10 minutes. Apparent injury to the furcula during molting was observed in two cases, in which it was dragged behind for some time afterward. Altogether molting required approximately 20 minutes. Based upon 20 molts, adults averaged 1 molt every 4.4 days with a maximum of 1 molt a day and minimum of 1 molt in 7 days.

Eggs were laid either singly or in clumps with single eggs being most frequent. In a culture chamber believed to contain 12 females and 6 males, 28 eggs were laid in 1 week, averaging 2.3 eggs/female. After 36 days, the same colony contained 92 juveniles and adults, indicating the rate of increase. With an average of 29.2 days required for full growth, potentially 12 generations/year could be reared in the laboratory.

Behavior.—A characteristic behavior pattern was that of grooming. A grooming cycle began with the cleaning of the antennae, accomplished by bending an antenna down so that its dorsal surface touched the substrate and its fourth segment was directly under the mandibles, with its apex pointing posteriad. The mandibles were then used to clean the fourth antennal segment, beginning at its base and with biting movements succeeding to its apex. When this routine was done several times, the other antenna was then groomed.

Then the individual rested its body on the 3 legs of one side, raised the opposite 3 legs, and extruded the collophore. Legs and mandibles were rubbed across the bulbous tip of the protrusible sacs. Afterwards, the legs were groomed from the femur to the claws with successive biting movements of the mandibles. The cycle was completed with grooming of the remaining 3 legs. The complete grooming cycle was not always followed, i.e., many times individuals cleaned only 1 antenna or only the legs, etc.

To determine frequency of grooming movements, active individuals were observed for 5 minute periods and grooming activities counted. Thus, antennae were cleaned an average of 2 times in 5 minutes with a range of 0 to 4 times. Legs were cleaned an average of 1.3 times in 5 minutes with a range of 0 to 3 times. These relatively high frequencies of grooming movements are possibly indicative of their importance to the animals.

An interesting consideration in the grooming process is the role of the collophore. It is possible that the collophore is primarily a functional grooming organ in *L. c.* f. *cinereus* and perhaps in other Collembola. Since the collophore is connected to secretory glands in the head by a ventral groove (Snodgrass, 1935), it is possible that fluids on the bulbous tip contribute to the grooming process as lubricators or cleansers. Although many believe that the collophore is an organ of adhesion (Willem and Sabbe, 1897, Hoffmann, 1905), observations of this species never revealed the collophore touching any substrate, whether horizontal, vertical, smooth or rough. This included vertical glass surfaces, upon which this species could not climb even though attempting such.

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A Dragonfly's Unusual Ecdysis-Site (Odonata: Libellulidae)

CARL W. SCHAEFER, Department of Zoology and Entomology, University of Connecticut, Storrs, Connecticut, 06268

In July, 1966, I found an exuviae of *Somatochlora* sp. (prob. *linearis* Hagen) which was five feet up on the trunk of a young maple tree about two feet from the water of a large still pond in Pink Ravine, Storrs, Connecticut. There was no indication of flooding, and the nymph must have made its way through two feet of low vegetation (mostly grasses and plantain) and up the tree-trunk before ecdysis. The exuviae was headed up and very firmly attached to the relatively smooth bark with the prothoracic legs close together, the meso-legs braced widely, and the meta-legs extended back and very close together.

Somatochlora nymphs are characterized by Walker (1925) as "very sluggish," and their exuviae are usually found "clinging to wet moss near the water line and only rarely to aquatic plants." He does report, however, occasionally finding exuviae of *S. minor* (Calvert) on the base of tree-trunks, but he does not say how high or how far from the water.

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WALKER, E. M. 1925. Univ. Toronto Studies, Biol. Ser. #26: 1–202.

Correction

Lines omitted on page 152, June ENTOMOLOGICAL NEWS, between the fourth and third lines from the bottom of the page:

larger adult *Xanthippus* is less than half as rapid. (These are not rapid rates by physiological standards but are more rapid

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